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EDITORIAL NOTES—GAS, &c.

An Extensive Gas-Works Scheme.

OF large gas-works schemes, after Beckton and East Greenwich, New York has given us the Astoria works, Berlin the Mariendorf works, Edinburgh the Granton works, and Glasgow the Provan; and now Paris has decided upon a scheme which will involve an expenditure of £7,200,000 (to be in major part spent on new works, and extensions at the principal existing stations), in addition to the sum of about £1,880,000 expended in the last two years as a matter of urgency. There are two points that are of extreme interest attaching to these enormous expenditures. The first is: What has caused the imperative considerable outlay during the last two years? The second is: Do the prospects of the gas industry warrant such an extensive scheme for Paris, as one requiring an outlay of between 7 and 8 millions sterling? Regarding the first question, there is no disparagement of the old Gas Company in saying that, prior to their giving up possession of the gas supply of Paris, neither in works nor price was the gas supply of the capital of France on the lines that it ought to have been. The Company were "cribb'd, cabin'd, confin'd" by the onerous conditions of their concession, and by the financial obligations to the City Exchequer imposed upon them for the privilege of a limited tenure and the rendering of a public service. The price of gas was necessarily high. Up to 1903, no less than 6s. 9d. per 1000 cubic feet was charged; and since then 4s. 6d.—prices which are the effects of indirect and inequitable taxation, and the lower of which is now nearly double that of the average price in London. Under the circumstances of that 6s. 9d. price, it would have been astonishing if the consumption of gas had increased by leaps and bounds. It did not do so. But since the reduction to 4s. 6d.—high as that price still is, according to British notions—the sales have piled up by 4202 million cubic feet, from 10,236 to 14,438 millions. The number of consumers has increased in the like period by 175,453. In these figures, the Municipal Council of Paris ought to see a practical lesson for them—that the fattest profits are not necessarily made by the highest prices, but rather, oftentimes, by the greater extent of business to be obtained at lower prices. There would never have been this considerable broadening-out of the business in such a short span of years, nor the prospect of so considerable an extension as that forecast, had the price of gas not been reduced. It is to be hoped that after this the policy of lower gas prices will be fostered in Paris in the greatest possible measure.

And as to the present necessity for such heavy expenditure upon works. With the sands of time running out for them during their latter years, it was natural the old Gas Company should not then commit themselves to more capital expenditure than was requisite. Those members of the Gas Institute who inspected the Clichy station of the Company at the time of the International Exhibition of 1900, and those British gas engineers who visited La Villette works at the time the Parisienne projector machine was designed by the Company's engineering staff, will remember something as to the characteristics of the plant then. Not all of it was striking in the matter of modernity; and some years have sped their way since then. Hence, with the rapid increases of business on the large scale while gas has been at a more reasonable—but not yet sufficiently reasonable—price, there has had to be prompt expenditure in extending the existing plant, and thought on more elaborate lines has had to be taken for the morrow, bringing within range of consideration the rescuing from wasteful conditions of material economies. These are not by any means reflections on the administrative or technical staffs of the old Company; but they are reflections on the deterrent and uneconomical conditions under which they were compelled to operate.

Are the prospects of the gas industry favourable to the execution of such a vast scheme of construction, re-construction,

extension, and reorganization as that now adumbrated? There can only be an affirmative answer. Paris itself, in its recent years' experiences, gives a resonant reply. The city has extensive generating-stations for electricity supply, and all the best parts of Paris are completely cabled. Notwithstanding this and the price-obstruction to the greatest vitality in gas-supply development and to freedom in meeting the electrical competition, despite, too, the severance of the suburban communes in 1906 (in which there was the prospect of very prolific expansion), the gas industry of the city has, as already remarked, added to its business stature since 1902 no less than 4202 million cubic feet. That is a no mean achievement under the circumstances; and it evinces a remarkable latent virility, as well as a considerable undeveloped field for business enterprise. And Paris has not even yet obtained the fullest benefit from its gas supply. Beyond all this, the scheme finds, in anything but an infinitesimal degree, justification on economic grounds, through the savings that will accrue in working expenditure. Half-a-dozen small and uneconomical works are now to be abandoned, and their sites disposed of. The Landy, Clichy, and La Villette stations are to be extended; and new works concentration is to commence to the south-east of the city. The minimum saving in works costs has been placed at 4d. to 5½d. per 1000 cubic feet. New tar and chemical works are to be erected; certain of the present residual products plant is to be discarded, and other existing plant enlarged. The distribution system is not to escape necessary revision, to meet the augmentation of demand; and, in this connection, it is interesting to learn that representatives of the new Company's technical staff, as well as those of the principal Suburban Company, have been in Edinburgh studying Mr. Herring's work there in high-pressure distribution. The scheme, too, involves—also in the name of economy—the provision of bottom-doored railway waggons. Economy is printed all over the scheme, upon which, year by year, until completed, expenditure will progress until it reaches to something like the estimated enormous sum.

The Company's Engineers are to be most heartily congratulated not only on the endorsement of their scheme for meeting immediate and prospective requirements, and for producing working economies, but upon the splendid engineering opportunities that such a scheme and expenditure unfold for them. The Company have done wisely in taking the "bull by the horns;" and, judging from the details in an article elsewhere, they will show to the people of Paris that the comprehensive scheme has been wisely conceived, and that it will represent a financial success of first-class order.

Factors in Measurement Error—

Juniors and University Lectures and Work.

WHEN one has read an address such as that Mr. Franklin Thorp (who, as is well known, is identified with the meter industry in its various branches—meters for productive, commercial, and scientific registration) delivered, as President of the Manchester Junior Association, last Saturday, one's mind drifts to the inquiry as to whether sufficient use is made by the industry's technical organizations of the practical, scientific, and constructive experiences that lie at the back of the manufacturing and trading part of the industry. This is a topic upon which we have dwelt before; but it naturally arises again on this occasion. Mr. Thorp, in connection with the Manchester juniors, occupies, in view of his commercial relations, a unique position in being their President for this year. His unremitting work among them, through an interest in cultural pursuits distinct from those of commerce, deserves the reward; but it is probable that he will be the first and only (we use the designation inoffensively) "trader" who will tenant the most distinguished office in the Association, as membership on the part of those having commercial intercourse with the gas-supply industry has been debarred. As to the wisdom or otherwise of this, there is no occasion for argument; but we do say that, in

the best interests of professional knowledge, the way must be kept open with our manufacturing industry for uninterrupted intercommunication on matters of technical import. The manufacturer's technical interest, researches, and experiences are, as a rule, concentrated in a single direction; whereas the gas-supply engineer's technical interests rove over a large field, and are in every part limited by his opportunities. The concentrated interest of the manufacturer, if he lives up to the times, must bring him into contact with all the various phases and details of his work and business. When, therefore, he is invited to speak upon a technical matter, his choice naturally falls into the lines of his especial interest, and his information is of exceptional value.

And so we have Mr. Thorp in one part of his address pointing, from his experience, lessons that will be of service to the gas engineer from their suggestiveness in more ways than one. With masterly ability and conscientious propriety, he steered clear of everything that could have been construed as taking an undue advantage of his position, and of the confidence of those who had honoured him with it. The points the President made in this connection may not be altogether new, but certain it is they are not general knowledge, or the effects of the disregard of them would not be so common as they are. He showed how the flow of gas in mains varies much more than one would expect from observation of the pressure-gauge. The point was illustrated by the results of personal investigation; and it was made perfectly clear that many meters are called upon to perform a greater duty than that for which they are constructed, though they may not be passing in an hour a larger volume of gas than that for which they are designed. To instal a meter of too small a capacity is foolish; inasmuch as its overloading may mean loss of money, as well as organic and functional injury. With the increase of overloading, the percentage of error increases, to the disadvantage of the gas supplier. Further, Mr. Thorp gives some practical advice regarding the testing of station meters by a holder; and he proves the soundness of his contentions again by the results of personal investigation. The errors that may and do arise through the variations of temperature in the holder itself are considerable; and, in the end, it is seen that his counsel is wise, that, in testing a meter by a holder, a night should be chosen when the temperature varies as little as possible, and the gas in the holder should be reduced to normal temperature and pressure at both the commencement and end of the test. These are only indications of points of the part of the address wherein Mr. Thorp's endeavour is to show where differences of error may arise from factors not generally taken into consideration.

A matter of much importance in connection with the technical advancement of the juniors was dealt with in the second part of the address. In considering the question of specialized technical instruction in the gas industry, and in the later developments in this direction—although the professional juniors of the industry have their own organizations, and it is such as those constituting the membership of those organizations that all educational effort in the industry is designed to personally benefit, and through them the industry itself—these organizations have not hitherto been in any way taken into counsel. It cannot be denied that the Junior Associations have cut out for themselves a good position in the gas industry; and the members are working heart and soul for the cause of the industry, and are losing no opportunities to that end. If this fact be recognized (as it should be), the more extended will be the respect already gained, and the greater will be the sympathy in a matter that has now to be discussed. In Mr. Thorp's address we are brought *vis-à-vis* with a question that has been recognized, though little talked about. But the juniors themselves are now—not from any opposition to the Leeds University scheme and efforts, but in their own interests in other parts of the country—making the matter a cause of (shall we say?) complaint on the ground of inequality in opportunity. While there are indisputable advantages in building up a strong centre for specialized educational work and for research—and the stronger the centre is in connection with any one industry the better—there is the one admitted disadvantage, whatever is done (and the Leeds University authorities have not been slow in doing all possible), that distance, time, and expense put a limit upon the number of those who are able to participate in the privileges. It is a difficult matter. But it is quite natural that the progressive juniors should desire, if there is a way, of seeing a better distribution of those privileges.

There are among the Manchester juniors (though Leeds is nearer to them than to the juniors of the Midlands, the Southern and more Northern Counties, and Scotland) several who would like to participate, but cannot do so, as students in the lectures and work proceeding at the Leeds University. As a result for the juniors of the Manchester district, there is a proposal on foot (as sketched by Mr. Thorp in his address) for a course of lectures at the Manchester University by men of special qualification in technical gas affairs; and a second scheme proposes a course of lectures, demonstrations, and practical work for advanced students at the University, from October to March, at a maximum fee of £2 2s. per course of sixteen lectures of two hours each. At the head of the department in which these lectures and practical work would be incorporated is Professor Harold B. Dixon, whose standing as an authority on matters relating to the chemical and physical properties of gases requires no special mention in these pages. There is the evidence of a distinct desire between University and Association to cultivate closer relationships; and, recognizing as we have the need for all opportunities for broadening knowledge among those into whose hands will hereafter fall the technical responsibilities of the gas industry, and advocating as we have too the formation of the junior organizations, and the provision of the very best and widest means of technical as well as practical education, it would ill-become us to do other than give cordial support to the aspirations of the juniors of the Manchester district who cannot participate in what the Leeds University has to offer, and to ask all concerned in the administration of the gas undertakings in the Manchester area to see what can be done to help the juniors in the matter. Let it be remembered, that all work of the kind is for the benefit not of the individual only, but for the gas industry at large. This, however, has also to be remembered, that the more that is done in this way apart from Leeds University, curtails the field whence it can hope to draw gas engineering students; and therefore it may at once be put forward as a suggestion, seeing that Leeds has been chosen as the head and centre of technical educational work and research for the gas industry, as to whether arrangements could not be made whereby the Leeds and Manchester Universities might work hand in hand in this matter—say, by lectures delivered at Leeds being repeated at Manchester. This is only an unconsidered idea; but from it (Professor Dixon showed on Saturday that the relations between the Manchester and the Leeds Universities were of the most cordial) there may be evolved a way through which the needed service and usefulness may be achieved, and economically. The Manchester scheme, however, is only at present in embryo; but there are those who ardently desire to see consummation, and now is the time for serious consideration, in which we hope, as suggested by Mr. Whatmough at the meeting of the Manchester juniors, the Senior District Institution will have an opportunity of joining.

Sulphate of Ammonia and Beet Cultivation.

THE subject of the cultivation of beetroot in this country for the purpose of establishing a home sugar industry has again arisen. It is one of those questions that come up periodically; but, from sheer apathy and want of encouragement, it sinks out of view as regularly as it appears. Here is a big industry at hand with great potentialities, if only it were taken up in a proper manner, and given the capital and protection that are required—the latter in view of the strength and established position of the Continental sugar industry, which naturally would be very loth to lose the trade with this country. It is obvious that the development of such an industry in this country would confer benefit on home agriculture, engineering, sulphate of ammonia producers, and labour. In an article in the "Daily Telegraph," it is stated that no less than £20,000,000 is year by year paid by the people of this country for sugar, of which something like £17,000,000 goes to the producers of beetroot sugar on the Continent. If it be at all possible—and there is no apparent reason why it should not be possible—a large part of the last-named enormous sum should be kept and utilized at home; but there will be little result if the movement to that end is not very seriously made. It cannot be said that the soil or the climate of this country is not suitable for beet cultivation. Some ten years ago, Lord Denbigh carried out some exceedingly successful experiments at Lutterworth in the growth of beetroot; and many other

people, in most parts of the country, have been similarly gratified with the outcome of trials. As a matter of fact, these point to the production per acre of land being greater than on the Continent. There are agriculturists who think that on English soil 20 tons of beet per acre might be grown; Lord Denbigh says that from 16 to 17 tons per acre should certainly be produced. The average weight per acre on the Continent is, however, only 13 tons. It is somewhat significant of what is considered abroad to be the capability of this country in this respect when it is found that contracts are being placed by a firm of Dutch sugar manufacturers for the production of sugar beetroot for exportation to their factories in Holland. Lord Denbigh has undoubtedly good grounds for his conviction that the effects of establishing a sugar industry in our midst, if adequately encouraged, would be far-reaching, and that they would not be confined to agriculturists. His Lordship is proposing to ascertain, by means of questions in the House of Lords, as to how far the Government will be prepared to give the necessary encouragement.

In these columns only a fortnight since [March 22, p. 782], we were writing on the subject of the greater cultivation of the home market for sulphate of ammonia, and pointing out how far we are behind Germany in the matter of the home absorption of the commodity. The rapid growth of the production of sulphate of ammonia in Germany and the expansion of its use there, are among the surprises in connection with it. The consumption has been going up by leaps and bounds, until, as we have recently been told, it was in 1908 no less than 284,000 tons, which, if calculated out at an average price of £11 10s. (taken as an approximate, and not an actual, figure), represents a value of £3,266,000. The figures make our own look very insignificant. A large proportion of this German consumption is utilized for the cultivation of beetroot, for which (and this is another consideration in encouraging the sugar industry in this country) sulphate of ammonia cannot be replaced by the nitrogen of nitrate of soda. Germany in this connection has a prominent characteristic. Statistics regarding its productions, commerce, and so on are available; but there is no great show of liberality in the information that it affords in respect of practical applications, where those practical applications are liable to be competitively assailed. Hence, we know generally that sulphate of ammonia is largely utilized in beetroot growing in Germany; but as to the absolute extent, methods, and so forth, outside knowledge is vague and limited. British agriculturists want educating on this question of beetroot cultivation, and the country on that of the encouragement of the establishment of a home sugar industry. This reawakened interest in the question is a matter that the Sulphate of Ammonia Committee must follow up closely; and there must be preparedness on their part with information as to what is done in Germany in the matter of the application of sulphate of ammonia in the cultivation of beet. Though the revival of interest in the subject has not yet had time to make any big headway, there is work to be done in the provision of material with which to stimulate that interest; and the question ought not to be allowed again to disappear from view without a struggle.

Indictment of the Sales of Gas Act.

THE Sales of Gas Act has lately been seriously arraigned as an imperfect instrument for ensuring or certifying the accuracy of gas-meters under the conditions of practical use. The Act has now been in operation upwards of fifty years; but, from the very first, its deficiencies have been recognized, but never made good. In 1860, the year after its introduction, the Astronomer-Royal reported that the omission of provision for the testing of indices rendered the Act nugatory and useless. That was a sweeping condemnation on the point of a single deficiency. Subsequently, a Select Committee reported in favour of amending the Act. Then, ten years later, the Standards Commission reported that the Act should be amended; but as the authorities, despite these recommendations, appeared to think there was no urgency in the matter, twelve years were allowed to elapse before the Board of Trade prepared the draft of an amending Bill. That was 28 years ago! The Act of 1859 has survived all the attacks made upon it; and it still continues its existence with its manifold and manifest imperfections and omissions. It has been a subject of reference of late—in Messrs. Kendrick and Ellery's presidential

addresses to the two District Associations of which they are this year the heads; also in our "Correspondence" columns; but more particularly in the article in our columns on Sept. 28 last of Mr. Fred. Coe, of Nottingham, and in the paper, read before the Yorkshire Junior Association, by Mr. P. M'Nab, and published on March 22. The tribute paid (in the discussion) by Mr. Walter Hole to the value and lucidity of this paper is richly deserved; and it must be admitted that it forms one of the most striking indictments of the Act that has yet been made. If the Act was weak in the various years mentioned in the opening lines of this article, how much more is it so now when the conditions under which consumers' meters are called upon to register gas have made such conspicuous flight from the standard conditions prescribed in the Act, and which conditions were thought to be equitable and appropriate enough at the time of their origin.

Meters, of course, are designed and constructed to meet the standard conditions. That is imperative, though the latter do not conform with the conditions under which the meters are called upon to perform their duties. It is, therefore, as has been pointed out, obvious that a meter is not necessarily satisfactory for the fulfilment of its functions under working conditions because it has passed the statutory test, though, as a matter of fact, taking the periodical indications of consumers' accounts as a rough-and-ready test, there is not much to complain about generally as to the constancy of meters, though the examination for stamping has been carried out under circumstances altogether different from those under which the meters are used. That this is so, is a tribute to the excellent range that some well-made meters possess; but, at the same time, there is solid evidence to show that a not altogether negligible percentage of meters would not, tested under the conditions of use, fall within the zone of error permitted by the Act. Pressures now are considerably higher than the standard ones under which meters are tested; and Mr. M'Nab indicates that substantial trouble may arise with wet meters with increased pressures. He also makes reference to the somewhat frequent indifference of dry meters to the passing of the fine streams of gas required by one or two pilot lights. His tests, however, confirm what has been previously pointed out, that under increased pressures the degree of error in registration is more often than not in favour of the consumer, and to the loss of the gas supplier. Among other questions, is that of the difference in temperatures between the test-room and the position in which meters usually work in consumers' houses. But here again the lower temperature of the latter position would be favourable to the consumer rather than to the gas supplier. Nevertheless, there must be some give-and-take in these matters. Standard conditions for testing there must be; and standard conditions cannot be ordered to meet the different degrees of temperature to which meters will afterwards be subject by location and season. There is an almost common agreement that provision should be specifically made in the Act for the testing of meter indices; but though there is not this specific provision, a meter ought not to be stamped unless it registers correctly within the prescribed margin of accuracy. This being so, by inference, if not by precise prescription, the testing of the meter-index should fall within the examiner's duty.

The more, however, that is written on this subject, only emphasizes the fact that the Sales of Gas Act requires revision and amplification, in the latter respect in one way (among others) indicated by Mr. Coe. He says that it is a remarkable fact that the greater number of the official examiners of meters pursue an inadequate practice; and "it is of general importance to all parties concerned, that "official inspectors of gas-meters should follow an adequate "and uniform practice more in accordance with the whole "spirit of the law regarding accuracy in the testing and "stamping of meters." Precision is the object of examination and stamping; and nothing should be left undone to make the examination itself as precise as possible. It is a point which must not be lost sight of.

Bradford and New Carbonizing Systems.

A Sub-Committee of the Bradford Corporation Gas Committee have begun an inquiry into the new carbonizing systems now seeking favour for gas making in place of the older types; and their first report (signed by the Chairman, Mr. H. Geldard, but

bearing unmistakable signs of the assistance of the Gas Engineer, Mr. Charles Wood, in the composition of its technical parts) has been issued. In this report are stated concisely the impressions and particulars collected in Berlin, Cologne, and Munich, with published information as to the British continuous plants. There is no doubt that the deputation returned from their studious wanderings on the Continent fully persuaded that the view of German gas engineers is that horizontal retorts are doomed, and that vertical retorts and chamber settings will represent the survival of the fittest in carbonization plant for gas production. But the deputation have more inquiry to make before they commit themselves to any precise expression of opinion or recommendation. They have been impressed, however, by the Dessau retorts and the Munich chambers in regard, among other points, to the ease of operation, the smallness of the labour requirement, the intermittent labour requirement, and the lowness of labour costs per ton of coal carbonized. By comparison, they place Bradford working in a very humiliating position. With the Dessau verticals in the Berlin retort-houses of the Imperial Continental Gas Association, the production of gas per man employed per shift varies from 270,000 to 310,000 cubic feet. In Bradford, the relative figures are 25,000 cubic feet with hand stoking at Valley Road, and 33,000 cubic feet with machine stoking at Birkshall. The total cost of retort-house labour at Bradford is 2s. 8.98d. per ton of coal carbonized. This looks an ugly figure in contrast with 4d. for the Munich chambers, 5d. for the Berlin verticals, 2.5d. for the new settings at Berlin, and 2.75d. for the St. Helens small trial setting. Respecting the Woodall-Duckham and the Glover-West settings, the views of the deputation will, it is anticipated, be forthcoming in a subsequent report.

First Coke-Oven Gas Scheme in Parliament.

The coke-oven gas scheme for the supply of Little Hulton, to which attention was called in early numbers of the "JOURNAL" this year, is not dead, nor is it even sleeping, through the action of a meeting of ratepayers in rejecting the proposal. As a matter of fact, the project (we think there need be no hesitation in saying now) will receive complete ratification by Parliament; it having already passed investigation by the Local Legislation Committee. The Committee appeared to be somewhat astonished that the Earl of Ellesmere—the owner of an extensive coke-oven plant (some fifty-ovens), carbonizing 200 tons of coal a day, and producing nearly 2½ million cubic feet of gas—should be prepared to spend £5000 on plant for dealing with a portion of the gas for the supply of the ordinary requirements of the district, and only make out of the deal, under present circumstances, some £150 a year. Of course, one side of the House of Commons is at the present time strongly suspicious of Dukes, Earls, Lords, and such-like, and can only associate them in a common class as land and money grabbers. They have a difficulty in appreciating that men of such rank can have anything but self-centred interests, and can have little thought for those of the people about them. Lord Ellesmere has consideration for the district in which his large coke-oven plant is placed, and he is willing to be of service to the district, not forgetting that this may be the beginning, if successful, of a greater and profitable use of the waste gas from the coke-ovens. That is what the Committee were told; and there is no reason for raising any question upon it. But we see at the back of this scheme the energy and influence of Mr. Ernest Bury, M.Sc., F.C.S., of Little Hulton, the Manager of the Brackley coke-ovens, who counts among the events of his career authorship of his contribution, on the utilization of coke-oven gas, to the proceedings of the Dublin meeting of the Institution of Gas Engineers, at which, it may be remembered, Mr. Charles Hunt was President.

An Economic Question.

With Mr. Bury at the back of this Little Hulton scheme, success may at once be said to be assured. In the discussion on the general subject at the Dublin meeting, Mr. T. Glover said the value of Mr. Bury's paper, and the cognate contributions on that occasion, would not pass away in a day; and both value and interest are revived upon the presentation to Parliament of this Little Hulton scheme. It is true the scheme (with which Mr. William Newbigging is also identified) is not a large one, as will be seen by our "Notes from Westminster" and the report of the Committee proceedings in our "Parliamentary Intelligence;" but

it will represent something more in the utilization of coke-oven gas for town purposes than has been done hitherto, in a small and rather tentative way, in this country. It will be a scheme, subject in every respect to the controlling conditions attaching to ordinary town supply; and there is to be nothing haphazard about it. Illuminating power and calorific power are to be kept above certain standards—in fact, the people of Little Hulton are promised a supply of gas, at a cheap rate, qualitatively equal to the Metropolitan gas supply. We remember well that Mr. Bury's Institution paper constituted a case for serious inquiry as to whether, on economic grounds, the whole or a proportion of the gas obtained from coke-oven plants should not be utilized for general purposes, thus producing a saving in the country's coal supply. But the trouble is there is so much of it produced, and the communities at hand to utilize it are so comparatively small. The surplus not employed for heating the ovens is now used for steam-raising. This is absolute waste. At the Brackley coke-ovens quite one-third of the 2½ million cubic feet of gas produced per day are utilized in this manner; whereas for the purposes of the neighbouring communities, it is worth considerably more than would be fuel of solid order for steam-raising. Mr. Bury does not suggest that the coke-oven is superior to the retort as a producer of gas; but he looks at the matter solely from the economic side. Metallurgical coke must be produced; and gas is evolved as a residual. What are the best practicable methods of utilizing that gas in the interests of the coal supplies of the country? The demonstration which is to take place at Little Hulton, with Mr. Bury on the spot and interested in it, will be watched with curiosity, with which will be associated a sanguine feeling as to success.

Gas Shares as an Investment.

Though no one having a knowledge of the gas industry would be likely to confuse the grossly over-capitalized, and therefore inevitably foredoomed, creations of professional company promoters with well-established and financially sound gas undertakings, it is evident that the outside public have not invariably shown the discrimination which is necessary even to preserve their capital—let alone increase it. "Once bit, twice shy," is an adage that may apply to investors, as it is said to do to others; and some of those who have put their money into the hopeless gas concerns to which it has of late been our duty to direct so much pointed criticism (as well as others who have read the melancholy accounts of proceedings in the various Courts) may hesitate to try their luck again in the same branch of industry—we intend, of course, in this remark, to refer to the "gas industry," and not the "company promoter's industry." This consideration makes us especially pleased to see in those papers which are perused more particularly by the general public such a signed article as appears in the April number of the "Investor's Chronicle" on "Gas Shares as an Investment." In this, the author expresses the well-grounded opinion that in all probability there is no form of investment that gives such regular and constant dividends as that of gas stock—and at the same time yields such good returns on the outlay; and he thinks the fact that there is not a still greater demand for such securities is probably because gas investments are, to a certain extent, on a different footing from ordinary shares, &c., and with few exceptions they are not quoted on the London Exchange. Taking the Board of Trade returns, it is pointed out in those for the year 1907 there were included 491 companies, with a capital of £86,476,293, and a profit for the twelve months of £4,494,178 which is equal to 5½ per cent. on the capital employed, or ¼ per cent. more than the previous year. The author says the returns show that "the number of companies in the United Kingdom is 491." But this, of course, is an error, as the returns embrace statutory undertakings, and not many small concerns which do not come under this designation. Emphasis is laid upon the need for studying the particular Act of Parliament which applies to the company in which the investor proposes to take an interest, and some points are indicated which, in conjunction with the usual rules adopted in estimating the merits of a company's stock, it is thought should enable an excellent selection to be made. Some dozen companies are named as possessing merit, both from a speculative and an investment point of view; but, in selecting these, care is taken to make clear—and it is a reservation with which we heartily agree—"that it is impossible to mention all the companies whose shares have merit."

Prospects of Peace in South Wales.

There has been much news from South Wales during the past week, with reference to the negotiations for arriving at a settlement of the coal mining labour troubles. It did not come altogether as a surprise to many people to find that the further meeting of the Conciliation Board which was held last Saturday week at Cardiff, after the intervention of the Board of Trade, was followed by an announcement that a new agreement (to extend over a period of five years) had been formulated, and that the clauses therein were mainly acceptable to both sides. The one debatable point left was with reference to working in abnormal places; and even here, it was said, the differences between the parties had been so narrowed down that nothing was left under this head to jeopardize an ultimate settlement. Under the new agreement, the minimum wage will be increased from 30 per cent. to 35 per cent.; and the equivalent selling price to the new minimum will stand at 12s. 5d. per ton. The maximum of 60 per cent. remains. The men have provisionally agreed to the introduction of overlapping shifts; and the owners no longer insist upon an unrestricted right of introducing double shifts. Such an agreement could, of course, only be arrived at as a result of mutual concessions. The men are withdrawing their claim for payment for small coal; while the owners have given way with reference to their demand that the men should work the extra sixty hours per annum permitted under the Eight Hours Act, and offer to withdraw their claim for accumulated damages, estimated at £250,000, which, it is contended, the men have rendered themselves liable to pay for refusing to work these extra hours since July 1. Subsequent consideration of the matter by the Miners' Federation of Great Britain led that body to express the opinion that the South Wales Executive had struck a good bargain for the workmen; and they advised the acceptance of the owners' offer. In fact, the resolution they arrived at was emphatic—"That we do not think the points of difference are sufficient to justify either a sectional strike in South Wales or a national struggle, with all the tremendous issues involved." The usefulness of this resolution becomes apparent, when it is considered that the acceptance or not of the new agreement will be decided by a ballot of the miners which it has been arranged shall be taken to-morrow (Wednesday). The result will be known by Friday, in time for the meeting of the Conciliation Board; and, if favourable, the new agreement will then be signed by both sides. Meanwhile, operations are being continued at the collieries on day-to-day contracts. It is unthinkable that the men should decline to support their leaders in regard to the agreement that has been arrived at—especially in view of the significant resolution already quoted of the parent organization—which is taken to mean that, should the Welsh miners decide in favour of a stoppage, financial support from the National Federation would not be conceded. Indeed, the confident hope is expressed that the colliers will prove loyal to those who have conducted the negotiations on their behalf.

PERSONAL.

At their meeting last Wednesday the Directors of the Whitworth Vale Gas Company appointed Mr. SAMUEL HILL as bookkeeper and collector, to fill the vacancy caused by the promotion of Mr. SIMEON LORD to the position of Manager of the Company in succession to his father, the late Mr. Edmund Lord.

Mr. HAROLD HORROCKS, who has been a member of the staff at the Heywood Corporation Gas-Works for about eight years, sailed in the s.s. "Ophir" on Friday last for Australia, having secured an appointment in Adelaide with the South Australian Gas Company. Mr. Horrocks, a nephew of Mr. W. Whatmough, will have charge of the carbonizing plant at the Adelaide Gas-Works. Before his departure the staff at the Heywood Gas-Works presented him with an overland travelling trunk.

We learn that Mr. W. H. BENNETT, the Assistant-Engineer of the Dartford Gas Company, is relinquishing this position, having obtained the appointment of Engineer and Manager of the Redhill Gas Company, in succession to Mr. James Paterson, M.A., who, as already announced in the "JOURNAL," will shortly be associated with his father at Cheltenham. The new Manager at Redhill is the son of Mr. C. V. Bennett, of Herne Bay, and was trained under him. He studied Continental gas practice in the Linnaeusstraat Gas-Works, Amsterdam, for eighteen months; and in 1898 he was appointed Assistant-Manager at Yeovil—a position he resigned in 1901 to take that which he now holds at Dartford. He is a grandson of the late Mr. W. H. Bennett, who, as is well known, was for many years Secretary of the British Association of Gas Managers and the Gas Institute.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 57.)

THE Stock Exchange had a busy and buoyant time last week, as if the break caused by the holidays had not been an interruption to business, but a refreshing pause in which to take breath for fresh exertions. The chief point of interest was the Rubber Market, which some little time ago was thought by many to have touched high-water mark, but which now surged more fast and furious than ever. There was not a large attendance the opening day; but the general tone was good, and the tendency was firm all day. Home Governments were steady; Railways were on the rise; and all the rest, except Americans, were in good case. Wednesday was active and firm. Gilt-edged were stronger, and Consols rose $\frac{1}{16}$. Satisfactory traffics gave a fillip to Railways; and the rest in general were fair. In the speculative lines, there was something like a boom. The fortnightly account engaged most attention on Thursday, but still there was no lack of fresh business. Railways showed unabated strength. Home Governments were, however, irregular, and there was more weakness in Americans. The settlement was over on Friday—a light job compared to the previous one, and unproductive of difficulties. In spite of the usual realizing, the tone was pretty firm. Railways continued to prosper, the gilt-edged division were in demand, and the Foreign Market did well. This state of things ruled through Saturday, and Rubber raged rampant to the last. In the Money Market, there was a good call for the Stock Exchange and for the quarter's end at good rates; and discount terms hardened. Business in the Gas Market was only moderate in volume; but the general firmness was excellent, and several quotations made further advances. Some changes will be observed in the Stock and Share List. Notably, the Gaslight and Coke Company's issues are now augmented by the absorption of the West Ham Gas Company's stocks; and in the aggregate they exceed the large figure of £27,000,000. Then, the ordinary shares of Buenos Ayres and River Plate fall out of quotation, in view of amalgamation. Gaslight and Coke ordinary was unchanged at from 103 to 103 $\frac{3}{4}$. In the secured issues, the preference made 104 and 105, and the debenture from 80 $\frac{3}{4}$ to 81 $\frac{1}{2}$. South Metropolitan marked 120 $\frac{1}{2}$ and 121. Commercial 4 per cent. was done at 106, and ditto 3 $\frac{3}{4}$ per cent. at 103 $\frac{3}{4}$. Among the Suburban and Provincial group, Brighton ordinary made 154 and 154 $\frac{1}{2}$ (a rise of 1), British 45 $\frac{3}{8}$ and 45 $\frac{3}{8}$ cum div., and South Suburban 121 and 122. In the Continental companies, Imperial rose 2, with dealings at from 179 $\frac{1}{2}$ to 181 $\frac{1}{4}$, ditto debenture marked 95, Union from 99 to 100, and Tuscan 9 $\frac{1}{2}$. Among undertakings in the remoter world, Buenos Ayres changed hands at 15 $\frac{1}{2}$ special, Bombay part-paid at 5 $\frac{1}{4}$, Cape Town preference at 6 $\frac{1}{16}$, Monte Video at 12 $\frac{3}{4}$, Primitiva at 7 $\frac{5}{8}$ and 7 $\frac{3}{4}$, and ditto preference at 5 $\frac{3}{8}$ and 5 $\frac{1}{2}$. Other improvements, in stocks which did not change hands, will be found in the list.

ELECTRICITY SUPPLY MEMORANDA.

The "Deadly Products" Slander Again—Policy of Fixed Prices per Lamp not Endorsed—Fire Warnings—Blackening of Metallic Filament Lamps—Chagrin at Felixstowe.

THE question of the "deadly products of the combustion of gas" has cropped up again—this time in "Meteor's" notes in the "Electrical Times." On March 8 we challenged Mr. T. Hesketh, the Electrical Engineer of Folkestone, to explain a statement contained in a circular he had disseminated in Hythe, as to the "deadly products" of the combustion of gas. It appeared in this sentence: "You experience no headaches in the evenings, resulting from the deadly products of combustion, as with gas." Mr. Hesketh has not responded; but it would appear that he has invited "Meteor" to his aid. That gentleman kindly complies in the "Electrical Times" for March 24; and (surely from Mr. Hesketh's point of view) a pretty mess he has made of it—the only defence that he can offer being that, under certain conditions of combustion, something harmful may be produced. Just so. A loose nut, or a flaw in an axle, may produce an omnibus accident. There must be lighting-back of an atmospheric gas-flame (Mr. Hesketh's mentor tells him) before anything deleterious can be given off. But if there is lighting-back in an incandescent burner, light will not be obtained; if there is lighting-back in a gas-heating apparatus of any kind, the apparatus will not perform its functions. This lighting-back condition is not a normal one; but Mr. Hesketh's circular suggests to the uninitiated that the giving off of "deadly products" is a normal accompaniment of the combustion of gas. There is no equivocation about Mr. Hesketh's statement: "You experience [as the result of adopting electric lighting] no headaches in the evenings, resulting from deadly products of combustion, as with gas." "Headaches" and "deadly products" the inhabitants of Hythe are here invited by Mr. Hesketh to infer are inseparable from the combustion of gas under ordinary and normal conditions. We again ask Mr. Hesketh to state what are those "deadly products" that are produced in the evenings by the combustion of gas. We ask that his reply may be as free from ambiguity as his original statement; and not a mere writing round the question, and avoiding the kernel, as has been done by the adept at specious writing, and friend of all electrical engineers who cannot defend themselves—"Meteor."

In defence of Mr. Hesketh, our journalistic friend quotes the case (we do not know whether it is an ancient or a modern one) of a Mrs. Jordan, who died, the doctor "concluded," "from carbon monoxide poisoning, traced to the kitchen stove." This has nothing to do with lighting in the evenings; and, in connection with the use of gas-stoves—bearing in mind the hundreds of thousands there are in daily, almost hourly, use—an isolated instance of this kind only goes to emphasize how safe gas is when used under ordinary (and not abnormal) conditions. The sagacious "Meteor" also quotes from the report of the Home Office Departmental Committee on the Ventilation of Factories and Workshops, to the effect that carbon monoxide is produced "whenever the combustion of gas is imperfect, as when a non-luminous flame used for heating purposes is allowed to strike-back." There, again, an abnormal condition has to be set up before carbon monoxide is given off—that is a condition precedent to anything harmful happening. "Meteor" must be well aware of the crude and antiquated character of some of the heating appliances used in factories and workshops—frequently of the home-made variety. Both in nature and attendant circumstances, there is no resemblance in these to domestic appliances and conditions of use. Furthermore, in many factories and workshops, the gas employed is of the producer variety, and not the ordinary town-gas supply. We hope that Mr. Hesketh will not further attempt to evade our request for an explanation as to the "deadly products" he insinuates ordinarily arise from the combustion of gas, and occasion headaches in the evenings.

The paper by Messrs. Handcock and Dykes where the fixed-price-per-lamp proposition was revived, and which was originally read before the Institution of Electrical Engineers in London, has been the round of the Local Sections for discussion; and few electrical engineers there are who take kindly to the proposal. So much have the authors been impressed with this fact, and by the reasoning of the opponents, that, at the meeting of the Manchester Local Section, Mr. Handcock, in replying to the discussion, was compelled to admit that the system was not an ideal one, and that there was room for something more satisfactory. That the Chairman of the section (Mr. S. J. Watson) is of opinion that Messrs. Handcock and Dykes have not revived a feasible scheme, is seen by his statement that the solution of the question of tariffs is now as far off as it was fifteen or twenty years ago. Several of the speakers in the discussion detected, without any microscopical examination, certain weaknesses in the scheme. There was no doubt on the part of Mr. R. B. Slacke as to how the small consumer would regard the renewal of the metallic filament lamps. Mr. Slacke understands that the depreciation of these lamps is equal to about 1d. per unit; and, of course, this materially increases the cost of the light. In his opinion, instead of renewing the lamps, the small consumers in many cases would get a new mantle, and return to gas. This view was supported by Mr. P. P. Wheelwright, of Blackburn, who thought that, in cottages and small property, trouble would sooner or later occur owing to the failure or breakage of the lamps. The tenant would then say he could not afford to replace the broken lamps, as they cost him shillings, whereas gas mantles could be obtained for a few pence. Mr. A. G. Cooper also agreed that the cost of the renewal of metallic filament lamps would be a difficult matter. He also saw a difficulty in the expense of connecting up, seeing that for the small consumer it was practically the same as in the case of a large consumer. Doubtful likewise was Mr. C. L. E. Stewart, of Rawtenstall. He finds that in some cottage houses, the yearly gas bill does not amount to 10s.; and, in his judgment, they would not be worth connecting up for electric lighting, in view of the cost of the service. This, however, seems to bear more on free-wiring than fixed prices per lamp. And in connection with the former, Mr. Stewart has no doubt at all that, while free-wiring brings in new consumers, it also brings in bad ones. Bearing upon this, the Chairman stated that he knew considerable sums had been spent on so-called free-wiring systems, with lamentable results to those who found the money. In cases of change of tenancy or ownership, if the installation fell into desuetude, the depreciation was very high. Apart from the want of endorsement of the policy of fixed prices per lamp by electrical engineers generally, there is still also a want of endorsement on the part of small householders in South London.

The Provinces have been having their taste of electrically generated fires as well as London. During the week ending on March 12, two fires of a serious character occurred in Birmingham. One was on the premises of the British Insulated Cable Company, and the other at the millinery shop of Messrs. Bates. The first one broke out at a time when most people are slumbering—2.59 a.m. on the Saturday; and, it is reported, that "several" of the electric wires were found to have been fused. The second fire was at 6.17 on Saturday evening, and was caused by an electric lamp being placed near some artificial flowers made of celluloid and rubber. There were three other cases during Christmas week; and then Chief Officer Tozer called public attention to the danger. But he complains, on the two more recent fires, that no notice whatever is taken of his warnings; and that shopkeepers continue sinning in this way in a lamentable manner. His voice is that of one crying in the wilderness; and he fears that nothing but a disastrous fire, in the midst of the Birmingham people, will shake into them any sense of the seriousness of the danger. The recommendations that he makes are threefold. Electric lamps should be kept several inches away from ignitable goods; wires should be covered with some fire-resisting material;

and flimsy materials should be kept a distance from electric lamps, seeing that the latter are so liable to burst. Of course, if shopkeepers will not give heed to these expert monitions, Chief Officer Tozer cannot help it. He has done his duty, and that must suffice. But the neglect comes hard on the fire brigade. Of course, there have been the customary attempts of electrical folks to minimize the statements. These attempts are not in the public interest; but the public recognize in them the struggles of an infuriated interestedness, and treat them with just as much consideration as Chief Officer Tozer's cautions. Now from Birmingham to Manchester. In the "Courier" of the latter city, a correspondent, signing himself "Insurance," has a letter pointing out the necessity of enlisting competent advice, and having all electrical work carried out by a fully qualified man. He thinks that the extensive fires and damage that have already occurred should impress the public as to the necessity of what he counsels. "I have," he remarks, "seen several instances of faulty work which have only just been discovered in time to check a serious conflagration." The public will begin to wonder whether all the statements made in electrical literature regarding electricity should have the literal meaning reversed. Anyway, they have learnt that the words "the safest illuminant" have to be rendered "the most treacherous illuminant;" and all the vapourings of electricians to the contrary will not lessen public confidence in the disastrous demonstrations that have been witnessed.

To the metallic filament lamp have been ascribed all the virtues to which the electrical engineer can lay tongue. But the lamps have their weaknesses; and the public are making their acquaintance. It is well known that the lamps want physical strength, and that there is a marked growing tendency for them to blacken. These matters have been dealt with by Mr. G. Basil Barham, Assoc. M. Inst. E. E., in the "Electrical Times." With the increased supplanting of carbon filaments by metallic filaments, the number of complaints is growing. It is declared by many users that the lamps are more liable to break than they were a year ago. Mr. Barham thinks this is due to familiarity breeding contempt. Whereas formerly the lamps were handled with considerable care—even with reverence—they are now fixed in unsuitable positions, and are more carelessly handled than were their predecessors. As to blackening, undoubtedly in certain brands of lamp, the percentage of blackened bulbs is increasing considerably; and while there are still many lamps which, after lengthy life, are quite clean, "a fair number which have only been in use a few weeks, are showing traces of discoloration." More especially is this so among the high-voltage type of from 40 to 50 candle power. The cause for this must lie either in the method of manufacture or in the materials used—in fact, it would appear there must be more than one cause. It is thought that the phenomenon is generally produced by either the presence of carbon in the filament, or of some volatile compound of tungsten remaining with the metal in the filament, or to the occlusion of carbon or volatile metallic gases from the leading-in wires, anchors, or supports. But the carbon appears to be the predominant cause of the trouble. If it is not entirely eliminated, the lamp is certain to blacken in time; and if it is removed, and the operation is not carried out with the utmost care, the filament is liable to fail prematurely. With the concluding words of Mr. Barham's article, there will be agreement. The problems that beset the metallic filament lampmaker are indeed many; and this question of discoloration is one of the most difficult he has to overcome.

Felixstowe is enjoying the periodical sensation of a contest for membership of the District Council; and the opportunity has been taken, apparently by the electrical interests, to push gas and electric lighting forward as a topic of public interest. We do not think the electricity folk will gain much by their temerity. But when one is smarting under an ignominious defeat, there is perhaps some little excuse for rashness. It may be remembered that last year the Gas Company obtained the lighting of the Sea Pavilion; and then upon this they secured a new contract with the Council for street lighting for a term of three years commencing with Jan. 1 last. These successes are the cause; electrical annoyance the effect. The troubles of the electricity concern at Felixstowe (which have resulted in it being vested in the District Council, who find the capital on which the Company pay interest) have given electricity a bad name in the town. But a curious ratepayer at the election meeting at which candidates were selected, asked one of them why, if the electric light concern belonged to the ratepayers, the streets were lighted by the Gas Company. The ratepayer had his quietus in the simple answer and fact that last year the electric light went out twenty times; and the Council must consider efficiency. If all Councils prudently considered efficiency, electric lighting for the streets would be doomed. After this meeting Mr. Napier Prentice issued a singular document, in which he, eschewing altogether the question of efficiency, endeavours to show that the Council, by throwing out gas and establishing electricity in the public lamps in 1903, would have made a decent profit on the transaction. But there are no details granted to enable critics to judge of the accuracy of his statements, nor whether the ratepayers would have been better served as a result of the change. There is good reason for grave doubts on the point of efficiency. If Mr. Prentice wants people to place any credence in his statements connected with a discredited undertaking, he must not be so economical in the information that he affords. A further reason for doubt as to the Council deriving profit by further electrical speculation in the

manner that would have delighted Mr. Prentice's heart, is found in the Council's electricity fund account for the year ending March 30 last. The amount received by the Council from the Electricity Company (6 per cent. on the capital advanced) was £747 12s. 4d.; and interest on the unexpended balances of loans placed on deposit was £25. These two sums make £772 12s. 4d. In respect of this capital, the Council had to pay £483 19s. 5d. interest, and in repayment of principal £382 16s. 5d.—together, £866 15s. 10d. Therefore the loss for the year which has had to be transferred to the district fund is £94 3s. 6d. This, and twenty failures in a year! Who is surprised that the Council have hardened their hearts against electricity? Perhaps, too, they know that Mr. Prentice's specious-looking figures do not tell the whole tale as to the relative illuminating efficiency of gas and electricity for the cost.

HIGH-PRESSURE DISTRIBUTION IN PARIS.

ABOUT six months ago, Mr. W. R. Herring, the Chief Engineer and Manager to the Edinburgh and Leith Gas Commissioners, had a visit from MM. Gustave Cocu and A. Chibault, two members of the technical staff of the Paris Gas Company (the latter being the Chief Distributing Engineer), whose object was to make a thorough investigation of the distributing system, more particularly with regard to the high-pressure main encircling the district, and, by means of underground governors, feeding gas not only into the heart of the area of supply through the existing system, but also, through branches taken from the main, to new districts developing in the outskirts. In order to assist his visitors in their investigations, Mr. Herring sent them a few weeks later one of the most recent official maps of Edinburgh, Leith, Portobello, and the suburbs, marked with lines showing the high-pressure mains conveying gas into the holders distributed throughout the city, from which supplies are taken by means of a governor or controller to the ordinary supply system, and with other lines indicating the lesser series of pipes containing the ordinary consumer's pressure. He also sent several drawings furnishing important particulars bearing upon the object of the visit. We now learn from him that the details above referred to were communicated to two of the Engineers (MM. Cramblay and Charuit) of the Société d'Eclairage, Chauffage, et Force Motrice of Paris, who supply with gas a large number of the suburban districts; and that a short time since he received a letter from the Secretary of the Company to the effect that the gentlemen named, the latter of whom is the Chief Distributing Engineer, would call upon him to obtain further information in regard to the advantages attending the Edinburgh system of high-pressure distribution, with the view of something similar being adopted by the Company. The system, it may be remembered, is fully described in Mr. Herring's account (in book-form) of the construction and equipment of the Granton Gas-Works.

Cause of Blue Prints Fading.

To those engineers and managers who have been inconvenienced by the fading of their blue prints, the following observations of Mr. G. G. Merry, contained in a letter to "Engineering Record," will probably be of interest. If prints are made on old paper, both the background and the lines will readily fade, because partial chemical change takes place previous to printing. It is very important that only fresh-coated paper be used. I never use paper that has been on hand for more than five days. The most rapid printing papers should be avoided, as the excess of ammonium salts used in coating this paper is difficult to remove by washing, and the continued chemical action causes fading. The best results are obtained from the slower printing papers. Insufficient washing causes many blue prints to fade. Only by washing a print for at least ten minutes in clear running water can all the salts be removed. If the paper is too porous, the coating penetrates too deeply into the paper; and since all the salts cannot be washed out, fading will follow. The coating should be only surface deep; and this can be realized with a non-porous paper only. Transparent or semi-transparent inks will promote fading, because the light which passes through the lines causes premature chemical action. Only the best India ink should be used on the tracing. Blue prints should be neither over nor under printed. If the former, the light penetrates the ink; if the latter, the chemical action is not complete. A print should, however, be exposed just as long as possible. After washing the print thoroughly, Mr. Merry always treats it with a chemical solution, and then washes it thoroughly again. In this way only is he able to get satisfactory results. He considers there is no economy in engineers making their own blue prints where the amount of work is small; and he thinks it more satisfactory to hand the job over to a specialist.

The annual dinner of the Association of Engineers-in-Charge will take place in the King's Hall at the Holborn Restaurant next Saturday. Tickets for the dinner, at which the President (Mr. Henry Adams, M.Inst.C.E., M.Inst.M.E.) will take the chair, with the Lord Mayor and the Sheriffs of the Corporation of London as the guests of the evening, can be obtained by addressing the Hon. Secretary at St. Bride's Institute, E.C.

NOTES FROM WESTMINSTER.

AFTER the brief Easter break—brief because the House of Commons is vehemently busy on a scheme for, if possible, rendering the House of Lords largely ineffective as a legislative body—there was a little show last week at preserving the continuity of Private Bill work by the Local Legislation Committee assembling on Wednesday and Thursday, and giving consideration to the Little Hulton District Council Bill, and afterwards adjourning until to-morrow. The Referees' Court of the Lower House also held a sitting on Thursday, and disposed of various applications for *locus*. In the present week, we are promised more activity, and a larger degree of interest. To-day, the Duke of Northumberland will preside over a Committee, whose group of measures contains the Matlock Bath Bill. Mr. Mooney, who rendered excellent service last year as Chairman of a Committee, will take headship of one who will have before them, among other measures, the Glasgow Consolidation Bill and the Wishaw Burgh Extension Bill. Next day, in addition to the Local Legislation Committee, a Committee (of which the Chairman will be Mr. Armitage) will commence the consideration of a group of measures, embracing the two opposing Mallow Gas Bills, the Tipperary Gas Bill, and the Slough and South Hants Water Bills. The Mallow and Tipperary measures were originally in the group allocated to Mr. Arthur Stanley's Committee, who considered the Brighton and Hove Gas Bill. But surpassing all else in interest will be the beginning, on Thursday, of the contest over the Standard Burner Bills; the Chairman of the Committee being Lord Ritchie, of Dunfermline. The same day a Committee with the Earl of Kintore as Chairman will set to work on a group of measures comprising, among others, the Abertillery and District Water Board Bill and the Cambridge Water Bill. Altogether, it should be a fairly busy week, and one full of interest.

Coke-Oven Gas Project. It had been thought that, in view of the ratepayers of Little Hulton having, in public meeting assembled, rejected the coke-oven gas-supply scheme outlined in a Bill the District Council had laid before Parliament, that the whole proposal was as good as dead. The thought was not only premature, but it was wrong. The Bill came before the Local Legislation Committee last Wednesday and Thursday; and Counsel (Mr. Jeeves), Mr. Ernest Bury, who is the Manager of Lord Ellesmere's coke-works, and Mr. William Newbigging between them convinced Sir Francis Leyland-Barrett and his colleagues that the project was sound and practicable. Briefly the plan is to supply to the district gas from the Earl of Ellesmere's coke-ovens, through the distribution system to be made over to the District Council for £7500 (without charge for severance or prospective value) by the Salford Corporation. It was proposed originally in the Bill to purchase the portion of the distribution system in part of the Council's area of the Farnworth and Kearsley Gas Company. But an agreement has not been effected with the latter; and the Council have therefore removed this part of the scheme from the measure, in the hope that time will yield an arrangement. The coke-oven gas scheme, and the terms of supply, were fully explained in the "JOURNAL" for Feb. 1, p. 291. The reported evidence on the scheme of Mr. Bury and Mr. Newbigging will be found more than ordinarily interesting, as it is the first project for the general distribution of coke-oven gas to come before Parliament. Technical details regarding the coke-oven plant were given by Mr. Bury; and it appears that in the fifty coke-ovens constituting the Brackley plant, some 200 tons of coal a day are carbonized, from which are produced 2,200,000 cubic feet of gas of a composition, illuminating power, and calorific value equal to the gas distributed in the Metropolitan area. What more can Little Hulton want? It was clearly shown by the evidence that in this matter the Earl of Ellesmere is animated more by the welfare of the district than by his own profit. Compared with the production of coke-oven gas, the requirements of the place are small—only about 13 millions a year being needed in the area to be first served. This will come out of the one-third part of the gas production at present used underneath the boilers at the coke-oven works; the remaining two-thirds, by the way, being employed for heating the coking chambers. The Earl is charging 9d. per 1000 cubic feet for the gas; so that the revenue will only amount to about £500 a year, of which some £150 will represent profit, though his Lordship will have to spend £5000 on the provision of the necessary works. The profit is not much, having regard to this capital expenditure and the responsibilities and obligations that will repose on the Earl. The future may make the scheme more lucrative for him if there is an additional demand from other areas; but anyway it is quite plain that his Lordship is not pressing the matter in any way. The Committee passed the preamble of the Bill. But they desired that it should be made abundantly clear that no statutory authority is conferred on the Earl of Ellesmere; and they further ordered the agreement with Salford to be scheduled to the Bill.

Welsh Water.

Questions of *locus* are often somewhat difficult to decide; but in the matter of the applications of the Neath Rural District Council and the Barry Urban District Council to be allowed a hearing on the Pontypridd Water Company's Bill, not much trouble fell upon Mr. J. H. Whitley and his colleagues of the Referees' Court, in deciding that the indulgence that is now being asked for by the Water Company will not in any way prejudicially affect the

petitioners. The Company obtained powers in 1908 to construct water-works and a reservoir in the neighbourhood of a reservoir owned by the Neath Rural District Council; the Act giving them two years within which to make a substantial commencement with the works. The Company are asking for an extension of this time. The Neath Council fear that there is no intention on the part of the Company to construct the works; and if they do construct them, water will be taken from the immediate neighbourhood of their own reservoir, and they will be injuriously affected. The Council were not granted what they desired; and the same result followed the application of the Barry authority. This body also asked to be allowed a hearing against the Pontypridd and Rhondda Joint Water Board Bill, under which the promoting authorities are proposing to purchase by agreement the undertaking of the Pontypridd Water Company. The Barry Council requested *locus* on the ground that the gathering area which would supply the reservoir under the Bill was the only source on which they could rely to supply their own growing population. Inasmuch as the promoters are not asking for any authority to enlarge the existing works and powers of the Company, *locus* was again disallowed. The Neath Rural Council were more fortunate in obtaining the right to be heard on the Mountain Ash Water Bill.

GAS-WORKS' BOOK-KEEPING.*

THE little volume before us has been compiled by Herr F. Greineder, the Works' Engineer of the Cologne Gas-Works, with the object of systematizing the keeping of books and accounts of the working operations of a gas-works, as distinct from the ordinary business book-keeping of a gas undertaking. The system may be followed either primarily—for facilitating calculations of prime cost—or for checking the routine working and periodical results. The necessity for such accounts for the purpose of controlling the operations and procedure in industrial undertakings, has become more clearly recognized in Germany during the recent period of depression in business. In regard to gas-works, Mr. E. Körting, the General Manager of the Berlin works of the Imperial Continental Gas Association, has on more than one occasion drawn attention to the imperative need of securing the light which careful book-keeping affords on the working of a gas-works. Herr Greineder says that doubtless there are good systems of works' book-keeping in use at many gas-works; but, unfortunately, none of the methods followed have hitherto been published. Hence his effort, made through the present little volume, to describe a suitable system.

Allowing for the necessary differences in procedure on German and English gas-works, and for differences in the way of conducting business transactions in the two countries, we think Herr Greineder has fulfilled his object very satisfactorily. He first deals with the fundamental principles which must underlie any system of works' book-keeping, and then passes on to the manner in which the accounts should be separated or classed, the subdivision of outgoings, and the establishment of subsidiary accounts, such as for the water or electric current required on the works. He next proceeds to the determination of expenditure under the heads of (1) wages, (2) materials, (3) improvements, (4) plant. After this, he shows how a general summary or abstract of the works' accounts should be drawn up from the various detailed accounts. Tables and plates are given to illustrate the mode of keeping the working accounts or books of a gas-works according to the author's system.

* "Betriebsbuchführung für Gaswerksbetriebe. Darstellung der Methode einer Betriebsbuchführung zum Zwecke der Wirtschaftskontrolle in Gaswerksbetrieben als Beispiel durchgeführt für einen grösseren Gaswerksbetrieb." Von Dipl.-Ing. Friedrich Greineder, Betriebsingenieur der Gaswerke Köln a/Rh. Munich and Berlin: R. Oldenbourg; 1910.

Labour Co-Partnership Association.—At the annual meeting of the Association, to be held at the Mansion House on the 15th inst., under the presidency of Mr. D. J. Shackleton, M.P. (who will be supported, among others, by Mr. Corbet Woodall, the President-Elect of the Association), Mr. L. W. S. Rostron, the author of "The Powers of Charge of the Metropolitan Gas Companies," and a member of the London County Council, will read a paper entitled "The Progress of Co-Partnership." It will follow Mr. Shackleton's Presidential Address.

The Havard Coal-Meter.—We learn from the Engineering Supplement to "The Times" that a device has been brought out by the O. D. Havard Company, of Scranton (Pa.), for measuring the quantity of coal or any other granular material, such as sand, gravel, &c., without weighing. It is intended to be placed in a vertical pipe such as the outlet from an overhead bin; and the action of the material in descending revolves a very long pitch propeller wheel projecting upward in the centre of the pipe. Through bevel and worm gears the revolutions of the propeller wheel are recorded on a counter on the outside of the pipe. The meters are calibrated to within 1 per cent. of scale weight; and in boiler-rooms, where they have been found valuable in giving a continuous measure of the fuel consumed, they can be calibrated to give a correction for the moisture in the coal, so that the engineer may know more accurately even than by weighing with scales how much coal is being burnt.

PARIS GAS-WORKS EXTENSIONS.

An Important Scheme.

THERE was recently submitted to the Paris Municipal Council, by the Prefect of the Seine, a report furnishing details of a scheme of reconstruction and extension of the gas-works of the city at an estimated cost of 180,000,000 frs. (£7,200,000). An abstract of the report has been given in the "Journal de l'Eclairage au Gaz et à l'Electricité," and from it we take the following particulars.

It should be stated at the outset that, on the suggestion of the Paris Gas Company, the Municipality have since 1908 undertaken, as a matter of urgency, some important extension works involving an outlay of 47,000,000 frs. (£1,880,000), which will be met to the extent of 38,000,000 frs. (£1,520,000) out of a loan which has been submitted for the approval of Parliament. As soon as the new Company took possession of the property, they laid before the Administration a scheme which they considered should be carried out in order to meet the demands upon the works; for though the severance of the suburban communes in 1906 left the Company with a margin of productive power to the extent of 38 million cubic metres, or about 1342 million cubic feet, the reduction in the price of gas from 30c. to 20c. per cubic metre—i.e., from 6s. 9d. to 4s. 6d. per 1000 cubic feet—enabled the Company to recover in two years the consequent loss of consumption, and the increase subsequently continued in a remarkable degree. This great demand could only be met by taxing the works to their utmost capacity, and utilizing reserves which were necessary for meeting emergencies. Had it not been for the very mild winter of 1908-9, these reserves would in all probability have been insufficient; and the member of the Municipal Council who had charge of the report (M. Dausset) clearly pointed out that the 47,000,000 frs. scheme was only an instalment of the complete programme. While the old Company kept a reserve exceeding the consumption by 15 per cent., their successors at one time had only 3 per cent., which, of course, was altogether inadequate.

When the loan of 38,000,000 frs. had been sanctioned, it was decided to commence the works without delay. Accordingly, new plant was put in at the Landy station equal to a production of rather more than 6 million cubic feet of gas per day; and two additional retort-houses of like capacity, as well as two gasholders, each capable of storing 5½ million cubic feet of gas, are in course of erection. The excavations for a third gasholder of the same size are in progress; and one of the gasholders at the Clichy station has now been telescoped, and its capacity raised thereby from 1 million to nearly 2½ million cubic feet. The purifying plant there and also at La Villette has been improved and enlarged; while new purifiers have been installed and the tar-distilling plant has been augmented at Ivry. Concurrently with these extensions at the works, the distributing plant has been extended. A 40-inch main has been laid from the Landy station into Paris, where it branches off in two directions, one of them being the well-known Place de la République. The other portion of the main leads into one 28 inches in diameter. A main is now being laid from the Landy station to the Place de la Concorde. The gasholders at this station and at La Villette have been connected; and those at Clichy are to be similarly dealt with. The quality of the gas has been improved by adopting more up-to-date processes of purification, notably by the introduction of naphthalene washers.

The series of works just described were undertaken to satisfy immediate requirements. A much more extensive scheme, however, remains to be carried out, not only to meet future increases in consumption, but also to perfect the manufacturing operations. This scheme has been carefully considered by the responsible officials of the Gas Company, who have had the gratification of seeing their proposals approved and adopted by the Prefect of the Seine, as evidenced by the report submitted to the Municipal Council. This report comprises a general programme of works to be carried out, during a period of ten years, with the object of increasing the productive capacity of the Landy, Clichy, and La Villette works, the extension and improvement of the plant, the construction of large additional works in the south-east of Paris, and the closing-down of six of those now existing which are out of date, and have for some time been marked for demolition. The reason for the preparation of this extensive scheme will be apparent from the following figures showing the progressive increase which has taken place in the consumption of gas in the period extending from 1902 to the end of last year:—

| Year. | Consumption, Cubic Metres. | Increase, Per Cent. | Number of Consumers. |
|-----------------|----------------------------|---------------------|----------------------|
| 1902 | 289,538,283 | .. — | .. 454,651 |
| 1903* | 314,039,558 | .. 8'42 | .. 489,185 |
| 1904 | 330,600,601 | .. 8'44 | .. 512,728 |
| 1905 | 344,157,847 | .. 4'70 | .. 536,626 |
| 1906 | 352,558,335 | .. 2'41 | .. 555,720 |
| 1907 | 371,156,556 | .. 5'27 | .. 583,343 |
| 1908 | 387,502,562 | .. 4'40 | .. 608,149 |
| 1909 | 408,902,303 | .. 5'52 | .. 630,104 |

* Price reduced from 6s. 9d. to 4s. 6d. per 1000 cubic feet.

It is unnecessary to convert all the figures showing the consumption of gas; it is sufficient to say that in 1902 it was about 10,236 million cubic feet, and last year about 14,438 millions.

Taking into account the progress since 1903, the Prefect of the Seine estimates that in 1920 the consumption of gas will have reached 550 million cubic metres, or about 19,500 million cubic

feet; and this is the figure given in the report. On this assumption, the productive capacity of the works should be equal to the maximum consumption—i.e., on the 24th and 25th of December—with a surplus of 10 per cent. for contingencies. The capacity of the existing works does not very greatly exceed 63½ million cubic feet per day; and it will be increased to the extent of rather more than 12½ millions by the end of the current year, when the new retort-houses at the Landy station will be finished. The necessary supplement will have to be obtained by further additions there and at La Villette. The first-named station can be doubled in extent by the utilization of some contiguous ground having a superficial area of close upon 114 acres, or nearly equal to that of the station itself, from which it is separated only by a main road. As it was acquired originally by the old Gas Company, it is now the property of the City. Upon it, therefore, can be erected, as in the existing station, four retort-houses having a total productive capacity of nearly 25 million cubic feet. The new works will stand alongside the St. Denis Canal, and be connected directly with it by a travelling crane to facilitate the unloading of barges; while by means of the adjoining works they will be in communication with the Northern Railway system.

The Company also contemplate the augmentation of the productive capacity of the works at La Villette. They are connected with three lines of railway—the Northern, the Eastern, and the Girdle—stand on an area about 52 acres in extent, and have a productive capacity of about 14 million cubic feet per day. In place of the existing horizontal retorts, heated by ordinary furnaces, and the buildings containing them, which are in a bad condition, there will be constructed powerful settings of modern type. In this way, their capacity will be raised from 14 to nearly 16 million cubic feet per day. Finally, in order to modernize the station, which is well situated, it is necessary to reconstruct the exhauster and purifier houses, which are altogether out of date, overhaul and repair the mains, instal plant for the mechanical unloading of the colliers, and telescope some of the gasholders which are of insufficient capacity.

The Prefect next considers the question of closing-down the works at Passy, Boulogne-sur-Seine, Alfortville, Ivry, St. Mandé, and Vaugirard; and he finally decides on the advisability of doing this, as well as of putting up large works in the south-east of Paris. The sale of the sites of the works named would, he estimates, produce at least 20,000,000 frs. (£800,000), which would go towards a reduction of the 180,000,000 frs. required for carrying out the complete scheme. The advantages attending the construction of these works are thus summarized: The maximum capacity of the works proposed to be closed being about 24 million cubic feet per day, the question might be asked whether their replacement by a single station equipped on modern lines would really be advantageous; the cost of such a station, inclusive of land, buildings, plant, mains, &c., being estimated at 56,500,000 frs. (£2,260,000). To this it might be answered that the substitution of modern plant in the new works would, according to the estimates prepared for the Gas Company, result in a saving of from 146 c. to 196 c. per cubic metre, equivalent to from 4d. to 5½d. per 1000 cubic feet, in working costs, or about 245,000 frs. (£9800) per annum, supposing retort-settings similar to those at the Landy station were employed. Under these conditions, which represent only the minimum of the economies realizable by the change, M. Lauriol, the Chief Engineer of the Municipal Gas Department, acknowledges that, after allowing for the sale of the sites and other matters, the figures would about balance themselves.

The proposed new station is intended to serve more particularly the left bank of the Seine. Its situation will certainly be less favourable there than on the north of the river for the delivery of coal by boat or by rail. But it is considered advisable not to locate all the centres of production in the same district; and therefore it will be a good thing to have on either side of the river works serving approximately the portions of the city in which they stand. The Prefect of the Seine is of opinion that the new station could be ready by 1915; but he points out that the Gas Company ought before 1912 to have the necessary authority and funds for the acquisition of the land. The proposed works will occupy a site 25 acres larger than that of the Landy station and the adjacent area, which it is proposed to cover. At the outset, the production could be limited to about 17½ million cubic feet per day; but by 1922 it could easily be brought up to nearly 25 millions, and later on to a similar extent. The new station would comprise tar and products works, and there would be spacious coal-storage grounds. With regard to the existing products works at La Villette, they have to deal with all the tar produced at the various stations, with consequent attendant heavy expense for its transport. Moreover, as with the introduction of modern appliances in the existing or the proposed works the production of tar must increase, it has been necessary to give some attention to the provision of additional plant. With the exception of the products works at Clichy, which are fairly modern, all the others which are to be thrown out of use will be replaced by entirely new ones at La Villette, and they will work up the ammoniacal liquor produced there as well as at Le Landy and the adjoining new works. Eventually tar and chemical products works will be erected in the new south-east station. After these arrangements have been completed, only the Clichy works will have to send their tar to other products works for distillation. From all the others it will be conveyed direct into the works adjoining those in which it is produced. When the Villette station is reconstructed, the fire-brick works will be dismantled. The portion of

the scheme just outlined is estimated to entail an expenditure of about 9,500,000 frs. (£380,000).

In the report under notice, attention is called to the fact that the Gas Company have no railway rolling stock, whereas this is urgently needed for properly carrying on gas-works. In order to avoid hand labour in getting the coal into the hoppers conveying it to its destination, it is necessary to have railway trucks which discharge directly from the bottom by the simple opening of a trap-door. The railway companies, however, decline to build such trucks, on the ground that they would be of use in only one industry. Moreover, it is very difficult to construct viaducts and provide hoppers which would be suitable for waggons of different types. It is pointed out that in large modern gas-works, especially those in England and Germany, the coal-waggons are adapted to the overhead railways and existing hoppers; thereby ensuring the economic discharge of coal without resorting to manual labour. The Company consider the provision of such waggons necessary for gas-works of the magnitude of those which for many years will be in operation round Paris. Indeed, those at Le Landy have already been arranged for taking in trucks of this type. The works which will be erected on the at present unoccupied site contiguous to this station will, of course, be laid out for receiving such waggons; the Villette and Clichy stations are to be altered and improved; while the south-east station will be entirely new. It seems only in keeping, therefore, to have a modern equipment of rolling stock running from the mines right into the works. Besides, the adoption of 40-ton waggons for the transport of coal commends itself from the fact that it would allow of the minimum of labour being employed in the works, and enable a special transport tariff to be arranged. Each train running over the companies' systems could be composed of 16 waggons; and allowing four to be kept in reserve for repairs, 20 waggons per train might be reckoned for. Assuming twelve trains running (six each way), 240 waggons would be required. Five of the trains could cope with the traffic from the mines to the five gas-works, and a double train would be available for conveying coal from one works to another, or coke from them to the stores in Paris.

The approximate cost of the works previously described may be stated as follows:—

| | Francs. | Sterling. |
|--|-------------|------------|
| Altering the Clichy and La Villette stations | 25,500,000 | £1,020,000 |
| New works at Le Landy and in the south-east of Paris | 110,000,000 | 4,400,000 |
| Land for the latter works | 10,000,000 | 400,000 |
| Tar, chemical products, and fire-brick works | 9,500,000 | 380,000 |
| Railway rolling stock | 5,000,000 | 200,000 |
| Reserve to meet unforeseen expenses | 20,000,000 | 800,000 |
| Total | 180,000,000 | £7,200,000 |

As already mentioned, the total cost of the scheme will be reduced by the proceeds from the sale of the plant and sites of the dismantled works, which it is thought may be reasonably estimated at 20,000,000 frs.—equal to the sum reserved to meet contingencies. This would bring down the total to 160,000,000 frs. (£6,400,000).

The foregoing is a summary of the report which the Prefect of the Seine has submitted to the Municipal Council of Paris. As mentioned at the outset, the principle of the scheme has been approved, and the Gas Company, who will carry it out, will have to submit to the Administration every year the particular portions they purpose undertaking.

The discussion on the "Measurement of Light and Illumination" will be continued before the Illuminating Engineering Society at their meeting on Thursday of next week, the 14th inst., at the Society of Arts rooms, John Street, Adelphi. The chair will be taken, at 8 p.m., by Professor Sylvanus P. Thompson, F.R.S.

Last night the Society of Engineers had presented to them a paper by Mr. Percy G. Scott, Assoc.M.Inst.C.E., describing the Moulheim Water-Works. The following is a synopsis of the paper: Outline of five schemes prior to the one described—survey operations—the reservoir and its storage capacity—head-works, comprising dam or earth embankment, outlet sluice, and waste weir—service cisterns—distribution system—water-rates—loans—abstract of costs—expenses of maintenance.

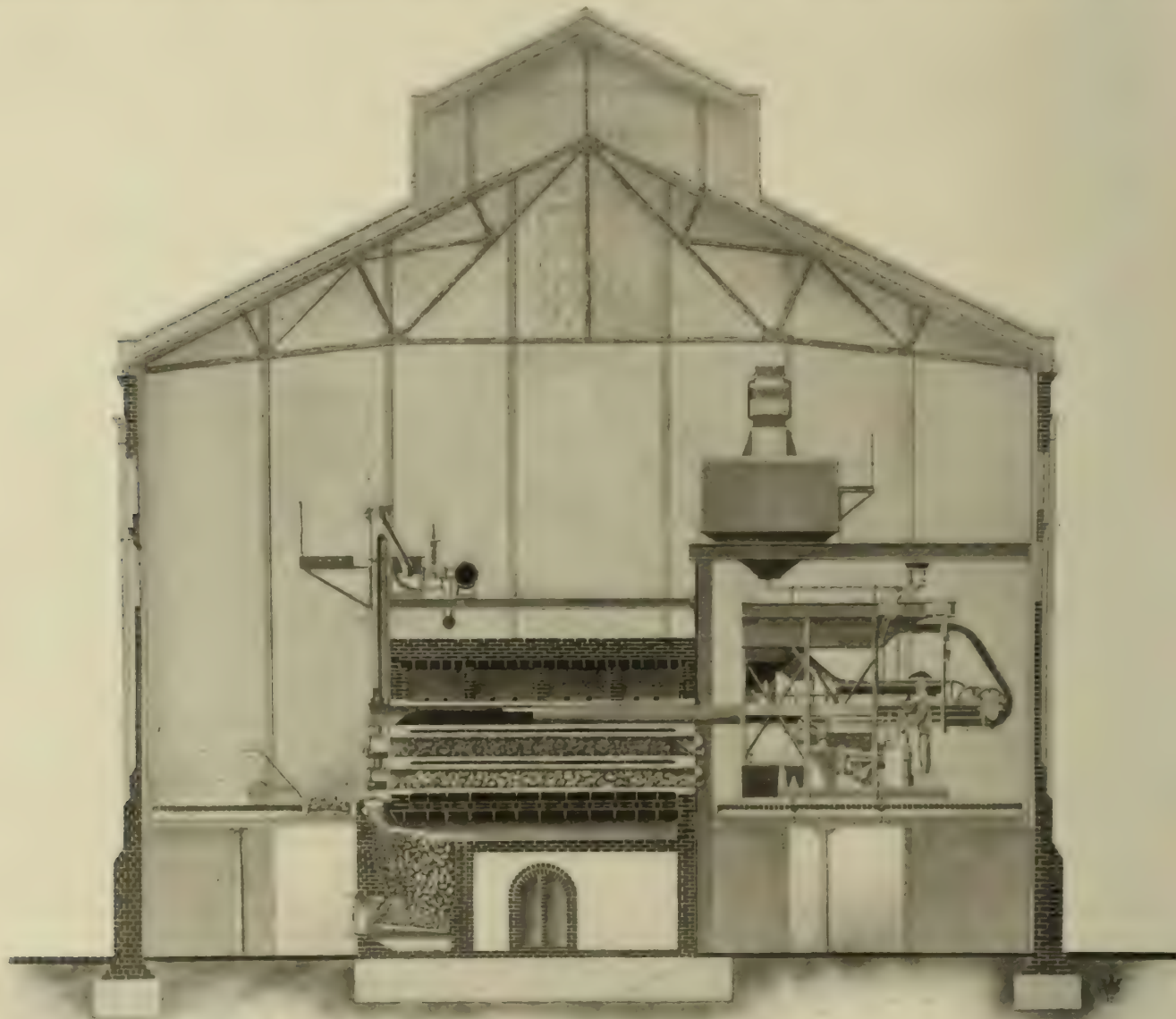
The owner of a name well known to many gas engineers and managers—M. Louis Denayrouze—has lately passed away. He was a man of varied talents; having in turns devoted his attention to literature, politics, and engineering. It is on account of his connection with the last-named profession that his death calls for notice in these columns. In the early days of electric lighting, he was attracted by it; but he subsequently devoted himself to improving the other systems of lighting—by gas, alcohol, petroleum, and benzol. Between 1894 and 1896 his burner was several times described in the "JOURNAL." He was admitted a member of the Société Technique du Gaz en France in 1883. In 1896, he read a paper on high-power incandescent lighting; in the following year, he described his burner; and in 1904, he reviewed the progress of incandescent lighting. His last communication to the Society was made at the meeting held in Paris in 1908; and it was on the subject of the use of coal-tar hydrocarbons for the above-named purpose.

WEST'S NEW POWER-STOKER FOR HORIZONTAL RETORTS.

As the pen is taken up to describe to our readers the new power-stoker with which the name of West is identified, it is impossible to restrain a little retrospection from the standpoint of present conditions. These are times when the eyes of carbonizers for the production of gas for town purposes are fixed intently on vertical retorts, but belief in the future of the new system of carbonization varies with different men in a somewhat markedly wide degree. There are those who think that, operated according to the modern approved methods, the horizontal retort, all things considered, will not be beaten out of the field by retorts set vertically; and there are others who are of the converse opinion. Whatever the present view—views of the kind can only secure their affirmation or negation by time—this is positive, that there cannot be any extraordinarily extensive transformation of the type of carbonizing plant for some years to come. What transformation there is must be within the limits of extension work and

complete conversion of settings. There are few gas-works in which there are not houses accommodating horizontal retorts; and the number of settings that are to be found in those houses that, by the renewal only of the portions within the arches and above the combustion chambers, will continue to render good service for a number of years to come are—we might almost say—countless. This being so, their operation in the most economical way, and in manner that shall yield the most generous results, are conditions devoutly desired by every gas manager. That is the position from which retrospection is made.

From the old days at Maidstone, when manual stoking-machines were first introduced by Mr. John West, there has never been any lack of ingenuity in enabling West's Gas Improvement Company, Limited, to not only keep pace with the times and the requirements, but it must be—in fact, it is universally—conceded that, through that Company's chief and founder, there have been given to the gas industry some considerable and valuable



Retort-House fitted with West's New Power-Stoker.

advances in mechanical operation of retort-houses. The power machines that followed the original manual ones have been greatly improved from time to time, and adapted to most conditions of works. The combination machine that discharged and charged from one platform, and the machine when lighter charges were the vogue in which the scoop was used as a ram, were inventions that were in keeping with the spirit of the times. In these advances, it has been seen that the firm have never allowed self-interest to interfere with their compliance with altered demands. Combination machines, the discharging and charging machines working from one side of the bench only, are the tangible recognitions of changing tendencies. The gas engineer felt that the extent of coal handling plant and hoppers, charging and drawing machines and coke-conveyors on both sides of a bench, represented a heavy capital outlay and also unnecessary working cost. Mr. John West met their views with the new machines. Upon this came the revised methods of working horizontal retorts—methods that are extensively approved by the professional men of the industry. But the machines of the old types are not con-

venient for, or suitable to, the heavier charge. There was a difficulty to be overcome; and there has been success in the machine now being described. Discharging and charging in one operation, and by a machine that will carry into the retort a heavy charge of coal, are the ends aimed at and achieved. It constitutes the latest evidence of the firm's desire—and not only desire, but ability—to conform with the progressive aims in the field of carbonization.

The new machine is designed for the discharging and charging of retorts of the usual length of 20 feet from one side of the bench; the re-charge being of weight suitable to the capacity of the retort, and the length of time allotted to complete its carbonization. By the heavier charge and the longer duration of carbonization, there are realized the advantages, subscribed to from many quarters, of an improved quantitative and qualitative yield of gas, reduction of sulphur compounds and naphthalene, and improved coke, with the additional advantage of decreased wear and tear of plant. The new power-stoker does the work which formerly necessitated employing four machines, with their

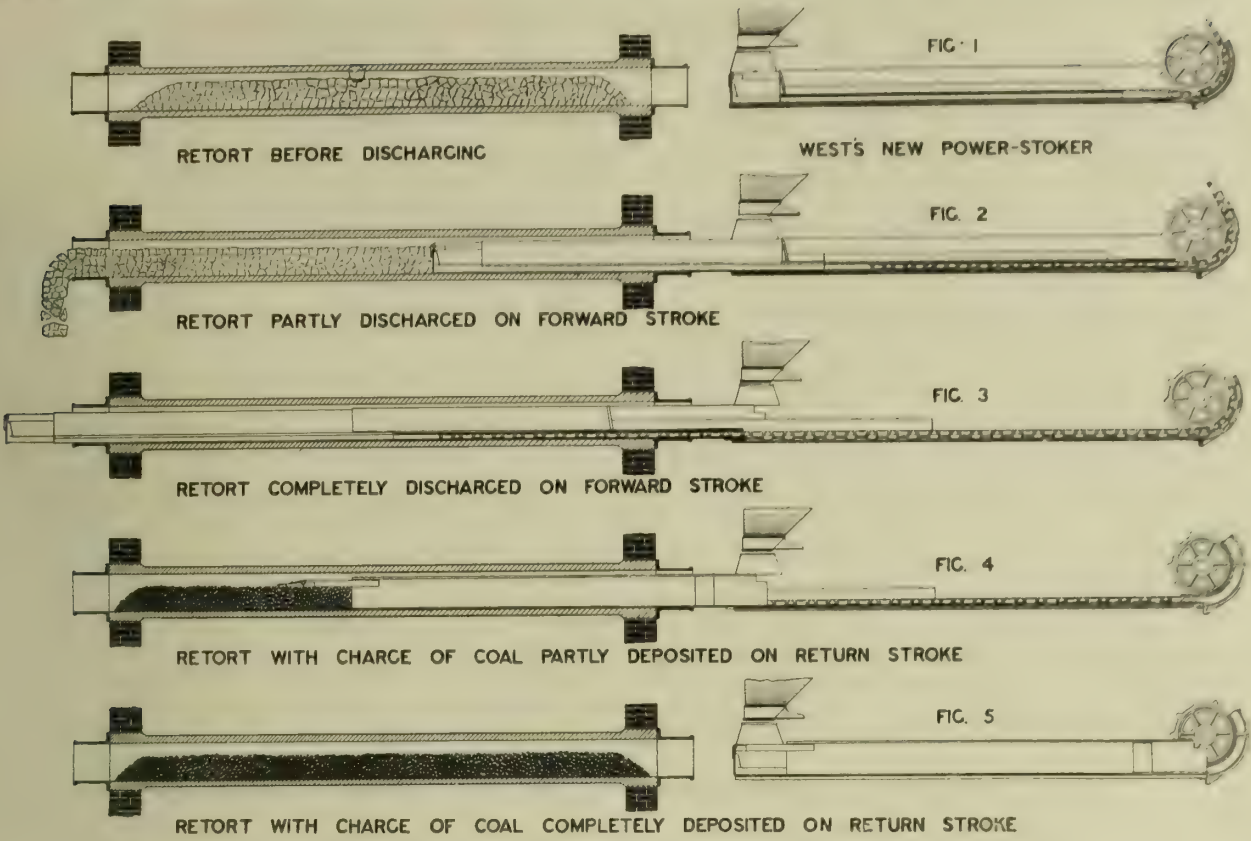


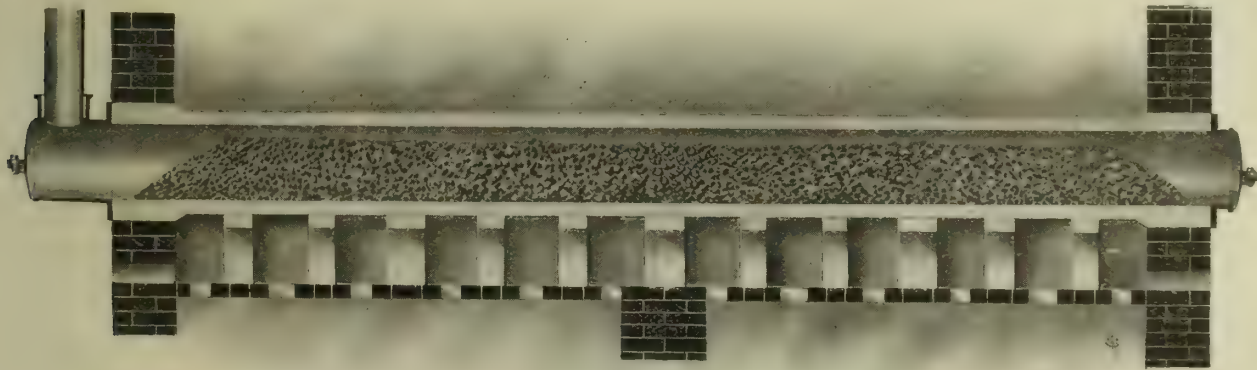
Diagram showing the Action of the Discharging and Charging Apparatus of West's New Power-Stoker.

complement of attendants; and although the one machine performs the duty of a plurality of predecessors, it is remarkable that it is of simpler construction than the latter.

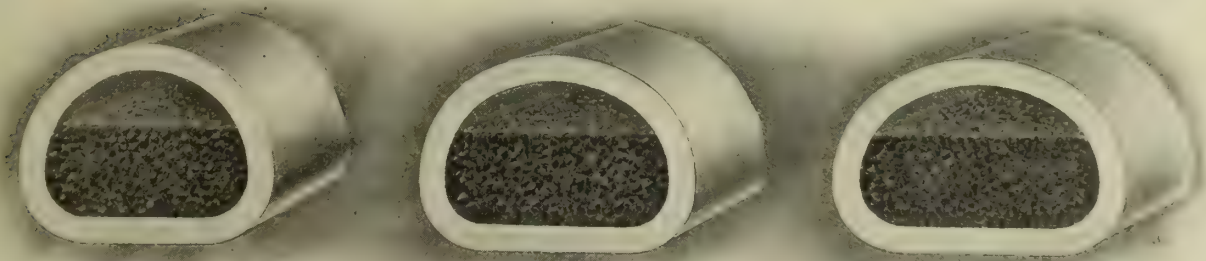
The power-stoker may in many respects be described as an adaptation of West's telescopic-ram discharging machine for discharging the coke from through retorts, and a novel telescopic scoop which conveys the coal into the retort when following the ram-head as the latter drives the coke forward; the coal being deposited in the retort on the return stroke of the ram and scoop to the machine. We must pause to remark upon this fact, that the coal is deposited by a scoop, inasmuch as it is a system that

Mr. John West has always maintained to be the best to assist in obtaining good carbonizing results—his lengthy experience of coal carbonization asserting the view that the coal should be lightly laid and in a regular layer throughout the length of the retort. It is also to be noted that the charge of coal laid by the machine is so invariably uniform that the removal of the resultant coke is facilitated.

The complete machine consists of a travelling trolley framework for supporting a coal-hopper; and the combined discharger and scoop, with the usual motor and gear for adjusting the machine to the retort, as is common with the other well-known



Section of a Retort showing the Layer of Coal deposited by West's New Power-Stoker.



| | | | | |
|---------------------------|---|-------------------------|-------------------------|-------------------------|
| Dimensions | - | 22 inches by 16 inches. | 24 inches by 16 inches. | 26 inches by 16 inches. |
| Weight of coal per charge | - | 11 cwt. | 12 cwt. | 13 cwt. |
| Retorts | - | 20 feet through. | | |

types of West's machines. It also receives its supply of coal from overhead coal-bunkers, which may have outlets opposite each vertical line of retorts, or the hopper on the machine may be of sufficient capacity to contain a supply of coal for a number of retorts. Referring to the main coal supply, it is interesting to note that the machine is the same height as the other types of West's machines, and consequently can be installed in those retort-houses which already have the separate machines, without the necessity of raising the coal-bunkers. The machine is fitted with West's bunker-door operating gear, which engages with the outlet doors of the overhead coal-bunkers, and enables them to be operated from the machine.

We illustrate an example of a retort-house designed to receive the new power-stoker, which, in conjunction with hot-coke handling plant, will enable the operations of discharging and charging the retorts, the opening and closing of the retort-lids on both sides of the retort-bench, the filling of the furnaces, and the conveying of the coke from the retort-house to be accomplished or directed by three men; and as the floor space on the discharging side need not be so wide as when required to provide for the reception of a machine, an economy in ground area is effected, and the floor can be of lighter construction.

The diagrams, figs. 1 to 5, illustrate the principal actions of the new machine.

Fig. 1 shows the machine in front of a retort from which the coke is ready to be discharged. The attendant then moves the starting-lever of the motor, or controller in the case of an electrically driven machine; and the discharger with the scoop enters the retort—the scoop at the same time mechanically opening the coal-feed from the hopper on the machine, and closing it when it

is fully supplied. The completion of the outward stroke, as fig. 3, has caused the whole of the coke to be ejected from the retort, and the coal to be conveyed into the retort at the same time. During the return stroke (as illustrated in fig. 4), the coal leaves the scoop, and is deposited in the retort in a layer as perfectly even as shown in the longitudinal section in fig. 5, and in cross section as shown in each of the three illustrations of examples of retorts of common dimensions and profiles. The machine is applicable to any common section or profile of retort; and it is capable of charging it with the quantity of coal to meet the conditions of eight-hour charges, or the machine can be constructed to suit any special section of retort if so required.

Although the machine discharges the retort and charges it at one operation, the two services may be accomplished separately by the simple movement of a lightly operated lever and rod, which trips the mechanical coal feed-gear, and prevents the coal being fed to the scoop. By this means, the retorts may be periodically inspected or stood-off for scurfing.

As the name given to the machine implies, it is a power-driven machine, and is operated either by electric, compressed-air, or other convenient system of power transmission.

The new machine has already been inspected by a number of gas engineers, who have (as we do now) very heartily congratulated West's Gas Improvement Company on their fresh advance. Among other interesting pieces of intelligence in connection with the new machine is the one that the Directors of the Cardiff Gaslight and Coke Company have placed an order with the firm for the supply of the machine, with coal and hot-coke handling plants, which will form an extension to the retort-house already fitted with West's stoking machinery.

S. B. CHANDLER'S DOUBLE-ACTION ROTARY WASHER-SCRUBBER.

THE patentee of this arrangement, Mr. S. B. Chandler, is one of the staff of the South Metropolitan Gas Company, and the eldest son of Mr. Samuel Chandler (well known in connection with rotary gas-purifying apparatus); and it will be seen by the drawing and the extract from the specification reproduced herewith that his invention relates to washer-scrubbers for extracting ammonia and other impurities from gas, where the gas ascends and descends into and through central openings. Many kinds of surfaces have from time to time been introduced, with which, of course, most of our readers are acquainted. It is, however, claimed that the invention under review "encompasses objects the advantages of which are very clear and improvements equally manifest."

In substitution for bundles such as are already known, thin sheets of metal are used after being pierced, stabbed, or forced through all over, so as to leave a number of ragged holes in each square inch (and this is the essential feature of the invention); the object in so treating the sheets being to leave on the reverse side into which the stubby pointed tool enters, a number of protrusions—sharp, prickly points and curled-up ragged edges (see fig. 4 of the specification drawing here reproduced). These pressed ragged holes surrounding each other (as they do) form tiny cups or carriers—i.e., one pressed hole leaves the split metal pointing upwards, downwards, and sideways, as is also the case regarding the holes that are above, below, and at the sides. This results in the formation of little receptacles for liquid all over the sheets. The flow of the gas through the machine continually disperses this large number of drops from edge to edge, on to and among the surfaces—an effect to be appreciated.

Number of segments so prepared are made up into a bundle as usual, and fitted into the scrubber-washer. On being revolved they must unquestionably split up and divide the gas into numberless parts every minute; and the action is, of course, reproduced at each revolution of the wheels. It therefore follows that the liquor is also carried up from the tanks by the rough projections, and divided into a great number of showers of little drops—resulting in a longer time-contact with the liquor surfaces and gas. In addition to this, the gas having the wetted surfaces only to rub against, as previously, is also subjected to the action of "these millions of constantly descending, rolling, moving drops, which, owing to the zig-zag course they must of necessity take, perform an important and additional part in purification."

It is not always a simple matter to make clear the functions or capabilities of apparatus of this description; and perhaps the better plan in this instance will be to explain that in a washer-scrubber containing (say) 12,000 square feet of surface there would be approximately 51,840,000 cutting edges and liquor dividing and lifting appliances, calculated as follows: Thirty protruding edges in 1 square inch = 4320 per square foot at 3 revolutions per minute. $4320 \times 12,000 \times 3 = 155,520,000$, or, taking the gas to be purified at 81,000 cubic feet per hour, it would mean that every 1350 cubic feet would be subjected to, and in contact with, this very large number of devices and sheets per minute. These figures and statements may seem somewhat surprising; yet they are borne out by simple facts, easily verified, and at all events may afford some idea of the possibilities obtainable.

In a model sent for our inspection, it is shown that, in practice, the spaces between each sheet are $\frac{1}{8}$ -inch, and that the projections extend only half-way. Thus a good open area is left between the plates for freely washing as they revolve through the liquor. It is necessary to mention this as the reproduction

of the drawing being necessarily small, may not convey the idea intended.

ABSTRACT OF PATENT SPECIFICATION, No. 214, Jan. 4, 1910.

The invention relates to washer-scrubbers used for extracting ammonia and other impurities from gas, of the kind in which a number of discs or wheels rotate in bays or tanks, each disc comprising a number of "bundles" or segments composed of a number of boards or thin plain metal sheets held together by side enclosures which are secured to the frame plates. The invention consists in the use of plates not of the ordinary kind, but perforated in such a way that they will be more effective than those hitherto used for the purpose.

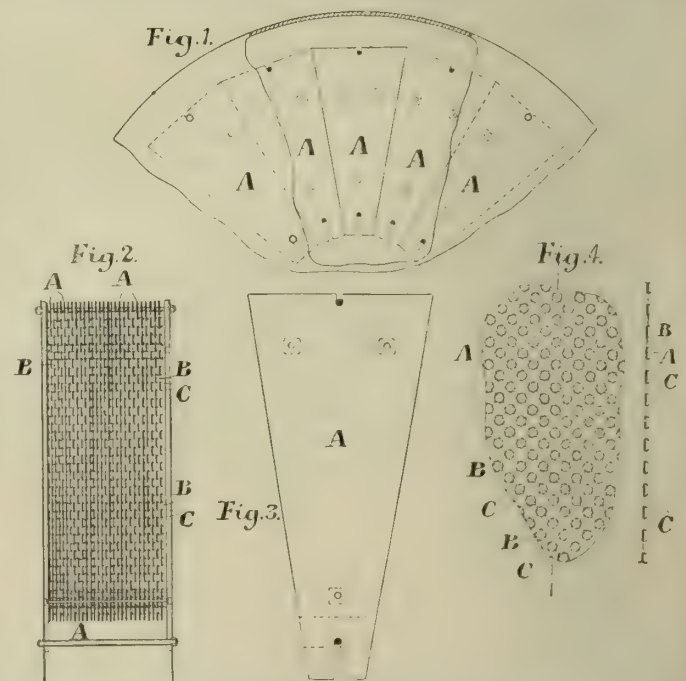


Fig. 1 shows an elevation of the segments in position. Fig. 2 is a vertical section of a bundle of perforated plates. Fig. 3 is an end view. Fig. 4 is an enlarged section and elevation of a plate provided with perforations.

The plates A are of thin material (preferably metal), and the holes B are pierced, stabbed, or forced through all over, close together, in such a manner as to produce and leave on the reverse side of the sheets which the tool enters a very large number of protruding sharp, prickly points and ragged edges C round each perforation. Alternate plates would have the perforations in the same position; the intermediate plates having the perforations in a different position, so as to zig-zag as much as possible the course of the gas which passes through the plates. The plates are bolted together with distance-pieces between them, as shown in fig. 2.

The patentee claims: 1. In a machine known as a washer-scrubber, the use of plates of metal or other suitable material pierced with ragged-edged holes. 2. In a washer-scrubber, arranging the plates which are pierced with ragged-edged holes in bundles or segments and placing the holes so as to form zig-zag courses for the passage of the gas.

GASHOLDER CUPS.

By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.

IT is not too much to say that gasholder cups are very little understood. Their action is a mystery to many. They are designed for the most part by mere rule of thumb, and frequently receive scanty attention. As a result, there are many gasholders which blow gas to waste every time they uncup. Gasholders with cups as deep as 18 inches or 20 inches very frequently "blow." What, then, is the reason for this? And what is the remedy?

WHAT "BLOWING" MEANS.

In order to determine whether a cup will "blow" or not, we must keep in mind what the blowing consists of. It means that when the cup lowers into the tank, it takes the water it contains down with it in such a way that, unless the lip of the cup-plate reaches the water-level in the tank (outside the cup) before the water in the cup is lowered below the grip-plate, then blowing must take place. This is the sum and substance of the whole matter. Nothing can be done unless this action is thoroughly grasped; and, therefore, to make it clear, we will glance at figs. 1 to 4.

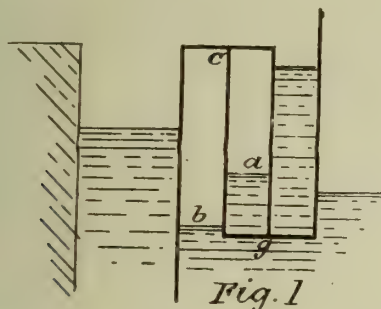


Fig. 1

Fig. 1 shows the position of the cup when the outer lift is just landed; and although the pressure of gas inside the cup may exceed the pressure in the holder, the cup does not blow—the level *a* being well above the bottom edge of grip-plate *g*. The water-level *b* is, of course, well below the lip of the cup *c*.

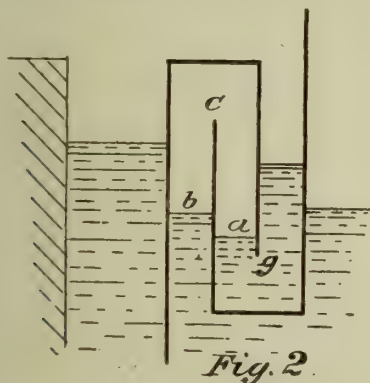


Fig. 2

Fig. 2 shows the cup somewhat lower. The grip is, of course, stationary. The water levels vary; but the exact amount of their variations is beside our present purpose, it is sufficient to note that the water level in the cup has been carried down, bringing the level *a* nearly to the bottom of the grip *g*. At the same time, the level *b* (outside the cup) rises at the same rate as *a* falls. Hence, if *b* can reach the top or lip of the cup-plate *c* before *a* reaches *g*, then water will flow into the cup and prevent its blowing.

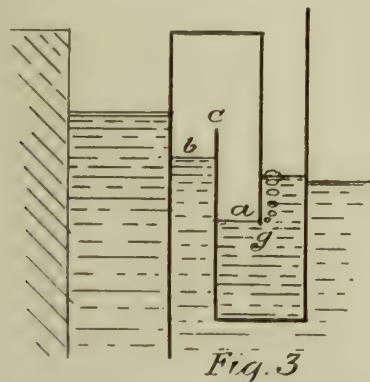


Fig. 3

Fig. 3 shows that *b* has not succeeded in reaching *c* in time to prevent *a* falling below *g*; and therefore gas escapes and blows to waste.

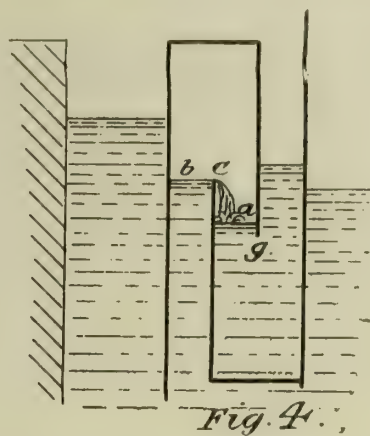


Fig. 4

Fig. 4 shows what the effect would have been if *b* had succeeded in reaching *c* before *a* reached *g*.

Upon consideration, we shall find that it is only in this way (fig. 3) that it is possible for a cup to "blow" gas to waste when uncupping; and, on the other hand, if the cup does not blow, it is only avoided by the action shown in fig. 4.

THE REMEDIES FOR BLOWING.

Now, presuming that we have a cup which would blow in the manner indicated in fig. 3, can nothing be done to obviate or remedy it? Yes; all that is required is to admit water to the cup just before the critical stage is reached. This can be done in two ways:

- 1.—By raising the overflow level in the tank so that the grips of all the lifts are entirely under water during the process of uncupping.
- 2.—By piercing the cup-plate with what we may term "flooding holes" at a level just below *b* in fig. 3.

Both these plans have been tried and with perfect success. A few words about each, before proceeding to a more detailed treatment of the subject.

1.—Mr. G. E. Stevenson advocated this plan in a letter which appeared in the "JOURNAL" for Jan. 30, 1894. Raising the overflow in the tank, of course, necessitates making a slightly deeper tank; but it must be remembered, as a set-off against this, that the effective capacity of the holder is increased thereby. In many multi-lift gasholders, the water level in the tank, when the holder is down, is very much lower than the top curb; so that not only does the domed crown of the holder contain a stock of gas which it can never deliver up, but the cylindrical portion of the holder does likewise, to a depth of perhaps 12 or 18 inches, according to the position of the tank overflow level and the pressure given by the holder. If, for example, the overflow level is 6 inches below the top curb—a very ordinary case—and the pressure given by the gasholder when full is 9 inches, the water-level falls to a level of 9 inches below the overflow, or 15 inches below the top curb when the holder is at rest in the tank. We, therefore, see there is a loss of 15 inches in effective depth of the holder, due to the low position of the overflow. Allowing the grips to be flooded, by raising the overflow, would not therefore be without advantage in other ways than that of preventing the cups from blowing.

We must, however, in adopting this plan, make certain that all the grips are flooded during uncupping. It will not do to apply it to the outer lift only; the water overflow level must be raised above the top of the grips by a distance somewhat in excess of the pressure given by all the lifts except the inner lift. For example, a gasholder giving a total pressure of 10 inches, of which the inner lift gives $4\frac{1}{2}$ inches, must have the tank overflow level raised more than 10 in. — $4\frac{1}{2}$ in. = $5\frac{1}{2}$ in. above the grips, or, to be safe, say $6\frac{1}{2}$ inches, so as to allow for ordinary irregularities, evaporation, &c. The greatest care must also be taken to maintain the water level, by making good any losses caused by evaporation or leakage. Otherwise, should the rainfall be insufficient to make good the deficiency, the water will not cover the innermost grips when uncupping, and if it does not do so, then it will probably blow. Moreover, under such circumstances, it will blow to a greater extent than if the water level in the tank was kept at the lower level in the ordinary way—in fact, some leakage from the tank when the overflow is below the top of the grips does not increase the liability of the cups to blow, but the reverse.

Before leaving this point, we may note that the low water-level in the tank is the reason why many gasholders do not blow when uncupping. Many gasholders which do not blow at the present time, would do so if the tank overflow level were raised, unless it be sufficient to cover the grips during the whole time of uncupping. It is therefore important to exercise the greatest care, and consider the matter scientifically, before making any alterations of the kind suggested.

2.—We now come to the second method of overcoming "blowing," where the cup has not been designed in such a way as to render blowing impossible under ordinary conditions of working. The piercing of the cup plate by flooding holes is an exceedingly neat and effective method of accomplishing the end desired, as it admits of the water-level being raised or lowered in the tank to any extent within reason, and allows of much shallower cups being

used than could otherwise be done. The author has introduced this system in cases where it would otherwise be impossible to add new lifts to gasholders owing to the shallowness of the existing cups, and with perfect success. The number and size of the flooding holes required to give satisfactory working may be taken at two in each bay round the holder. They should be about $1\frac{1}{2}$ inches diameter, or elongated holes about 2 in. by 1 in. are preferable.

We cannot, however, determine whether a cup will blow, nor the level at which to place the flooding holes, without following the action of the water in the tank, step by step, during the process of uncupping. If we find that at any stage the water level *a* (fig. 3) falls below the grip-plate at *g*, we then know that it will blow. And, further, if we note the exact position of the lip of the cup *c* when this is about to take place, as well as the water level *b*, we can at once fix the position where flooding holes are required.

UNCUPPING.

The conditions which arise during the process of uncupping vary, thereby necessitating variations in the treatment. These we will take in succession, by choosing examples to cover all cases likely to arise in actual practice.

NOTES.

In the following diagrams—

- All water levels in the tank outside the gasholder are lettered . . . T
- " " in the tank inside the inner lift . . . W
- " " between the cup-plate and the next lift . . . G
- " " and the grip-plate . . . C
- " " outside the grip-plate . . . E

The successive levels in each space—that is, under each letter—are numbered 1, 2, 3, &c., corresponding with the successive stages in the uncupping.

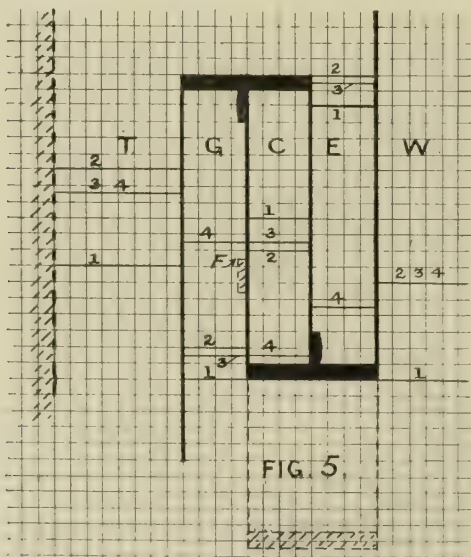
When the distance between two levels is referred to, such as $W_1 T_1$, it means the difference between the water-level line W_1 , and the water-level line T_1 .

The thick lines (top and bottom of cup and grip) denote the thickness of the rest-block, added to the thickness of the channel or bent plate.

CASE I.

Example 1.—Three-lift gasholder. Cups, 18 inches deep (effective). Depth over cup and grip, 19 inches. Water overflow level, 6 inches from top of grips. Pressure of gas given by three lifts = 4 in., $1\frac{1}{2}$ in., and $1\frac{1}{2}$ in. respectively, or a total of 7 inches. Proceed as follows:—

(1) Sketch, in outline only, the lowermost cup and grip, on sectional paper (four to an inch is a convenient size). Every division on the paper may be taken to represent one inch, as shown in fig. 5. [Note: The diagrams accompanying this paper are to a smaller scale than should be adopted in actual practice.]



- (2) Show the water-levels when the cup just touches the water. W_1 represents water-level inside holder.
- G_1 " " in grip space.
- T_1 " " in tank when distance $W_1 T_1$ = total pressure of gasholder—viz., 7 inches.
- E_1 is the level of water in outside of cup. This level is assumed to allow for evaporation, &c.
- C_1 is the level inside the cup (distance $C_1 E_1$ = the total pressure, 7 inches).
- This is the first position the water-levels take up with respect to the cup and grip; and therefore all levels are marked 1.
- (3) Now to find the second position. This is when the cup has sunk into the water and is just about to land the outer lift. All the letters are marked 2.
- T_2 is the distance of overflow level from top of grip.
- Make $W_1 W_2 = T_1 T_2$.
- Make $E_1 E_2$, $C_1 C_2$, and $G_1 G_2$ each equal to one-third of $W_1 W_2$.
- (4) The third position is when the weight of the outer lift is landed. This causes the water outside the holder—viz., T_3 —to

fall to T_3 , a distance equal to the reduction of pressure $1\frac{1}{2}$ inches. W_2 remains, for all practical purposes, stationary. Make E_3 and G_3 each one-third of $T_2 T_3$ below E_2 and G_2 respectively.

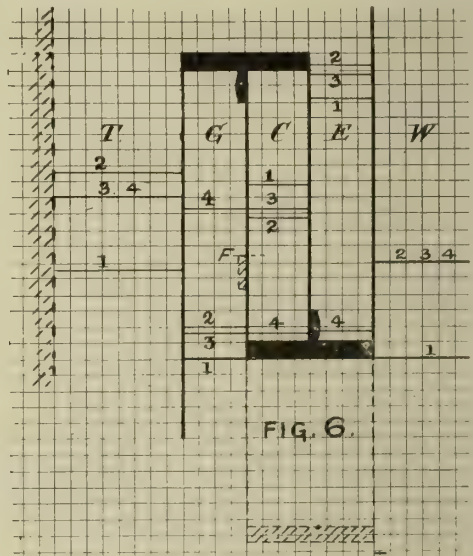
Make C_3 one-third of $T_2 T_3$ above C_2 .

(5) The cup now begins to descend, leaving the grip stationary. Assume, for safety, that to avoid blowing, the water level C_3 should not approach nearer than $\frac{1}{2}$ inch to the bottom of grip-plate. Draw C_4 at that level. Now, the distance the cup will fall before C_3 reaches C_4 is $1\frac{1}{2}$ times $C_3 C_4$. Mark a point on the cup-plate $1\frac{1}{2}$ times $C_3 C_4$ below the lip, as at F. The water level G_3 will, when the lip of the cup has fallen to F, have risen a distance of $G_3 G_4 = C_3 C_4$.

E_3 falls to E_4 a distance = twice $C_3 C_4$.

It will be seen in the present example, therefore, that the water-level G_4 overflows the cup at F before the water-level C_4 descends too low for safety—that is, it will not "blow."*

Example 2.—Before proceeding further, we will ascertain if the inner lift cup would blow. It is always desirable to do this, because the water level E not only falls by evaporation, but is lowered by a distance equal to half the pressure of the outer lift.



The numbered letters in fig. 6 show the successive stages; and, therefore, it is unnecessary to repeat the explanation. All that we need note is that, in the first place, E_1 and T_1 are lower than in fig. 5, and that in the final stage the water-level G_4 rises above the lip of the cup F in good time to prevent any blowing taking place under the grip-plate.

Example 3.—We will now alter the conditions somewhat, still taking the same proportions of cup. Let the overflow level be only 3 inches below the tops of the grips and the pressures $5\frac{1}{2}$ inches, $2\frac{1}{4}$ inches, and $2\frac{1}{4}$ inches respectively.

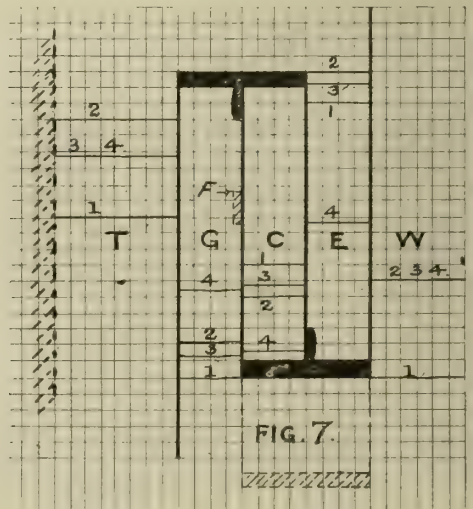
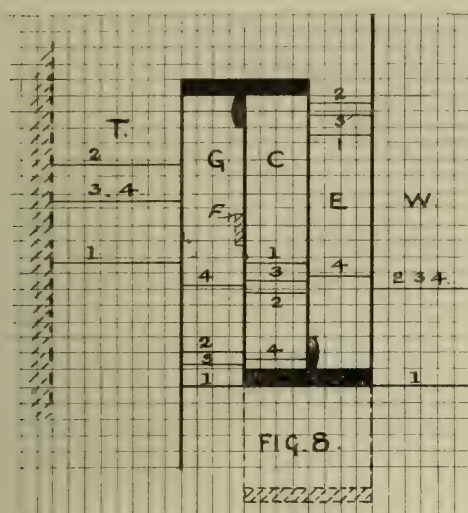


Fig. 7 shows the action in a similar manner to the preceding examples; but we note that the water-level G_4 has not reached the lip of cup F before the water-level C_3 has arrived at C_4 . We therefore know that it would blow. To obviate this defect, flooding holes should be put through the cup-plate (say) 1 inch below the level G_4 —that is, at a distance of about 7 inches below the lip of the cup. The cup would not then blow.

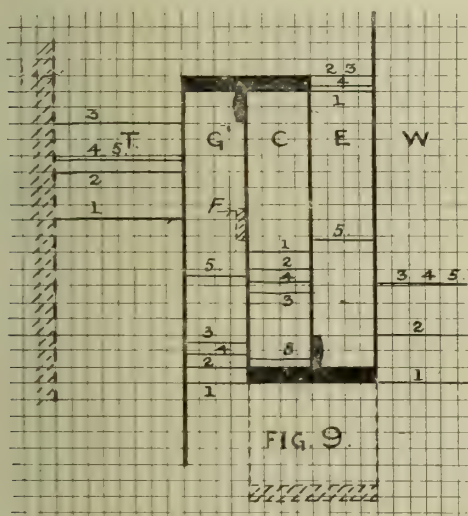
*NOTE.—In this and other examples where blowing does not occur, the level G_4 is shown above the lip F; but, in reality, the water would, of course, flow over F into the cup, and thus prevent the grip becoming unsealed. All that we need note, however, is that if G_4 is above F the cup will not blow.



Similar treatment of the inner lift cup would show that this would likewise blow, and that flooding holes would be required at a level of 5 inches below the lip (see fig. 8).

CASE II.

The foregoing examples belong to what may be termed the simplest case. The next example will present more difficulty, because water will flow out of the cup and over the top of the grip into the tank as the cup enters the water.



Example 4.—Taking the same cup (fig. 9) as before, let us assume that the water-level at E_1 is only 1 inch below the top of the grip; otherwise let the data be the same as in Example 3.

- (1) Commence by showing W_1 G_1 T_1 E_1 and C_1 in their proper positions, when the cup has just touched the water in the tank (see fig. 9).

- (2) Let E be just on the point of overflowing the grip at E_2 .

Make W_1 W_2 = three times E_1 E_2 .

" T_1 T_2 = three times E_1 E_2 .

" C_1 C_2 = E_1 E_2 .

" G_1 G_2 = E_1 E_2 .

- (3) Next show T_3 at the level of overflow below top of the grip.

Make W_2 W_3 = T_2 T_3 .

" C_2 C_3 = half of T_2 T_3 .

" G_2 G_3 = half of T_2 T_3 .

E_3 , of course, remains at E_2 level, as the water is overflowing the grip.

- (4) After landing the outer lift, the levels become

T_3 T_4 = pressure of outer lift = $2\frac{1}{4}$ inches.

C_3 C_4 , G_3 G_4 , and E_3 E_4 are each equal to one-third T_3 T_4 .

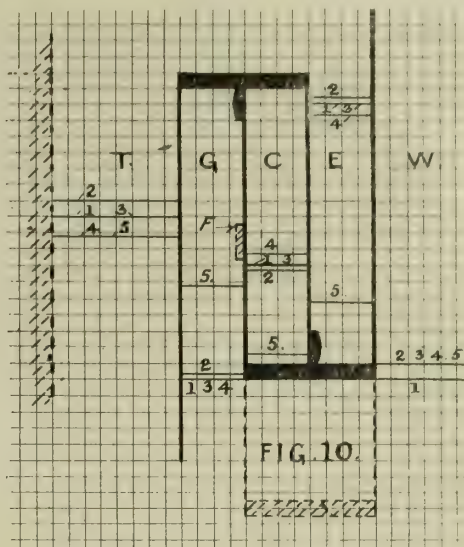
W_4 remains at the level of W_3 .

- (5) Now to test the cup for blowing. Let C_5 be (say) $\frac{1}{2}$ inch above the bottom of the cup, as Example 1. Then the lip of the cup would descend to F , a distance of one-and-a-half times C_4 C_5 , and the water-level G_4 would rise to G_5 , when the water in the cup is within $\frac{1}{2}$ inch of blowing—viz., at C_5 . Hence, as G_5 is below F , the cup would blow, and flooding holes should be put through the cup-plate slightly below G_5 (say) 5 inches down from the lip.

CASE III.

The next example treats of a case where the gas pressure in the cup forces the water in G down below the bottom of the cup, thereby letting gas escape back into the holder.

Example 5.—Let the proportions of the cup and the pressures be as in the last example, but make the tank overflow level 8 inches



below the top of the grip instead of 3 inches, and let E_1 be 2 inches below the top of the grips. Then proceed as follows:—

- (1) Show W_1 G_1 T_1 E_1 and C_1 in their proper positions when the cup has just touched the water in the tank (see fig. 10).

- (2) Make T_2 level with the overflow = 8 inches below the grip.

Make W_1 W_2 = T_1 T_2 .

" G_1 G_2 = one-third of T_1 T_2 .

" C_1 C_2 = " T_1 T_2 .

" E_1 E_2 = " T_1 T_2 .

- (3) Now show G_3 so that gas is just on the point of blowing under the cup into the holder.

Make C_2 C_3 = G_2 G_3 .

" E_2 E_3 = G_2 G_3 .

" T_2 T_3 = three times G_2 G_3 .

W_3 remains at W_2 level.

- (4) Make T_2 T_4 = pressure given by the outer lift, $2\frac{1}{4}$ inches. Then as G_3 remains stationary, G_4 will be level with the bottom of the cup.

Make C_3 C_4 = half of T_3 T_4 .

" E_3 E_4 = half of T_3 T_4 .

W_4 remains at W_3 level.

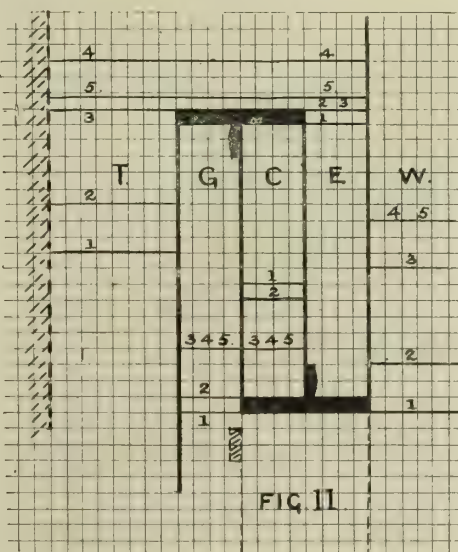
- (5) To test for blowing, allowing the margin of $\frac{1}{2}$ inch as before, we have,
 F equal to one-and-a-half times C_4 C_5 from the top,
and G_4 G_5 = to C_4 C_5 .

We see therefore that as C_5 has not reached F , gas would blow to waste when uncupping, and, therefore, flooding holes should be put through the cup-plate at a level of about 4 inches from the lip of the cup.

CASE IV.

The only other case which is likely to arise with the ordinary cup, in practice, is that of flooding the cup from the outside, due to the grip passing right under the water before it uncups.

Example 6.—Repeat the diagram as before, but make the tank overflow 3 inches above the top of the grip. Let E_1 be 1 inch below the top of the grip before the grip is immersed, and let the pressure given by the three lifts be $5\frac{1}{2}$ inches, $2\frac{1}{4}$ inches, and $2\frac{1}{4}$ inches respectively, as in former examples.



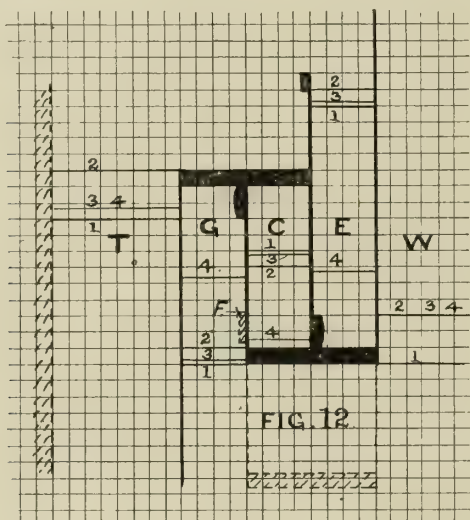
- (1) Show W_1 G_1 T_1 E_1 and C_1 as before, for cup just touching the top of the water, as in fig. 11.

- (2) When E_1 rises to E_2 —that is, level with the top of the grips—the other levels will be as follows.
 C_1 will fall to $C_2 = E_1 E_2$.
 G_1 will rise to $G_2 = E_1 E_2$.
 $T_1 T_2$ and $W_1 W_2$ will each equal $3 E_1 E_2$.
- (3) When the top of the grip has descended to the level of the top of water T_3 , the other levels will be $W_2 W_3 = T_2 T_3$.
 E_3 will be level with the top of the grip, like E_2 .
 $C_2 C_3 = \frac{1}{2} T_2 T_3$, and $G_2 G_3 = \frac{1}{2} T_2 T_3$.
- (4) When the grip is just on the point of uncupping, the water-level T_4 will be 3 inches above the top of the grip. E_4 will, of course, be level with T_4 .
 $W_3 W_4 = T_3 T_4$.
 C_4 and G_4 will remain level with C_3 and G_3 ; and from this position they will not alter during the remainder of the uncupping.
- (5) When the weight of the outer lift is landed, T_4 and E_4 will fall to T_5 and E_5 .
 $W_5 C_5$ and G_5 all remain stationary.

The cup will descend in the tank, leaving the water in the grip standing at this common level, and therefore it cannot blow.

CASE V.

The grip-plate is occasionally taken up higher than the top of the grip, so that a greater quantity of water may be held in the cup under pressure, and the necessity for a deep cup is avoided (see fig. 12).



This case may be treated precisely as Cases I. and III. in the early part of this article. The vertical plate prevents the water overflowing the top of the grip, and therefore brings it under Cases I. and III. But as this case allows of making the cup very shallow, it will be interesting to give one example of it.

Example 7.—Let the cup be 12 inches deep, and the grip-plate project 6 inches above the top, as shown in fig. 12. Tank overflow level with top of grip. Pressures of three lifts, $4\frac{1}{2}$ inches, $2\frac{1}{2}$ inches, and $2\frac{1}{4}$ inches respectively.

Then proceed as in Case I. It is unnecessary to explain the process again, as the successive stages are indicated by the numbers on fig. 12. It will be seen that, although the cup is only 12 inches deep, the water-level G_4 rises above the lip of the cup F long before the water in C would fall to C_4 . Hence the cup cannot blow.

AXIOMS.

The following axioms apply to all cases, and should be borne in mind when working examples:—

1. $G T$ must always equal $E C$.
2. $W_1 W_2$ must always equal $T_1 T_2$.
3. Water in the tank (inside inner lift) is always at one level after the holder has once been fully inflated—viz., at a depth below the overflow equal to the pressure given by the gasholder when full. (The different levels shown in diagrams for W denote that the cup has sunk that much in the water; but the water itself remains stationary. It is shown thus to avoid multiplying diagrams.)
4. Gas space inside the cup and grip does not alter in volume—that is, the distance of G and C from the top of grip added together never varies.

NOTE.—Strictly speaking, 3 and 4 vary slightly; but the variations are so small that they have no appreciable effect; therefore they are treated as *nil*.

NOTES.

It will be noted that only what are usually termed “channel cups and grips” have been dealt with; whereas many gasholders are made with bent-plate cups and grips, very generally called “Piggott’s cups.” In such cases they may, for all practical purposes, be treated as if they were of the ordinary channel type, of equal depth. To allow for the curved form would introduce

tedious complications, which are not justified by the difference in results.

The width of the spaces $G C$ and E have been treated as equal throughout, whereas they sometimes vary. But this so rarely happens that it is scarcely necessary to give examples.

In conclusion, it should be stated that the author, in order to make the directions given of practical use and easily handled, has refrained from proving the accuracy of the directions laid down. To have introduced proofs at every successive stage would have increased the length of the article considerably, besides rendering it obscure, thereby defeating the object in view. For proof of the principles involved, reference may be made to a series of articles published in the “Gas World” in 1899. The author was associated with the writer of those articles (not a gas engineer) in their production, and ventures to assert that a more comprehensive and scientific demonstration of the theory of the action of gasholder cups has never been written. Earlier efforts may be mentioned, but they only touched the fringe of the subject, and only treated of isolated cases. Of these, the following may be noted:—

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| M. Arson | “Notes on French Practice in the Construction of Gasholder Tanks and Gasholders.” (Translated by Dr. Pole, F.R.S.) | “JOURNAL OF GAS LIGHTING,” Vol. XXIX., pp. 12, 49, 84, 121. Also King’s Treatise, pp. 191-193. |
| MM. Monnier and Thibaudet. | “A Study on Gasholder Construction.” | “JOURNAL OF GAS LIGHTING,” 1881, April 19, p. 656. |
| Various authors | Discussion on Gasholder Cups. Channel Cups versus Bent Plate Cups. | Correspondence in “JOURNAL OF GAS LIGHTING,” from March 5, 1889, to April 30, 1889. |
| W. E. McKay | “The Gasholder Cup in Practice and in Theory.” | “JOURNAL OF GAS LIGHTING,” Jan. 23, 1894, p. 150. Also “American Gas Journal” for Jan. 11, 1894. |

A GASHOLDER CONFLAGRATION:

A REMINISCENCE.

By WILLIAM KEY,

Formerly Manager of the Tradeston Gas-Works, Glasgow.

DURING the late seventies, we in Scotland were still diligently doing our best to maintain that impossible standard of 25 to 26 candle gas which was then considered necessary—employing every artifice, in “faking” the appliances and bringing up new batteries under every conceivable cover in order to meet, and be prepared to nullify as much as possible, the approaching onslaught of irresistible King “John”—otherwise “Jack Frost.” Regrets, when one was tempted to reckon up the number of hundreds of pounds value per week which had mysteriously disappeared by the subtle methods so ruthlessly enforced by his attacking powers, were utterly worthless; and one felt inclined to say that the gold might as well have been sent to the bottom of the Clyde. This thought—engendered by irritability at the futility of our defences—was, however, an error, knowing as we did that, to a considerable extent, the cash was recoverable during the months of summer; for by the end of September, on opening a manhole on a gasholder crown and examining the surface of the water within, every vestige of spirit had disappeared, and during the period of its evolution—say for six months—large sums for coals had been saved by carbonizing with a much inferior quality than would otherwise have been required.

It was during that winter of six months’ continuous frost, but very little snow, that the deposit of spirit from the high-priced coals which had to be used became so heavy that from within the holders it more than counterbalanced the weight of water on the outside; and occasionally, if the holder rose to its full height, quantities of spirit bubbled to the surface and were immediately taken up by, and frozen into, the ice from which it was scarcely possible to keep the lutes clear. This holder being the heaviest, its inlet was generally open; other holders being filled by drawing from it. Many men were engaged, both day and night, keeping the water-channels from becoming solid.

On one particular afternoon, the author found that the odour from spirit in the ice surrounding the holder was particularly strong, though there was not any appearance of spirit on the surface of the water; and, as a precaution, he personally awaited the arrival of the men who were to take over the duty of keeping the lutes clear during the night shift. The men were warned very particularly of the danger of having any artificial light; and each was personally instructed how to act. As the light from 3 inches of snow on the ground was quite enough for their purposes, they were told they required no other; and in this they agreed.

The author resided within 200 yards of the works, and had been asleep an hour when he was aroused by the furious ringing of the bell. On opening the door, a man, prostrated and fairly gasping for breath, was there, but unable to utter a word. His face, however, spoke volumes, and told enough. In a very few minutes the

author was out under a most brilliantly illuminated sky, and, turning a corner, came in full view of the holder, more than half full of gas (when full it would contain $1\frac{1}{2}$ million cubic feet), and completely enveloped in flames. Running towards it, and intercepting the men, who were tumbling heels over head over the walls into the roadway, he took them all back by the gate, and sent for more men from the night foreman and for dozens of empty sacks. Having wetted the sacks and collected the men at one point, the author started them to divide the flaming spirit, drive it right and left, and chase it along in opposite directions. In this they were successful; and the flame slowly diminished in height. Having succeeded in keeping one side clear, the originator of this furnace was dispatched to draw as much gas as possible from the holder into others, while the author, by means of the governor, put another inch of pressure on the street mains, and thus brought down the holder to a height of 30 feet or thereby.

Another danger, and what to the author seemed a most serious one, now commanded attention. Many great jets of gas were playing with a roaring force and noise upon the bases and the holder sides of all the cast-iron columns, which were becoming red hot. Sending for a barrowful of clay and some retort-patching tools, he had begun to master these jets when the Captain of the Fire Brigade arrived with several engines in the roadway adjoining, and, without a moment's delay, was busy unlimbering. The author, however, told the Captain that not a single jet of water would be allowed to play on the flames; and he was advised to return at once and be out of danger. He was also told that should he persist he would be held responsible for whatever happened afterwards. It was explained to him that the columns were red hot and made of cast iron, surmounted by heavy lattice wrought-iron girders, and should a jet of water be thrown on these, the whole framing would come down, and go through the crown of the holder, and probably put his own and his men's "lights" out. The engines were withdrawn; and the remainder of the flame was gradually extinguished.

On examination, it was found that some of the $\frac{3}{4}$ -inch rivet-holes in the sheeting behind the columns, for riveting it to the internal vertical bars, had not come properly opposite the corresponding holes in the bars, and, being against a blank surface, lead rivets had been moulded with snap-heads the same as those of iron, and made to rivet themselves against the bars on the inner side of the sheeting. These melting out allowed the jets of gas (under several inches of pressure) to play on the columns, and nearly caused the collapse of the whole guide-framing structure.

This conflagration was caused thus: The night attendant on the station meters, governors, &c., had not been informed of the author's instructions as to not using lights, seeing that he had nothing whatever to do with the men on the ice work. Noticing that they were working without a light, he obtained and lit a piece of thick tarred gaskin; and, bringing it forward, said: "Here, men, this will let you see better." Almost immediately a small flaming loose portion fell from the torch on to the ice, and a blue flame instantly flashed round the holder, gathering more power by increasing heat. It became yellow; and then, melting the ice in the tank and on the ground, the flames mounted up as high as the holder—40 feet or more in the air. The buckled sheeting had subsequently to be removed and replaced by new plates. The hair on the head of the comparatively young man (probably about thirty-five) who brought the torch, was of a dark hue on his going on duty that evening; on leaving next morning it was quite white.

A day or two later, the author designed his method of preventing gasholder tank water from freezing, by connecting 4-inch flow and return pipes to a low-level boiler, circulating warm water right round the tank, at a cost in mid-winter of 2s. 6d. per week for coke and attendance. The lutes were afterwards fitted with steam circulators.

These shapely gasholder excrescences on the globe's surface are, when full of gas, in themselves absolutely safe from explosion.

Separation of Tar from Gases.—In a recent number of the "Journal of the Society of Chemical Industry," abstracts were given of two specifications of French patents for methods of separating tar from gases. The first was taken out by the Société C. Menzel. The scrubber employed comprises a vertical cylindrical casing divided into superposed compartments by a series of conical partitions; the angle of the cone being about 120° . The partitions are perforated with rectangular openings, about 8 mm. by 2 mm.; the metal being cut along three sides of the rectangle and then bent back so as to form a blade or wing. Immediately above each of the partitions is a similar perforated plate mounted on a central spindle and rapidly rotated. The rotation may be effected by the pressure of the gases against the blades on the perforated plates. The lowest of the rotating plates may have a cylindrical extension with turbine-blades adjacent to a jet in the casing. Means are provided for adjusting the rotating spindle vertically, so as to regulate the distance between the fixed and rotating plates. The several compartments have drain-pipes for the separated liquor. The second patent was taken out by Dr. C. Otto and Co., whose process consists in washing the gas with tar or gas liquor, the temperature of which is not allowed to exceed 80°C . The gas may be cooled before washing, so that the stated temperature cannot be exceeded, or the desired limitation of temperature may be effected by using a sufficient quantity of tar or liquor; or liquor may be added as required.

GAS-WORKS EXTENSIONS AT KILMARNOCK.

The formal inauguration ceremony in connection with extensive additions to the Kilmarnock Gas-Works took place on Saturday, the 26th ult. An invited company of about 140, which included a considerable number of gas managers, assembled at the new Riverside Gas-Works, where they were received by Provost R. Gemmill and Bailie Robert Muir, the Convener of the Gas Committee. Thereafter Mr. C. Fairweather, son of and Joint Manager with Mr. W. Fairweather, conducted the party round the works.

The works at Riverside were opened in 1904. They have, from time to time, been considerably enlarged since then. Perhaps the most prominent addition has been the introduction of an elevated railway, which it was necessary to carry across the River Irvine by a bridge, and for which, also, a large amount of banking was required. The railway, however, is not confined to the service of the gas-works, as, after it has passed through the retort-house, it is carried forward into the Corporation electricity works, which adjoin. Since 1904, the Corporation have closed the old works in Langland Street as a manufacturing centre, and have removed to Riverside considerable portions of the plant, consisting of condensers, purifiers, exhausters, storage tanks, pumps, and machinery. In the works at Riverside, as originally constructed, the retort-bench contained four arches, with settings of sevens, back to back. These have been converted by Messrs. R. Dempster and Sons, Limited, of Elland, into throughs, with a single furnace on the discharging side. There have been added to the bench four new beds of nines, 22 in. by 16 in. by 19 ft. 6 in., throughs, with a single furnace per through arch. The settings are Brooke's patent, of the deep regenerator type, the distinguishing points of which are the particular subdivision of the regenerators, combined with an extra large heating surface for the preheating of the secondary air, the outcome of which is that the setting works with an exceptionally small draught. Each through retort has been fitted with a single 8-inch ascension pipe, placed on the furnace side, so that the men and the stoking machine do not interfere with one another when auguring pipes. The hydraulic mains are of the open lute type. The seal is regulated by a tar-tower, so as to secure a liquor seal; and the foul main is fitted with an 8-inch retort-house governor, so that the seal and vacuum in the hydraulics are kept at a steady minimum. The hot coke on being discharged is delivered, through shoots arranged in the discharging floor, direct into Belton's patent hot-coke trucks, supplied by Messrs. Dempster. The trucks are all fitted with anti-friction bearings, so that one man can handle the coke from a heavy charge without undue exertion. The plant has been working for about six months, with an all-round advantage, in an increased yield of gas, tar, ammonia, and coke, from the same coal as hitherto used, and with a reduced cost of production.

The charging and discharging machinery is electrically driven; but instead of an array of electric motors, only one is installed, and the power is led away by friction clutches to the several motions of the machine. Thus the electric equipment is cut down to the very minimum, which is a feature of paramount importance in small gas-works. The friction clutches are interchangeable, as are the gear wheels, pedestals, &c.; so that one spare wheel will fit into a dozen places. The charging-machine is Toogood's patent, and is of the slow running type; 80 revolutions per minute only being required—the wear and tear being thereby reduced to a minimum. The positive nature of the machine enables it to pack the coal during charging, thereby facilitating the work of the discharger, and incidentally improving the coke from the Scotch coal used. It is a prevalent opinion that it is impracticable to discharge the coke resulting from Scotch coal from horizontal retorts by means of a pusher discharging machine; but it has been found that if the coal be well packed by the machine charger, and the pusher discharger has a steady acceleration of speed, it is possible to deal with 90 per cent. of Scotch coal, and the remaining 10 per cent. also, if it is judiciously mixed. The pusher discharging machine is on the Dempster and Ordish patent, and consists of two telescopic sections only.

The special feature of the machine is that it retains all the advantages of the cooling effect of hydraulics, but omits the difficulty of keeping a tight joint against water pressure in the hot retort. In action, the ram is always full of water, free from pressure, and open to the atmosphere; and a perfectly steady and uniform motion is imparted to both sections of the ram simultaneously, by a unique arrangement of wire ropes, so that both sections work as one and no shock is given to the charge of coke. In fact, the ram appears to float in and out of the retort, so elastic is its motion. Should a charge buckle, however, no damage can result to the ram or to the retort, as the friction clutch slips, and thus acts as a safety escape for the surplus energy. The stoking machine takes its supply of coal from overhead hoppers, by means of a semi-automatic device, which is simple, inexpensive, and reliable, and is such that the stoker can take coal from his position on the machine platform. The overhead hoppers have a capacity of 100 tons storage of coal, and are fed by a distributing push-plate conveyor arranged above the main tie of the roof principals, driven from the head of the existing elevator, which, in turn, is driven by a steam-engine in the breaker pit.

Besides the work which has been accomplished in the retort-house, the Corporation have built a handsome suite of offices at the entrance gate, and inside the yard extensive ranges of work-

shops for blacksmiths, tinsmiths, fitters, &c. There is also a sulphate-house, into which an installation of Wilton's patent plant has been fitted. The total cost of the works to date has been £60,000; the later additions having cost about £13,000. All the work has been done to plans prepared by the Messrs. Fairweather. Contracts have been entered into for the provision of elevating plant for the delivery of coke from the yard into railway waggons.

After the inspection, tea was served in an upper room which is intended for use in connection with the gas-stove department; and a toast list was gone through.

Provost GEMMILL proposed "The Gas Undertaking." He said it was now nearly forty years since the Corporation took over the gas undertaking, paying £45,000 for it. The annual make of gas was then about 30 million cubic feet; now they had an annual output of 173 millions. He thought the success of the undertaking had been due to the way in which it had been managed by the Corporation. They were all aware that Messrs. Fairweather were men who took quite an enthusiastic interest in their work, and that they had left no stone unturned to make the undertaking a success. Another element had leaned towards success—that was the harmonious manner in which the whole work went on. The workmen, to a man, were loyal to the gas undertaking, and did their work in a thoroughly conscientious manner. Perhaps he ought to mention that they had always had very able conveners, and very able gas committees. He had never been aware of any occasion upon which their Gas Managers had made any request for funds with which to proceed with improvements, but that the Gas Committee, after careful consideration, had seen fit to grant the request. They must all recognize that the relationship of gas to public health was very clear indeed. Public authorities were concentrating their attention towards the improvement of the public health. It was felt that they must have a purer atmosphere. They would have observed that in Glasgow a crusade had been started in favour of purer air. They could only have this by inducing householders to use gas for domestic purposes. They knew that the cheaper the gas the more of it was consumed; and the object of the extensions they had seen that day was to enable them to provide gas at a cheaper rate than they had hitherto been able to do. He was convinced that they would be able to supply gas at an early date at 2s. per 1000 cubic feet.

Baillie R. MUIR, the Convener of the Gas Committee, in acknowledging the toast, said that a gas company was formed in Kilmarnock in 1822, by a few prominent and enterprising gentlemen. They had by no means an encouraging reception, because all over the country there was very great fear with regard to being near gas-works. In fact, so much was this the case that in some of the early concerns they were not allowed to lay their pipes near to public buildings. At that time there was a very worthy Baillie in Kilmarnock, who was a far-seeing man. In fact, previous to the Gas Company being started, he had erected a small gas concern of his own, and used it in connection with his workshops. This gentleman invited the new Company to come to Morton Place, near to where his workshops were, where there was plenty of open space. The result was that they placed the old gas-works in the highest part of the town. When Baillie Morton's attention was called to this in later years, he confessed that they had made a mistake, because at that time it was thought that the higher the gas-works were placed, the better it would be, because the gas would run down. The Company started with a capital of £4000. It was a comparatively small beginning. The population of Kilmarnock then would not be more than half what it was now. At that time consumers had the option of taking gas either by meter or at so much per burner. The price by meter was 13s. 6d. per 1000 cubic feet; by burner, 10s. per annum. The burner was a cockspur burner, and it had to be put out at 10 o'clock at night. But the people used to close their shutters, and go on using gas after that hour; and there was so much friction, that latterly the supply of gas per burner was abolished and meters were alone used. When, in 1871, the Corporation took over the gas undertaking, the price of £45,000 which they paid worked out at £1500 per million cubic feet. This was a very stiff price. In 1871, the price of gas was 5s. per 1000 cubic feet. As time went on, the Corporation, he might say, rebuilt the old works. Not only were the works rebuilt, but he could not say how many miles of pipes were laid through the streets. All the expenditure for this had come out of revenue; and the result was that the whole of the borrowed money in connection with the old works was now reduced to about £13,000. For the new works, they had bought 16 acres of land, paying about £400 per acre for it. The cost of erecting the works had been some £60,000; so that the whole debt on the works now was about £75,000. According to the make of gas, their works now stood at the figure of something like £420 per million. All the extensions to works, in both the old and the new works, had been planned and engineered by Messrs. Fairweather. They had never had to employ either an architect or a gas engineer to do a single thing in connection with the extensions. There were two reasons for removing the works to the new site. In the first place, they were hemmed in on every side, and had no room for extensions; and, in the second place, the works were very badly situated, being so high. The new works were in the lowest part of the town; and they had a good supply of water, which was a great saving in the manufacture of gas.

Dean of Guild SMITH having proposed "The Contractors,"

Mr. E. J. KING, of Messrs. Robert Dempster and Sons, Limited, in replying, said that their contract was entered into last March, both for the new bench and the re-modelling of the existing bench. It had been completed for some time, and Mr. Fairweather had told him that since the installation had been at work the make of gas had increased by 400 or 500 cubic feet per ton of coal carbonized, which was certainly very satisfactory indeed, as it was testimony to the economy of the producer, and also that 1400 or 1500 tons more coke had been sold this year; thus showing how economical the new furnace was over the previous one. He thought that the results obtained fully justified the expenditure that had been incurred; and he sincerely hoped, as one of the Contractors, that the installation would continue to do excellent work, to the advantage of the Corporation of Kilmarnock.

Mr. G. MORISON proposed "The Managers." They knew, he said, that in Mr. Fairweather they had one of the ablest Managers in Scotland; and in his son they had a replica of their Senior Manager, who was keeping up the reputation of the name in a way that they must all appreciate.

Mr. C. FAIRWEATHER, in the course of his reply, said that the first sod of the new gas-works was cut on April 10, 1902; and the works were inaugurated on May 10, 1904. The Town Council then began to take into consideration for what length of time they would retain the old works in operation. They thought it would be better to remove them slowly, both for reasons of convenience and also for reasons of finance. The railway, as a first step in the process, was brought into use on Oct. 17, 1906, and then three years were fixed as the period within which the complete translation of the works was to take place. This had been accomplished; and now they had a complete works at Riverside. There had been a great deal of work in connection with the complete translation; but the whole of the contractors who were chosen by the Gas Committee had carried through their work thoroughly and well. As to the working of the plant, the class of coal they obtained was a very difficult one to deal with. In fact, with some of the coal in the district it was more like trying to discharge a retort filled with slates than with coal; and the result was that the machinery was very severely strained. But he thought it said a great deal for the machinery supplied by Messrs. Dempster that it did this work. He believed that, with a careful selection of coal, it would be found to work very satisfactorily in the coming season. As Managers, they did not think that the gas undertaking in Kilmarnock was quite dead. They had had a good many of their consumers taken away by the electric light, which was only natural; but they had more work to do now than they ever had. At the present time the output of gas was 10 million cubic feet more than it was in the corresponding period of last year.

Rev. W. DUNNETT, in proposing "The Chairman," said they ought to be very pleased that the discovery of gas for lighting purposes was made by an Ayrshire man. It was only a matter of about 120 years since the first use of gas for lighting purposes was made by William Murdoch, in lighting his own house; and they had that day seen the latest height of improvement and development at present attainable. They were indebted for these developments and improvements to the liberal-mindedness and spirit of enlightenment of those who were charged with the public interests of large communities such as theirs.

SIMPLE SETTING OF VERTICAL RETORTS.

IN addition to the installation of vertical retorts on the Dessau system now approaching completion at the Sassafras Point Station of the Providence (R.I.) Gas Company, referred to in the last number of the "JOURNAL," one on a system designed by the Gas Bench Construction Company, of St. Louis, which is stated to be specially suitable for small or medium-sized works, being simple and easy of operation, has been put up at Columbia, Missouri. According to some particulars in "Progressive Age," it consists of two benches of fours, with one generator or producer, so arranged that the gases can be directed to all eight retorts or to only four, as may be required. The recuperators are built in two banks, one on either side of the producer, each bank having divided secondary air. The retorts are 10 ft. 6 in. long, will hold a charge of 1000 lbs. of coal, and can be operated with eight, ten, or twelve hour charges. At present, the longest period is preferred. It is stated that the heats are very uniform throughout the length of the retort, and are easily controlled. The fuel consumption runs about 15 lbs. per 100 lbs. of coal carbonized; but it would be reduced if all of the retorts, instead of only four, were worked.

The scheme of handling the coal and coke in connection with these benches of retorts was worked out by Mr. Sylvester Watts, the owner of the Columbia works, and is as follows: The coal is drawn from the store in a "sulky"—a skeleton frame made to receive the coal-bucket. The bucket is raised by a small electric hoist to a trolley arranged over the retorts and furnaces; and, by means of a flap, the coal is discharged into the retort. The sulky is then put under the discharging end of the retorts with another bucket, into which the coke is drawn. The coke drops from the retorts instantly when the lower mouthpiece lids are opened. These are operated by a system of levers by the man standing in front of the bench; and he is not required to go under it. The lids are self-sealing, and are provided with wearing shields, to protect them from the wear of the discharging coke. The sulky, with the coke-bucket, is then withdrawn from under the bench, and is quenched under a shoot. The bucket is then lifted from the sulky by the electric hoist, and is carried on a trolley over the furnace, and the coke discharged thereinto; or, if not required for fuel, the bucket is carried on the trolley over the yard and emptied on the coke heap. The furnace is filled every twelve hours, and requires clinkering only once a week; but it is stated that, owing to the low temperature at which the furnace operates, there are practically no clinkers in the furnace.

The constructors of this bench of vertical retorts claim that it produces from 6 to 8 per cent. more gas per pound of coal than do the horizontal benches in the same works. The quality of the coke is very much better than that from the horizontals, being very dense and hard, and resembling in texture that produced by bee-hive coke-ovens. There is practically no breeze or waste. Among other features claimed for these retorts are that there is no naphthalene produced, that there are no stopped ascension-pipes, and that the quality of the tar is very much better than that produced by the horizontal retorts—being more in the nature of an oil free from lampblack.

HERRING'S VERTICAL RETORTS.

Last week, the Patent Office issued the specification left on Sept. 4 last in connection with an application made on March 5 (No. 5362) by Mr. W. R. Herring, of Edinburgh, for a patent for "Improvements in, or Connected with, Retorts for Use in Carbonizing or Otherwise Treating Minerals and the Like—Particularly Adapted for Use in the Recovery of Gaseous, Volatile, and Other Products."

In the introduction to his specification, Mr. Herring remarks :

For the purpose of carbonizing minerals, it has been proposed to use retorts arranged vertically or inclined to such a degree that their contained charges tend to gravitate downwards. In practice, retorts of this character are worked fully charged ; provision being made for feeding material into the head and withdrawing

Fig.1.

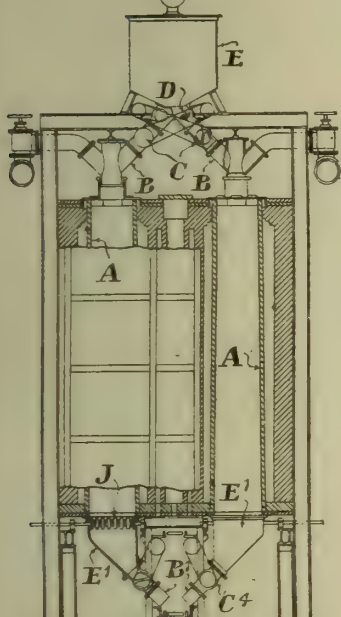


Fig.2.

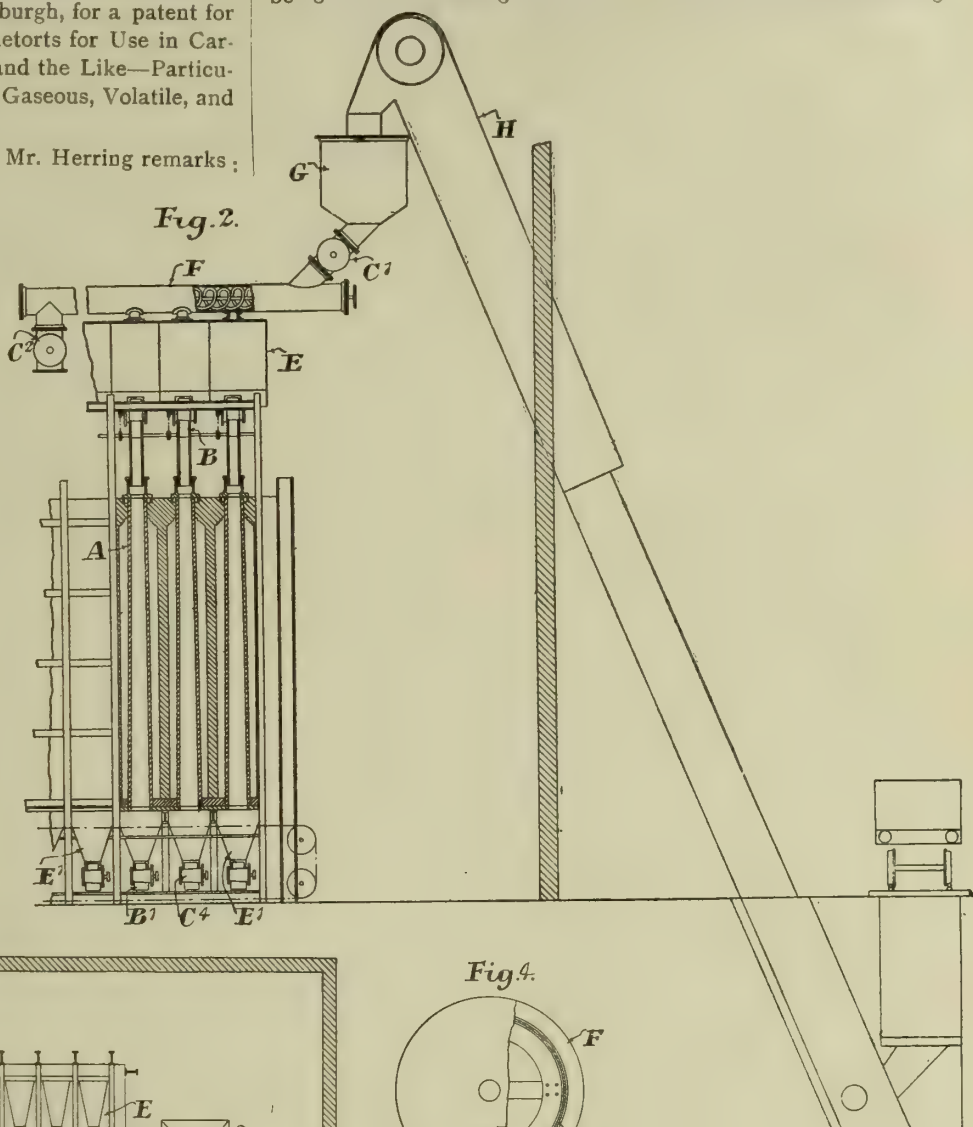


Fig.3.

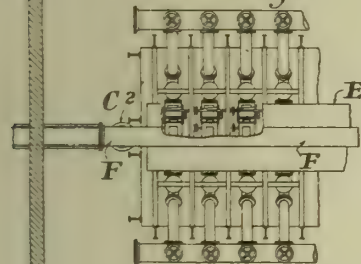


Fig.6.

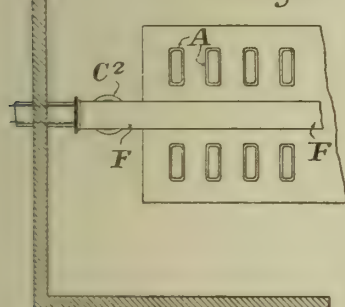


Fig.4.

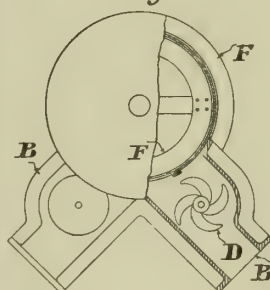
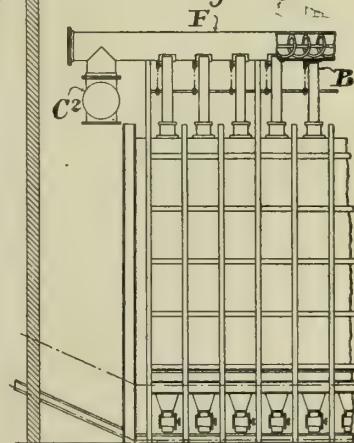


Fig.5.



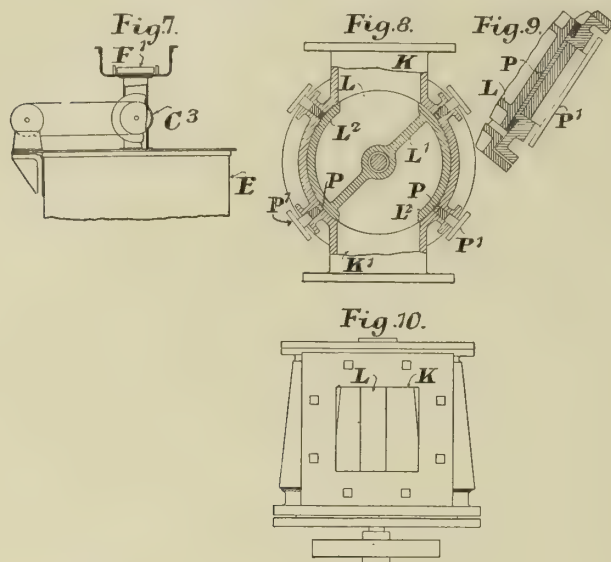
the carbonized material from the foot—permanent closure means being provided, which enable the feed and discharge to be effected without permitting air to enter or volatile products of distillation to escape. It has also been proposed to withdraw the products of distillation by means of an exhauster—a reduced pressure being thereby produced within the retort. Further, for the purpose of supporting a charge of shale or other oil-yielding mineral within a retort, and for withdrawing refuse, it has been proposed to provide two rotary shafts, positioned directly beneath the body of the charge, furnished with radial arms; the inner arms of the two shafts overlapping one another, and the outer ones extending towards the inner side faces of the base of the retort. The object of this invention, which relates to improvements in, or connected with, feeding and discharging apparatus for gravita-

tion retorts of the closed type (particularly adapted for use under working conditions involving a vacuum or comparatively low internal pressure), is to provide means for maintaining a permanent dry seal or closure at the head and base of the retort, associated with apparatus for regulating the supply of material to the closure device at the head of the retort, and means for supporting the charge within the retort at the base.

Fig. 1 is a cross sectional view, fig. 2 is a sectional side elevation, and fig. 3 shows, in sectional plan views, a battery of retorts. Fig. 4 is a cross sectional view of a conveyor. Fig. 5 is a part sectional elevation, and fig. 6 shows, in part sectional plan views, a battery of retorts and modified form of conveyor. Fig. 7 is a cross sectional view of a hopper furnished with a conveyor and closed apparatus. Fig. 8 is a cross sectional view, fig. 9 is a

longitudinal section of a part, and fig. 10 is a plan of the closure apparatus.

The head of the retort A is provided with a delivery shoot B comprising the closure apparatus C, which is adapted to maintain the shoot sealed while permitting material to pass through it, associated with feed-controlling apparatus D for regulating the supply of material in accordance with the capacity of the closure apparatus. For supplying material to retorts arranged in pairs (as figs. 1, 2, and 3), a hopper E may be employed having its base



connected to the head of two delivery shoots B provided for serving the retorts; or (as figs. 4, 5, and 6) a conveyor F, of the helical type, may be arranged to deliver its supply direct into the shoots. In some cases, a sealed hopper, or sealed conveyor, may be employed deriving a supply of material through a supply way comprising closure apparatus, associated, if necessary, with feed-controlling apparatus. For example, a conveyor F (fig. 4) may be fitted to a battery of retorts (as figs. 5 and 6) and (as fig. 2) be furnished with feed closure apparatus C¹ at its head, and with discharge closure apparatus C² at its terminal end; the latter being provided in order to permit any excess of material which may be conveyed beyond the shoots B to be discharged without affecting the sealing. Or a sealed conveyor of this description may be associated with a series of hoppers E (as figs. 2 and 3), or (as fig. 7) the supply way of a hopper E may be furnished with closure apparatus C³ associated with a sealed conveyor, or be provided with an open conveyor F¹ of the chain scraper bar type. For delivering material to a conveyor (as fig. 2), a main supply hopper G may be provided in conjunction with an elevator H.

In the construction of closure apparatus illustrated in figs. 8, 9, and 10, a casing is provided having an upper port K and a lower port K¹, constituting tubular extensions of the casing, arranged to form part of a delivery or discharge shoot. The casing is fitted with a hollow cylindrical valve L, divided into pockets and with mouths which, in the rotation of the valve, are adapted to be presented to the upper port K for charging and to the lower port K¹ for discharging; the body of the valve cutting off connection between the upper and the lower part of the shoot. The valve L is interiorly divided by a diaphragm L¹, which extends across the interior and is formed with peripheral portions L², which extend from opposite faces of the diaphragm arranged to project in the direction of rotation.

With the object of reducing leakage, provision is made for automatically compensating for wear. For example, the casing and the body of the valve may be correspondingly tapered, and means be introduced tending to force the valve into its seating, which may conveniently comprise springs located between a cover and the head of the valve (the force of the springs being regulated by adjusting the cover); or springs may be located between a ring and the head of the valve—the ring being made capable of adjustment by providing a sliding sleeve for regulating the force exerted. As illustrated in figs. 8 and 9, longitudinal packing-pieces P are provided, arranged to be kept in peripheral contact with the valve by a longitudinal gland P¹, or the packing may be carried by the valve, and be kept in contact with the casing by a longitudinal gland. By providing the casing of a valve with longitudinal packing-pieces in this manner, the path on the periphery of the valve swept by the ports may be recessed so that a clearance is produced between the valve and the surrounding casing; the longitudinal packing strips closing the annular passage so produced.

The feed controller (fig. 1) consists of a rotary toothed wheel D arranged in, or adjacent to, the head of the shoot and located at a distance above the closure apparatus C to be fed, adapted when at rest to check the flow of material, and when rotated to permit material to flow at a rate regulated by the speed of rotation of the controller, for which purpose the controller and closure apparatus may be geared to work together.

The means for supporting the charge within the retort and withdrawing carbonized material comprise two rotary shafts (having

radial arms of material length) positioned approximately beneath the side faces of the retort, and having complementary arms arranged in radial pairs adapted to be set so as to extend laterally across the bottom of the retort, so that presented arms extending between the two shafts form a support for the central part of the charge, and, when rotated in opposite directions so that the arms in the upper path of travel move towards one another, descend with the part of the charge supported on their surface—the following pair of arms in passing into the horizontal position closing the central passage temporarily opened by the receding arms, and in operation act upon, and break up, the material enclosed between the advancing arms, the size to which the material is broken being capable of regulation according to the position, size, and number of arms with which the shafts are provided.

The patentee's claims are: 1. A retort having a delivery shoot at its head, comprising permanent dry closure apparatus associated with means for controlling the feed to the closure apparatus, the foot of the retort being provided with a hopper having a discharge shoot fitted with permanent closure apparatus associated with a supporting base. 2. A retort furnished with a feed hopper or conveyor. 3. A retort furnished with a sealed feed hopper or sealed conveyor. 4. Apparatus characterized by the closure apparatus comprising a casing having an upper port and a lower port constituting tubular extensions of the casing and fitted with a hollow rotary valve divided into pockets; the casing and body of the valve, or the ends, being correspondingly tapered, in conjunction with springs tending to force the valve into its seating for automatically compensating for wear. 5. Apparatus characterized by the feed controller comprising a rotary toothed wheel arranged in, or adjacent to, the head of a delivery shoot. 6. Apparatus characterized by the supporting base comprising two shafts, positioned approximately beneath the side faces of the retort, furnished with radial arms adapted to be presented in radial pairs extending laterally across the base of the retort.

VERTICAL RETORTS & CHAMBERS IN GERMANY.

A Bradford Report.

A Sub-Committee of the Gas Committee of the Bradford Corporation, who recently visited several of the most important works in Germany where vertical retorts and chamber settings are in operation, have presented the following report on the matter to the Gas Committee. The report is signed by the Chairman of the Gas Committee, Mr. Horace Geldard.

Introduction.

During recent years, the attention of those responsible for the administration of gas undertakings has been increasingly given to the study and improvement of the methods of carbonization of coal, which is, and must always of necessity be, the most important section, economically considered, of their business. For many years, while gas enjoyed practically a monopoly of lighting and heating, horizontal retorts were almost universally adopted; being charged by hand with either shovel or scoop. The various competitors that gas had to contend with, and the necessity for cheaper production, led to the introduction of machinery for charging and drawing the retorts, as well as for conveying the hot coke away to the coke-yards. Retorts placed at an angle of about 40° have been adopted in many works; but having many drawbacks when coals with varying physical properties have to be used, they have not been universally approved.

For some time past, gas engineers in Germany have been developing the use of vertical retorts and chamber carbonizing settings with excellent results. The earlier difficulties—such as irregular heating and the leakage caused by the failure of the brickwork to withstand the more intense heats required—appear to have been practically overcome. Both of these systems are now rapidly extending throughout Germany. In other parts of the Continent, various installations have been visited and examined by gas engineers and directors from all the important towns in this country.

In view of the extensions and reconstructions of some of the Bradford Gas-Works which must be carried out in the near future, it was decided that the Sub-Committee should visit several of the most important works in Germany where the new systems of carbonization were in operation. Opportunity was taken at the same time to inspect different types of improved street lighting.

Dessau Vertical Retorts at Berlin.

By the courtesy of the Directors and Engineers of the Imperial Continental Gas Association, who own several of the Berlin Gas-Works, we visited the principal works—Oberspree, Mariendorf, Holzmarktstrasse, and Weissensee. We were afforded every facility for examining the plant and working arrangements.

In 1907, the Imperial Continental Gas Association erected 216 vertical retorts at their Oberspree and Mariendorf works, and 168 more in 1908; also 98 at their Weissensee and Holzmarktstrasse works. Nearly all these were in operation at the time of our visit; and we were informed that no more horizontal retorts would be erected by the Association.

The retorts, which taper from 22 in. by 9 in. at the top to 27 in.

by 14 in. at the bottom, are fixed twelve in a setting heated by one producer furnace. They are 16 ft. 6 in. high; the total height of the bench from the floor level being about 25 feet, and the width 17 feet. The coal is emptied from railway trucks into hoppers below the ground, and is then elevated and conveyed mechanically into bunkers placed above the retort-benches. The coal for charging is then allowed to fall from the overhead bunkers into light measuring chambers running on overhead rails. These are easily pulled along over the particular retort to be charged.

The operations of emptying and charging the retorts were very simple and easy. The hot coke was discharged through counter-balanced gas-tight doors at the bottom, which were opened by simply pulling a lever and turning a handle. The coke then dropped down a shoot on to a conveyor at the side of the bench, and after passing under a water shower was carried to the elevators and coke-heaps outside in the yards. A small quantity (about 30 lbs.) of breeze was first dropped into the retort to take up some of the tar settling at the bottom. This breeze, after a second carbonization, became good coke. One movement of a lever then allowed the measured charge of 11½ to 12 cwt. of small coal to fall into the retort. A mixture of Durham and Silesian coal—which is much inferior to the average Yorkshire coal—was being used.

The retorts were easily drawn and charged by two men, one above and one below, at the rate of 45 seconds each. The charges in the retorts were being carbonized for ten hours in the ordinary way, after which a small quantity of steam was passed into the coke for two hours, producing a certain amount of water gas, at the same time expelling the last traces of the volatile hydrocarbon gases still remaining in the retort.

We were much impressed by the small number of men employed in the retort-houses. The furnaces are large, and capable of running for six to eight hours without attention. The other work was arranged so that all the drawing and charging of retorts could be done during 16 out of the 24 hours. Two shifts of men of eight hours each were therefore only necessary in the retort-houses. We are agreed that the manual work itself was much easier than with our ordinary hand stoking.

The actual production of gas per man employed in the retort-houses varied from 270,000 to 310,000 cubic feet per shift. In Bradford, it is less than 25,000 feet with hand stoking at Valley Road, and under 33,000 feet with machine stoking at Birkshall.

The retort-houses were clean, well ventilated, and lofty. Vertical retorts do not require such substantial and expensive buildings as are usually found in this country.

The average production of gas per ton of coal when using steam was 13,700 cubic feet of 11¼-candle power, or without steam 11,300 cubic feet of gas of 15½-candle power. In Bradford, with better coal, we only obtain 10,230 cubic feet of 17-candle gas.

In Berlin, a low-power gas is all that is required, as practically all gas lighting is incandescent; flat-flames being seldom seen. It being, therefore, more economical, 10-candle gas is supplied; and the city is admittedly the best lighted in the world.

The coke made in the verticals was harder, larger, and of better quality; while the quantity was greater owing to the small proportion of breeze produced. The tar was thinner, and of better value. There was also an increase in the quantity of ammonia produced. Another important advantage was the almost entire absence of naphthalene, which is a source of much trouble in most gas-works.

The total cost of all the retort-house labour on the verticals was stated by the engineers to be less than 5d. per ton of coal carbonized. Even this figure would be reduced when more settings are in operation. This cost in Bradford is 2s. 8-98d., or more than six times as much.

At one of the Berlin works, where just half the old horizontal retorts had been replaced by verticals, both sections of approximately equal gas-producing capacity were at work. Seventeen men in all were employed on the horizontals, and two men on the verticals.

The heating of the retorts appeared very good and regular; and the work generally seemed to be carried on with ease and comfort. During the short time occupied in charging the retorts, there was certainly a quantity of smoke and coal dust on the top of the benches; but much of this was evidently due to the German coal, which is much dirtier than Yorkshire coal.

Dessau Vertical Retorts at Cologne.

At Cologne, we visited the Ehrenfeld Gas-Works, where 240 vertical retorts of the Dessau type were in use. The general arrangements were very similar to those in Berlin.

At these works, the Director informed us that the results obtained from the verticals were so much better than could be got from horizontals, that they intended to pull down a retort-house containing nearly new benches of horizontal retorts.

Munich Chamber-Settings.

At Munich, we made a very thorough examination of the chamber-settings at the old gas-works at Kirchstein, also at the magnificent new works at Moosach. We were conducted over the works by the Director, the Engineer, and the London representative of the Munich Chamber Syndicate.

At Kirchstein, there were five settings containing fifteen chambers altogether. These had been at work for three years, and appeared to be still in excellent condition. Each of these chambers was charged with 3½ tons of coal. The charging was very rapid—only taking 40 seconds. The whole of the heavy

work was done mechanically; and all the men had to do was to open doors, push along the travelling shoots, pull the levers, and allow the measured quantity of coal to fall into the chamber.

The charge of coal during the carbonizing period of 24 hours was kept in the chamber by means of heavy counterbalanced gas-tight doors placed vertically at the bottom of the chambers. These were opened mechanically, when the 2 tons of coke fell out into a large cooling tower. The chief purpose of this was for conducting the large volume of steam above the level of the buildings. The coke, after slaking, passed into a semicircular trough running the length of the installation, from which it was picked up by a travelling crane and placed where required in the yard or hoppers for filling carts or waggons. The coke produced was hard, bright, and of excellent appearance. It would certainly fetch a higher price for manufacturing purposes than our ordinary soft coke, but might not prove quite as suitable for domestic use.

In the new works at Moosach, the chambers are larger; taking a charge of 6½ tons of coal each, or 19½ tons per setting. They are 28 ft. 6 in. long, 7 ft. 6 in. high, and 22 to 24 inches wide. The inclination of the bottom is about 36° with the horizontal. The ease with which the whole of the operations at the Munich Gas-Works were carried out was very striking.

All the charging and discharging was done during the daytime; only firemen being needed at night to feed the producer furnaces with coke. The amount of labour required was very little, and therefore the cost was low—being less than 4d. per ton of coal used, as against our cost of eight times this figure. The heat of the chambers was good and regular, the tar thin, and no trouble appears to be caused by pitch, naphthalene, or choked pipes.

The yield of gas with German coal was from 12,000 to 12,500 cubic feet of about 12-candle gas; but tests made in similar chambers at Hamburg with Durham coal gave 12,400 cubic feet of 580 B.Th.U. calorific power—or about 16-candle power.

Both the vertical retorts and chamber-settings have been subjected to exhaustive trials by a Committee of the German Association of Gas and Water Engineers.

Work being Done in this Country.

The rapid advance which has been made with vertical retorts and chambers, and the excellent working results obtained, together with the fact that the system is being extended in almost every gas-works where it has been tried, furnished sufficient reasons to warrant us in believing that very large economies would certainly result from adopting the process in Bradford.

We desire to point out that there are several other systems being developed in England and Scotland at the present time—notably the Woodall-Duckham process of continuous carbonization now working at Bournemouth, London, Burnley, &c.; and the Glover-West system (also continuous) in use at St. Helens.

The working results of these systems are very good; 12,400 cubic feet of 16-candle gas per ton of unscreened Yorkshire coal being obtained by Dr. Colman at St. Helens, while 14,000 feet of 14-candle gas have been produced at Bournemouth from mixed Somerset and Yorkshire coal.

An important advantage in both of the continuous processes is that one quality of gas can be uniformly maintained; while with chambers working 24-hour charges we should be obliged to make provision for the varying qualities getting properly mixed. Another advantage is that very little smoke is given off—an important feature in a town gas-works. The St. Helens plant also takes up less ground space for the same production of gas than any other system.

The Dessau installation at Sunderland has already been at work for several months. It is very successful; producing from Durham coal 12,000 feet of 17½-candle gas (calorific power equal to 568 B.Th.U.), with eleven-hour charges, and no steaming.

The Dessau Company have introduced improvements during the last two months at Mariendorf. The three retorts in a row are charged together by one operation; a divided shoot being used. The gas now made per man per shift when working English coal is 388,000 cubic feet; and the cost of carbonizing wages only amounts to 0-18d. per 1000 cubic feet.

Working Results Compared.

For the purpose of comparison, the working results obtained with the various installations, as well as our latest Bradford figures, are tabulated.

| Type of Setting. | Gas per Ton, Cubic Feet. | Candle Power. | Coal per Charge, Cwt. | Time in Charging, Seconds. | Gas made per Man per Shift, Thou-sands. | Wages per Ton of Coal, Pence. |
|-------------------------------|--------------------------|---------------|-----------------------|----------------------------|---|-------------------------------|
| Bradford hand stoked | 10,440 | 17 | 2½ | 120 | 25 | 35 51 |
| Bradford machine | 10,622 | 17 | 3 | 45 | 33 | 27-81 |
| Munich chambers | 12,300 | 12 | 65 | 40 | — | 4-0 |
| new | — | — | 130 | — | — | — |
| Berlin verticals | 11,300 | 15½ | 11½ | 30 | 285 | 5-0 |
| new | 13,430 | 10 | 21½ | — | 388 | 2-5 |
| Sunderland verticals | 12,028 | 17½ | 9 | — | — | — |
| St. Helens (Glover-West) | 12,400 | 16 | 60 per day | — | 290 | 2-75 |
| Bournemouth (Woodall-Duckham) | 14,000 | 14 | 50 per day | — | — | — |

NOTE.—Different classes of coal are used in the different installations. The total value of the residuals produced per ton of coal by the vertical retorts or chambers is greater than by our system of working horizontals.

Conclusions.

It is impossible to say what the cost of wear and tear of vertical retorts would be; but as some of those in Berlin have already been working longer than the average life of our Bradford retorts, with very little having to be spent on them for repairs, it seems probable that the cost would not be serious. As the machinery is simpler, the cost of maintenance should be less than that of the machinery for the ordinary horizontal types.

As to capital cost, this would depend largely upon the site available, and the size of the installation; but there is not the slightest doubt that, if we decide to have a plant erected in place of some of the existing retorts at the Valley Road or Thornton Road works, the improved results obtained would show a large saving to the Corporation after paying all charges of interest and sinking fund.

The Sub-Committee, being anxious to have the best system, are not yet prepared to advise as to which one should be adopted; but in view of the great importance of the matter, they strongly recommend that the whole of the Gas Committee should visit the various installations working in this country at Sunderland, St. Helens, Bournemouth, and Kensal Green, as early as possible.

Berlin Street Lighting.

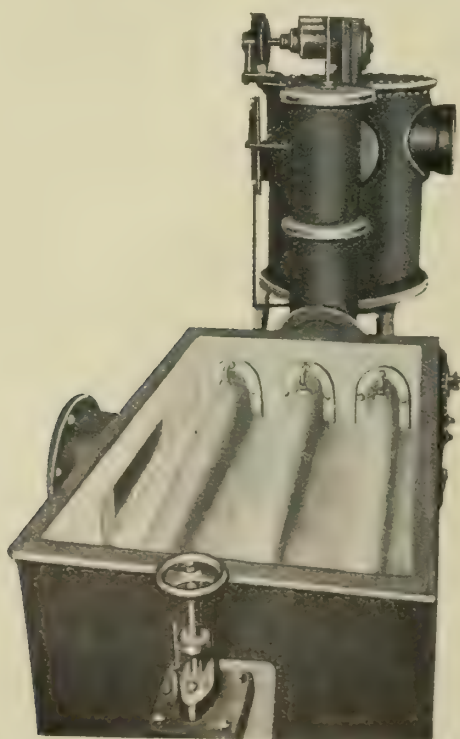
As far as time allowed, we carefully inspected the lighting of the Berlin streets.

In the main thoroughfares, high-pressure inverted gas-lamps having two or three burners are used; each burner giving a light of 1300 candles. The lamps are 19 feet high and about 35 yards apart. The lighting effect was extremely brilliant, though the cost per mile of street is necessarily high in comparison with the low cost in Bradford. The Berlin Municipal Council spent £50,000 per year for the last three years on replacing their old lamps (both gas and electric) with these new gas-lamps. They have decided to continue these improvements at the same rate for the next four years.

We were informed that in four years, there would be no electric public street-lamps left in Berlin.

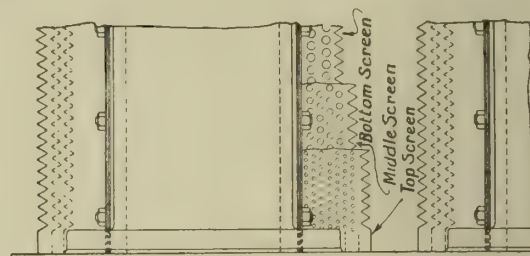
IMPROVED MULTIPLE AMMONIA WASHER.

The issue of the "American Gaslight Journal" for the 21st ult. contains an illustrated description, specially communicated, of an improved multiple ammonia washer manufactured by the Western Gas Construction Company, of Fort Wayne (Ind.), and used extensively in the production of both water gas and oil gas, as well as in connection with the Holmes rotary scrubbers, which are also manufactured by the Company. The following are some particulars of the apparatus.

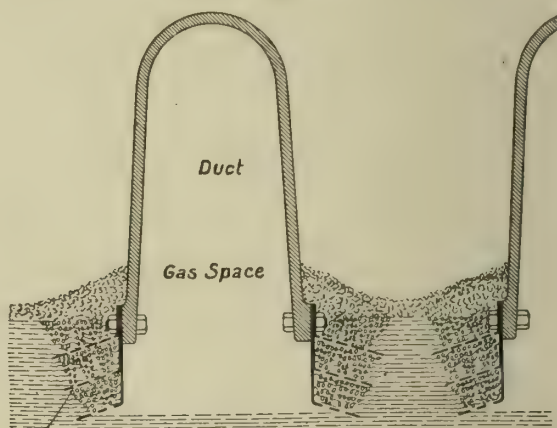


It may be first of all remarked that the ordinary type of multiple ammonia washer, which aims to perform the purification of gas from tar and a considerable proportion of its ammonia, by subdividing the stream of gas into minute streams or bubbles, through two or more stages, accomplishes this object by forcing the gas through channels which are closed with perforated plates. When the perforations become clogged with tar, lampblack, or naphthalene, the passage of the gas through the washer is effected only by a considerable increase in back-pressure; and the process

of cleaning the perforations is a laborious and expensive one. It was with the thought and object of obviating these difficulties that the type of washer described and illustrated was designed. Its special feature consists in placing the perforated plates one above the other; each plate extending slightly farther than the one below it, and all being bent to a common angle, sufficient to retain a pocket of gas proportional to the capacity of the washer, and leaving an absolutely free and clear opening between the ducts. The edges of the perforated plates are serrated, and the perforations diminish in size and increase in number from the bottom plate up.



Plan.



Sectional Elevation.

It is at once apparent that the gas is thoroughly subdivided and washed in as many successive stages as there are perforated plates, three of which are found to be sufficient in ordinary practice. In case the washer should be overloaded beyond its rated capacity, or should some or all of the perforations in any of the plates become clogged up, there is practically no resultant back-pressure; the gas passing at the serrated edges of the plates, and being caught by the plate above on account of its projection beyond the edge of the first plate. The passage around the serrated edges has a considerable washing effect, although, of course, not so much as when the gas passes through the perforations. At no time can a stoppage occur in the washer or excessive back-pressure be experienced; and at no time does the gas receive less than three stages of washing, even if all the perforations became clogged up, which is extremely unlikely. In case they should do so, the plates are easily accessible for cleaning, and can be steamed in position by means of a bent steam-pipe. The expense of construction and repairs is very materially decreased, since the plates are simply bent to the proper angle, and bolted (the three together) to the ducts without the necessity of expensive and careful forming in frames and enclosed spaces.

The peculiar construction of the washer afforded an excellent opportunity of ascertaining definitely, by experiment, its maximum capacity per lineal foot of ducts; and these experiments were accordingly made. Air was, of course, used for them; and the results obtained were corrected for gas at a density of '4, '5, and '6 sp. gr. The washer was 3 ft. by 5 ft. by 2 ft., and air was furnished by a No. 6 Sturtevant blower driven by a 20 H.P. turbine; the amount of air being controlled by a gate-valve in the air-delivery line. The air was sent first through a new model Pelouze and Audouin condenser, in order to obtain practical working conditions; and the quantity of air delivered to the washer was determined by Pitot tube readings in the ordinary way. The maximum capacity of the washer was decided by observation of the contained water and the escaping air. In this manner very accurate information, such as would be impossible with enclosed escapes, was obtained regarding the capacity of the ducts.

It is claimed for the washer that it not only removes the last traces of tar and lampblack, but, in connection with the Holmes scrubber, absorbs from 25 to 50 per cent. of the ammonia contained in coal gas. A double-deck washer of this type, having a capacity of 8 million cubic per day, was specially constructed some months ago for the Pacific Gas and Electric Company, of Oakland (Cal.). It was 10 ft. by 8 ft., and 5 ft. 3 in. high, with 24-inch inlet and outlet connections divided into pairs 20 inches in diameter.

The late Mr. H. Spencer Hughes, one of the Directors of the Bromley Gas Company, left £29,227.

MANCHESTER JUNIOR GAS ASSOCIATION.

Annual Meeting.

The Eleventh Annual Meeting of the Association was held on Saturday evening, at the Exchange Hotel, Manchester. Prior to the business being entered upon, members and invited guests had "high tea" with Mr. F. Thorp, the President-Elect.

At the subsequent meeting, Mr. JAMES TAYLOR (Mossley), the President, occupied the chair; and those present included Professor Harold B. Dixon, M.A., F.R.S., of the Victoria University, Manchester, Mr. H. Kendrick (Stretford), President of the Manchester District Institution of Gas Engineers, Mr. T. Duxbury (Oldham), Past-President of that organization, Mr. W. Whatmough (Heywood), the Hon. Secretary, Mr. T. B. Ball (Rochdale), Mr. S. W. Shepherd, President of the Yorkshire Junior Gas Association, and Mr. James Hill, Manager of the Bradford Road Gas-Works, Manchester.

THE ANNUAL REPORT.

In their annual report, the Council stated that the membership of the Association had been well maintained. On April 3 last year, the number of members on the books was 157; and during the twelve months 14 new members had been elected, while 14 had retired—leaving the present membership as it was at the commencement of the year. Two very successful "coffee meetings" had been held, and also a debate with the Manchester Students' Section of Electrical Engineers on "Gas v. Electricity for the Generation of Heat and Power." The Association desired to express their indebtedness to Professor Dixon for the lectures he gave to members at the Victoria University—one on the "Chemistry of Flame," and the other "Some Theories of Combustion of Gases"—and also for his kind interest in the Association, which had made possible a valuable connection between the Manchester University and the Junior Association. The connection between the Association and the Manchester District Institution of Gas Engineers, whereby each was represented on the Council of the other, had been continued; the rules of the respective Associations having been so amended as to admit of this. Thanks were tendered to the authors of papers, and to Mr. J. Alsop, who had carried out the duties of the Hon. Secretaryship with satisfaction to the Council and credit to himself.

The PRESIDENT, in moving the adoption of the report, mentioned that it was with regret that they had received the resignation, owing to his distance from Manchester, of Mr. Mottram, of Ossett, one of the original members of the Association. A point for gratification was that they had not, since the formation of the Association, lost a single member by death. He desired to acknowledge on behalf of the Association the kindly feeling shown by the Manchester District Institution of Gas Engineers to them, and the willingness always shown by the seniors to further the interests of the juniors in gas affairs generally. They had with them that night a number of gentlemen who had contributed to their education during the year, by inviting the members to visit their works; and he desired to say that on every occasion they received nothing but the most kindly treatment. Everywhere they had been, the engineers had extended to them the greatest courtesy, and shown willingness to explain the working of their respective plants and specialities. In conclusion, he paid a warm tribute to Mr. Alsop, for the way he had discharged his work as Hon. Secretary.

Mr. R. H. GINMAN seconded the resolution, which was carried without discussion.

The balance-sheet was approved on the motion of the PRESIDENT, seconded by Mr. T. W. SMITH.

ELECTION OF OFFICERS.

The ballot for the Vice-Presidency resulted in Mr. A. L. Holton securing the largest number of votes.

Mr. D. V. HOLLINGWORTH, F.C.S., who had also been nominated, at once, on the result being announced, moved the election of Mr. Holton to the post.

Mr. ALSOP, in seconding, said Mr. Holton well deserved the honour, in recognition of his work on behalf of the Association in the past.

The resolution was carried unanimously.

Mr. HOLTON, acknowledging the compliment, said he greatly appreciated the action of Mr. Hollingworth in so kindly moving his election as Vice-President.

The following other appointments were made:

Hon. Secretary.—Mr. J. Alsop.

Hon. Treasurer.—Mr. R. H. Garlick.

Auditor.—Mr. A. Berry.

Members of the Council.—Messrs. W. Buckley, D. V. Hollingworth, S. Carter, and A. Hodgson.

On the motion of Mr. W. L. HEALD, seconded by Mr. A. BERRY, a vote of thanks was accorded the retiring officials—reference being made to the excellence of the programme arranged for the past session.

Mr. TAYLOR, in asking the new President to take the chair, said that in Mr. Thorp they had a gentleman eminently fitted for the position he was now called upon to occupy. He could not vacate the office of President without expressing his appreciation of the kindness and assistance he had received from the members. He was confident Mr. Thorp would have the same support.

Mr. THORP, who, on taking the chair, had an enthusiastic reception, moved a hearty vote of thanks to Mr. Taylor for his services as President. He said Mr. Taylor not only handed over the reins of office untarnished, but burnished through his skilful handling.

Mr. J. NICHOLL seconded the motion; and in commenting upon the excellence of the syllabus of the past session from an educational point of view, expressed the hope that the University lectures would be continued in the coming session.

The resolution having been duly carried, Mr. TAYLOR suitably responded.

Mr. THORP then proceeded to deliver his

INAUGURAL ADDRESS.

The address opened with a recognition by the President of the honour conferred upon him, in view of the position he held among the members by his election, and an expression of his sincere thanks for the confidence placed in him. He assured them that it would be his earnest endeavour to maintain the dignity of the office he had been chosen to fill, which had been so worthily upheld by his predecessors. He acknowledged the ability of the Treasurer and Secretary of the Association (Messrs. Garlick and Alsop), and the loyalty of the Council; and said that it only remained for the members generally to assist in making the session on which they were entering a remarkable one. He appealed to them to assist in this grand endeavour. He said he could not, as other of their Presidents had done, give them experiences on his own gas-works; but he thought his address should have a personal note in it. Being a trader, it was somewhat difficult to do this without treading on dangerous ground; but he would, with their permission, discuss a few of the more important and interesting points bearing upon the measurement of gas. He then proposed to devote a little time to the educational problem in connection with the Association; and he trusted they would find some way of taking advantage of a very generous offer which had been made by Professor Dixon on behalf of the Manchester University.

Proceeding to deal with his first subject, the President said it was originally his intention to trace the evolution of the gas-meter from the time of Clegg and Malam to the present day; but he found, on going through the patent records, he had undertaken a task which was impossible of accomplishment, in the limited time at his disposal, with any degree of satisfaction to the members or to himself. He, however, would very shortly review the progress made. He then referred to the patents taken out in connection with gas-meters, the first of which was granted in 1815 to Samuel Clegg. From this year to 1850 (a period of 35 years), 38 patents were taken out; but from 1850 to 1858, some 69 were applied for—showing the increasing importance of correctly measuring gas. The President described, with the help of lantern slides, the early meters of Clegg, Malam, and Crosley, and explained that, as the result of successive alterations, the drum finally assumed something like its present shape. He then referred to the attempts made to keep the water-line constant, and mentioned the Warner and Cowan drum, the Greenall meter, and other modern types of gas-measuring instruments.

Having roughly sketched the history and development of the gas-meter, the President proceeded to indicate a few instances where meters are wrongly used; expressing regret that it is the rule rather than the exception to employ a meter which is too small for the purpose. This part of the address, and the President's remarks on the educational question, are given below.

THE QUESTION OF MEASUREMENT.

I do not wish to go into the merits of any particular meter or system of measurement, as this would be treading on the dangerous ground I mentioned early in my address; but in case any outsider by chance reads the remarks, I wish it to be understood that there is a positive cure for all the ailments I shall mention. In making experiments some time ago on engines and exhausters, we found the flow of gas in the mains varied much more than one would expect from an observation of the pressure-gauge. We carefully tested, by means of a diagrammatic meter, this variation; and the diagram (fig. 1) gives the variation of flow

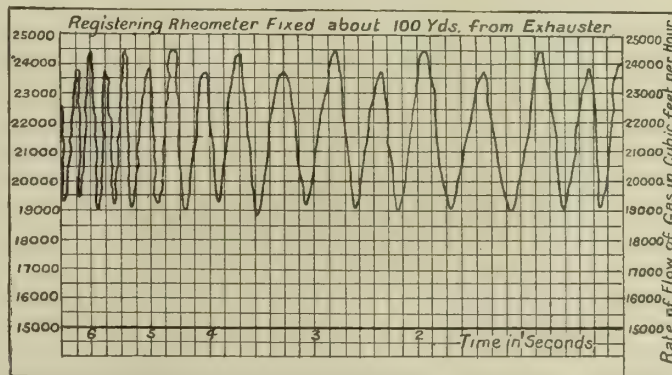


Fig. 1.—Diagram of Pulsations from a Two-Bladed Exhauster.

100 yards from the exhauster. It will be noticed that the difference of flow is enormous—viz., 19,000 to 24,000 feet per hour; whereas the pressure-gauge only showed a few tenths variation.

We then examined the case of a gas-engine fitted up with the usual gas-bag supplied by the engine builders. Diagram No. 2 is taken on the main before the gas-bag and at the outlet of the meter. The engine is a new 13 H.P. "National," working very

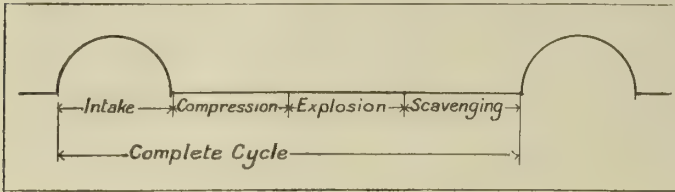


Fig. 2.

well indeed. It will be seen that the quantity varies from 50 to 500 feet per hour, although the actual consumption per hour is only 120 feet at about half-load. Now I find that most gas companies and engine-makers, when deciding the size of meter required, simply multiply the horse power of the engine—e.g., 13 H.P. \times 20 = 260 feet per hour, and then say, "A 40-light or a 50-light meter will do." I have seen a 30-light meter used. The meter makers, who naturally want as big a meter as possible installed, give 80 lights for a 13 H.P. engine; and where a proper anti-fluctuator is not used, they are much nearer right than the engine builder. If we examine an engine of the Otto cycle type—most of the engines gas engineers deal with are likely of the single-cylinder Otto type—we get the diagrammatic cycle fig. 3.

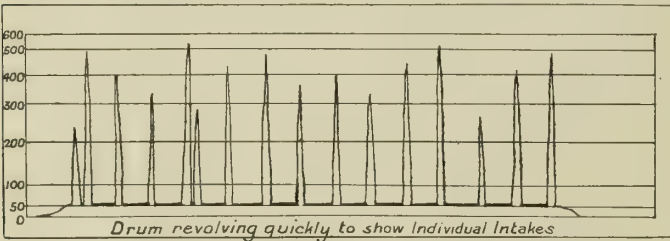


Fig. 3—Thirteen Horse Power Gas-Engine (Otto Cycle), Working at about Half Load; 120 Cubic Feet per Hour.

The cycle is divided into four parts—viz., the intake stroke, the compression, the explosion, the scavenging stroke, and then on to the intake again. If no gas-bag is used, then all the gas is taken from the main in a quarter of the time of the cycle; and really at the middle of the stroke it is taking it at a quicker rate still. But we will neglect this point for a moment. The present gas-bags are often nearly useless, as the diagram shows; so if we say the gas is taken in half of the cycle, we are well within the mark. The engine being a 13 H.P. one, requires (say) 260 feet per hour; but as it takes its gas in half of the cycle, the actual rate of flow through the meter will be at times (say) $260 \times 2 = 520$ feet per hour. It is taken at this rate whether working at quarter, half, or full load, as a gas-engine takes its quantity at the same rate—the only difference being that it takes it more frequently on a full load than it does on a lighter one. Now it is very obvious that most meters are working at much greater rates than they are made for, although they may not be passing more gas than designed for in the hour. I want to impress upon you the fact that it is the rate per hour you must watch. How does this affect you? I have tested many new meters—some fast, some slow, some correct; but an average one will suffice to show you the importance of this. A 30-light new dry meter, of good make, gave

| | | |
|--------------------------------|--------------------|-------------------|
| At its rate per hour | 180 feet | correct |
| | 300 " | 2½ per cent. slow |
| | 400 " | 7½ per cent. slow |
| | 500 " | 10 per cent. slow |

As the engine takes its gas at the rate of 520 feet per hour, the registration is slow. You now see where you are losing money and racking the meters to pieces by installing them of too small a capacity. That this is not overstating the case will be at once recognized by those who have read Mr. Ellery's address to the Southern District Association, as he gives the results of testing meters on overload as much as 20 per cent. slow. It is important to notice that as the quantity increases, the percentage of error increases; and this is a most serious condition of affairs, as 10 per cent. slow at 10 feet an hour is only a loss of 1 foot, while at 500 feet it is 50 feet per hour. A gas manager would, of course, prefer, I should think, a meter correct; but if it must be slow, then let it be at low quantities, and not at high ones. Irrespective of the pulsations produced in the main, it is therefore absolutely necessary that efficient anti-pulsator governors should be fixed on all gas-engine meters.

I have read with very great interest the Presidential Addresses of the worthy President of the Manchester Senior Association, Mr. Kendrick, and of Mr. Ellery, the President of the Southern Senior Association, to which I have just referred. Mention was made of the passing of gas unregistered by dry meters when by-passes are burning; and their having given publicity to it must be my excuse for mentioning it. The passing of gas unregistered is generally attributed to leaky valves, and I believe very often correctly so. In these days of compressing plants, however, we are approaching American practice; and it is well to look occa-

sionally to what they are experiencing. In a paper read at the American Institute in October, 1909, while I was in America, Mr. Miller, of Philadelphia, gave some of his experiences of meter diaphragms. It is found that compressing produces very dry gas, and this gas extracts the oil from the diaphragms, and very soon allows as much as 5 feet per hour to pass through the diaphragms without registering; and arrangements have had to be devised to keep the diaphragms continuously oiled. I do not wish to go further into this matter, but think that it is a point well worth watching, especially with our present Government methods of testing meters.

TESTING METERS.

Several members have from time to time requested me to describe the testing of meters; but considering my position, I should prefer to refrain from doing so in this address. If some member cares to give us a paper on the subject, I shall be happy to assist him. The question of testing station meters is, however, one which I am often asked about; and some personal experiences may be worth relating. Before proceeding, I should like to refer you to the excellent paper read by Dr. Davidson before the Midland Juniors in December, 1908.* A common practice is to test a station meter by a holder. The danger in testing a meter in this way is not so much in the want of accuracy of calibration of the holder or variation between the temperature of the holder and of the meter, but in the variation of temperature in the holder itself. The really wonderful way in which the gas responds to an increase or diminution of temperature is surprising. One can easily understand the rising and falling of a holder when the sun shines or is obscured by a cloud; but one would hardly be prepared for variations at night. I remember very vividly sitting on a large gasholder for some hours one September night in Copenhagen, taking temperatures at the top and half way down inside the holder, and being surprised at the variation of temperature from, I almost said, minute to minute. At the commencement of the test, it was one of those beautiful nights when one would have preferred to lie down and contemplate the beauty of the heavens, instead of sitting on a gasholder taking temperatures; but before long, thin vapoury clouds came across the sky, and very fine rain occasionally fell. Then, again, all was clear and bright. There was sufficient variation during these changing conditions to upset all tests if we had neglected making corrections.

That a small variation in temperature is not a trivial matter, I will show by an example of a test I made in Stockholm on a large 100,000 cubic feet rotary meter and a 2½ million feet holder. This holder is in a large brick building, to protect it from the great variation of outside temperature they experience in these northern countries in the different seasons. The temperatures were taken at the top and half way down the holder. We commenced the test at 9.30 a.m., and continued until 7.10 p.m. From 9.30 to 3.10 there was a rise of 3.4° C., and from 3.10 to 7.10 a drop of 2.5° C.; the greatest variation being 11.30 to 2 o'clock—viz., 1.8° C. This does not seem much. But let us take an example, and see how it affects us. Gas is going into the meter at (say) 50,000 feet per hour. For 2½ hours the actual gas passing and registered by the meter is therefore $2\frac{1}{2} \times 50,000 = 125,000$ feet. Now take it that the temperature at the meter and holder is the same, but between 11.30 and 2 o'clock there has been a rise in temperature in the holder of 1.8° C. At 11.30 there were 2 million feet in the holder. Adding the amount passed into the holder, we should expect 2,125,000 cubic feet. What was actually found was about 2,147,000 feet, thus showing an increase of 147,000 feet, in place of 125,000 feet. The increased amount that would be shown by the holder without the addition of the new gas would amount to about 12,700 feet; and when we consider that we are only passing 125,000 feet in, it makes the meter apparently 10 per cent. slow. This error would be increased to 100 per cent. if 5000 feet per hour had been passing in place of 50,000 feet. My point is that in testing a meter by a holder a night should be chosen when the temperature varies as little as possible, and the quantity of gas in the holder should be reduced to normal temperature and pressure both at the commencement and the end of the test. I have seen holders go up when we have been taking gas from them, and fall when putting gas into them. I cannot go into detail; but I trust this rough indication of what happens will be of use.

Another thing in testing wet station meters that I think has not received the notice it deserves is the variation in the water-line due to sudden changes in the rate of flow, especially when working near or over the badged rate per hour. You all know the considerable difference in pressure absorbed by the meter at these rates, with consequent change in water-line and variation in measurement if not compensated for. You naturally say, "But we have always water running in and out, and so the water-line is kept constant." Suppose we get a change of water-line of ½ inch, which is often the case at the rates previously mentioned. Consider the size of a 100,000 feet meter, and multiply the area of the drum at the surface of the water by the ½ inch deep, and you have a space capable of holding a large volume of water. Now as the water only trickles in or out of the meter, I leave it to you to imagine how long it will be before the meter is working at its correct water-line, remembering that during this time the meter may be several percentages incorrect. There are, of course, many other points to watch; but my endeavour has been to show where possibilities of error may arise from factors not generally taken into consideration.

* See "JOURNAL," Vol. CIV., p. 764.

EDUCATIONAL MATTERS.

Having examined somewhat briefly the subject of measurement, with, I trust, some benefit, I will now proceed to lay before you some views of the educational problem as it presents itself to your President, and to some, if not all, of the members of your Council. At the onset, I wish to express the thanks of our Association to the authorities responsible for the classes in Gas Engineering, Gas Supply, Gas Analysis, and Gas Manufacture, &c., which have performed, and we trust will continue to perform, a very useful and necessary work. The success of the Leeds Chair of Fuel is very gratifying to the gas industry as a whole, especially as practical results, so dear to the man in the street, have already made themselves manifest; but, unfortunately for Lancashire men, Leeds is in Yorkshire, and many of our members who would dearly like to take advantage of the facilities there offered to increase their knowledge, are prevented by the expense and distance.

In Manchester, we have the Victoria University, and not only the University, but, what is even more important, the Head of the Department of Chemistry and Fuel. Professor Dixon is a gentleman whom we have all very good cause to know and to think of with gratitude for the many kindnesses he has shown to us. I think I may say without fear of contradiction that in Professor Dixon we have the leading authority on the chemistry of flame, the combustion of gases, &c.—in fact, in everything relating to chemical and the physical properties of gases; and it has been a matter of much concern to your Council how to take advantage of the opportunities for increased knowledge that here present themselves. Your Council have given very careful consideration to several schemes, and have appointed Mr. Hollingworth and myself to interview Professor Dixon. We were not only courteously received, but our suggestions met with much more consideration and sympathy than we had dared to anticipate. That there should be a distinct connection between the University and our Association was the first consideration; and the permission to hold our meeting of Jan. 15 at the College marked the beginning of, I hope, a long and useful association with the University. Professor Dixon's admirable lecture further cemented this connection; and I trust the lectures and classes it is proposed to hold in the coming session will definitely bind the gas industry, through this Association, with the Manchester University.

There are very many reasons why this connection is desirable; and one not generally considered, but to me an important one, is the standing this relationship will give to our profession in the eyes of the world. It has always seemed to me that a gas engineer is not looked up to in the same way as a civil or electrical engineer; whereas the educational requirements and technical knowledge demanded of a present-day gas engineer are greater than in almost any other profession. Professor Tilden, when speaking on Professor Meldola's address to the Society of Chemical Industry, referred to the requirements of a chemist; and I have taken the liberty of applying his words to the gas engineer:

There was a disposition nowadays to require of the young man taken into industrial chemistry rather too great diversity of accomplishments. It was not necessary only that he should be a skilled chemist, that he should know something about electricity, that he should have sufficient mathematics at command to enable him to tackle any problem in physical chemistry, and also that he should know something of engineering, but he had to study the nature of markets, and how to deal with matters of business. It seemed to him that there could not be rolled into one person a research chemist, a works manager, and a business manager—it was physically and humanly impossible that any such person could ever be found; and the man who was to assist as a scientific chemist in a works must be allowed to devote himself to that department of the business. If he were wanted in the office, that was one thing; but the laboratory was another. It was not fair, and neither human strength nor human life was sufficient to enable a man to undertake all these various functions.

If this be true of the industrial chemist, how much more so is it true of a gas engineer? The general public do not know this, and do not associate science with gas making. Now a recognition by the Manchester University will go a long way towards changing this; and I trust before long the gas engineer will be looked up to as his abilities deserve.

While all may be agreed as to the desirability of something being done, many may say that it will cost money, and that the Association cannot afford it, especially considering the present state of our balance in hand. Let me say, first of all, that it is not intended to put the members to any greater expense—at least, not at present, as the Association has already been promised a sum nearly sufficient to cover expenses; and we have no doubt we can easily raise the balance. When the manufacturers, gas committees, and directors of gas undertakings in Lancashire see that we are prepared to do our share, we ought not to have any trouble in raising the sum necessary for the good work; for it is not only the individual that benefits by increased facilities for education and research, but the whole of the industry.

When we consider the great importance of the gas industry, the enormous amount of capital invested, and begin to realize that it is one of the principal industries of the country, it is surprising the small amount of interest that has been taken in the higher education of gas engineers and in research work. This lack of interest cannot be laid at the doors of our Technical Journals, as they have repeatedly called attention to the fact, and deplored the small amount of assistance given to educational

schemes by gas undertakings. It has seemed to me that the Chair of Fuel at Leeds is the outcome more of a wish to perpetuate the memory of one of the greatest gas engineers and organizers the world has seen, than an actual desire in the first place to found a Chair of Fuel.

Mr. J. W. Helps, of Croydon, the worthy President of the Institution of Gas Engineers, as well as many others, has done exceedingly good work in this direction; but, as in most cases of this kind, the lack of funds has prevented the forward movement to a large degree, and has certainly prevented many taking advantage of the Leeds lectures. I have often wondered at this lack of appreciation of the necessity of higher training, and am driven to the conclusion that it is to a large degree due to the fact that few of the gas undertakings are in the hands of individuals as owners. In the great iron, steel, and allied trades, the captains of industry, having the interest of their industry at heart, have founded scholarships, endowed colleges, and assisted aspiring students in many ways, to the lasting credit of themselves and the good of the great industries they have been connected with. I trust my socialistic friends will excuse me mentioning it; but I feel our industry is suffering from want of individual help, such as the individual capitalist can, and often does, give. I saw a notice in the paper the other day that a soap maker had given £90,000 to a University—oh, for some such help!

Corporation committees have in the past been more concerned in making profits and appropriating them to relieve the rates, and boards of directors in making present-day dividends, than in considering the future of the gas industry. I trust that we shall soon be able to look upon this attitude as a thing of the past, and that when we appeal for assistance we shall find a new state of affairs, and that we shall not only be encouraged by their generosity, but assisted with their advice. The question resolves itself therefore mainly into one of self-help; and our Association, along with the kindred Associations, must move if anything is to be done in our separate districts. Lancashire is without a course of college training for the gas engineer who wishes to go beyond the honours stage of gas engineering; and it is a reproach to this great county. We have also in Lancashire the foremost firms in meter making, gas machinery, and apparatus manufacturing, the chief coal companies, and also a very large number of gas undertakings. It will be a lasting reproach if Lancashire cannot at least arrange for some evening students' scholarships and a series of lectures at the Manchester University, where students who are unable to avail themselves of the advantages offered at Leeds can have the benefit of Professor Dixon's guidance while working in the splendidly-equipped laboratories, &c.

The College authorities, through Professor Dixon, have very generously offered their help; and I want this meeting to authorize the Council to appoint a Sub-Committee to go thoroughly into the scheme, interview the Senior Association, the Technical Press, leading Lancashire manufacturers, and gas companies, with a view to providing a fund for the furtherance of education in gas matters. It is our intention to begin very modestly; and if we can send three, or assist six, students to attend the College one or two nights a week in the coming winter session, and to hold a special series of lectures given by the most eminent men in the scientific and gas world on subjects covering the general work of a gas engineer, I for one shall be satisfied. This is the beginning only of our scheme; and I am sure that, once we commence and the results are made manifest, the larger scheme will succeed our modest one as the day follows the night. I have not time to show how all would benefit, from the humblest workman to the chairman of the gas company, or from the junior pupil to the finance committee of a corporation. Suffice it to say that the elementary student would benefit in the first place by the fact that his teacher would have the opportunity of increasing his own knowledge, with the corresponding advantage of being able to more clearly demonstrate to the elementary student, through attending the college course, and all members, either of the junior or senior associations, would have equal opportunity of benefiting by the lectures.

Many people look askance at college training, and, personally, I have little faith myself in purely college work. But our men would be those who had been engaged for three years at least in practical work—men, therefore, who know where they are deficient and what will be of the greater help. What I should like to see would be a working arrangement between the University and the gas-works where a combination of the qualities of a professor and an engineer could produce results impossible by either of them working independently. Why should not an engineer use the laboratories at a university for working out, along with a professor, ideas impossible of success in the works alone? And why should not the professor or a research student, either in the physics or chemical department, not necessarily a gas man, work in conjunction with an engineer on some practical problem on a gas-works? It is often a matter of difficulty for a research student to decide upon a course of research. For example, a student in biology, for want of something better, spends a year or more on investigating the functions of a parasite on a rotifer.

Look at the possibilities a university connection with a gas-works opens out. We have (say) a difficulty on the works which requires a lengthy investigation—the engineer has not time to devote to it, and his assistants have their routine work, or leave before an investigation is completed. The engineer and the professor come together. The works are open to the professor, and he can direct several research students upon this work, tabulate the

results, and, when the course of one set of students is finished, the new students can continue the work under the guidance of the professor and engineer, who have carefully noted the results of the first set of investigators. I am in hopes that we shall be able to assist, by way of scholarship or grant, several students to take up evening research work, and that the results of their labours will be embodied in communications to our Society.

I should here like to quote from Mr. Thomas Newbigging's Presidential Address to the Society of British Gas Industries, where he said: "Depend upon it, the economical results that must follow research work and such work as a university with adequate means can undertake, will be of incalculable value to the industry in the not remote future." We could not wish for better testimony than this. Here we have the University at our doors—willing students desirous of increasing their knowledge, and talented professors anxious to join hands with the industry. Must we remain asleep? Or shall we awaken to the full responsibilities of our position, and, having awakened, rest not until something is accomplished?

I am going to ask you now to vote upon the matter, remembering that, by supporting this suggestion, each one pledges himself to use his best endeavours in assisting the Sub-Committee, if called upon to do so. In voting, remember the advantages we enjoy to-day through the energies of our predecessors, some of whom, I am happy to say, are with us to-night—men who worked so hard to establish the classes at technical schools. Shall we therefore earn the thanks of our successors for our labours on their behalf, or be remembered only as the neglectors of grand opportunities? By your action, I firmly believe you have the opportunity of making to-night's meeting a memorable one in our annals. See to it that the memory is a pleasant one.

COMPLIMENTS TO THE PRESIDENT.

Mr. W. BUCKLEY, who moved a vote of thanks to the President for his address, said he had known Mr. Thorp for a good many years now, and what impressed him most, in addition to that gentleman's technical skill, was the attention he always paid to detail—evidence of which they had had in the address. Mr. Thorp's lecture was a masterpiece; and the only regret one had was that their President did not tell them something more about his own meter outside what was obtained from the Technical Press.

Mr. S. E. HALLIWELL seconded; observing that the address would not only be of considerable value to them as members of the Association, but to a larger public outside.

Mr. T. DUXBURY (Oldham), supporting the resolution, said that from personal experience he could bear out what had been said about Mr. Thorp's attention to detail; and he went on to compliment the President on his address. He said he considered the address one of the greatest value to their profession, and believed with the previous speaker that it would be read with interest by many who were outside the Association. As to the latter part of Mr. Thorp's address, he was certainly of opinion that something ought to be done on the lines suggested, so that Manchester, from a gas-engineering standpoint, might occupy a position worthy of its name and importance as a great centre.

Mr. H. KENDRICK (Stretford) desired also to associate himself with what had been said about the excellence of the address. In fact, he said, it was one of the best it had been his lot to hear; and as to the proposed scheme in connection with the Manchester University, he would take the first opportunity of laying it before the Council of the Senior Association. He was satisfied that some such scheme would be of great benefit to gas engineers in the Manchester district, and to those associated with gas manufacture. It was only the other day that he said to a friend of his that Manchester could have had what the Leeds University got—the Chair of Fuel—if they had tried. Manchester was too late in the field. He did not know whether Manchester and district could raise another £10,000; but they could surely do something in the way suggested in the President's address.

The resolution was then put and carried; the PRESIDENT briefly responding.

UNIVERSITY SCHEME OF SCHOLARSHIPS AND LECTURES.

Mr. A. L. HOLTON then moved the adoption of the following resolution:

That having heard from our President the proposal as to there being a bond of union between the Manchester and District Junior Gas Association and the Victoria University on distinctly educational lines, we welcome this opportunity of increasing the educational advantages of our members; and we hereby authorize the Council of the Manchester and District Junior Gas Association to go into the matter thoroughly, along with Professor Dixon and the University authorities, together with any other bodies they may deem it wise to confer with, and to send out their full suggested scheme along with the May notices to be voted on at the June meeting.

Mr. J. ALSOP seconded the motion.

Mr. NICHOLL (Radcliffe), in support, said, if the scheme came to fruition, it would be of great benefit to the gas industry, both to those on the inside staff and those on the outside staff, especially in view of the keen competition they had with electricity. Such, indeed, was the competition they had now to face, that it was absolutely necessary for those engaged in gas manufacture and its distribution to so equip themselves in knowledge as to be able to meet that competition. As one employed on the outdoor staff, he found that the competition was becoming keener almost every day; and he hoped the scheme mentioned by the President would be carried through.

The motion was adopted with only one dissident.

Professor HAROLD B. DIXON, having expressed the hope that Mr. Thorp would see his way to deliver to the students at the University an address on gas-meters, with special reference to his own meter, proceeded to speak of the proposed bond of union between the Junior Gas Association and the University. He remarked that the greater part of what he had intended to say upon the subject had been covered by the President in his address. This he would say in addition, that there were things in which they might co-operate with benefit to the students at the University, and to those engaged in gas manufacture. He told them frankly that he had a personal interest in the proposed scheme as well as they had, and that it was not to be a one-sided arrangement. As practical men, the members of the Association had something to tell him and those attending the University; while he and the staff no doubt could in different ways help those engaged in the manufacture and distribution of gas. Problems might arise which could be satisfactorily solved by their working together; and it was his desire to have the advantage of the knowledge of practical men as well as the theoretical knowledge. In this way, he was sure much useful work could be done for their mutual benefit; and this was important, seeing that Manchester and district were so largely interested in gas and its production. When Leeds took the matter up, he rejoiced, and helped as far as lay in his power to establish the Chair of Fuel at the University there. And it was gratifying to him to know that two old Owen College students—Professor Smithells and Professor Bone—were associated with the successful carrying out of the work at the Leeds University. He saw no reason why they should not do something in Manchester on the same lines—not in opposition to Leeds, but to have a friendly rivalry between the Universities. This would result in benefit to every one; and he would say so in Leeds as openly as he said it at that meeting. If the members of the Junior Gas Association were anxious for this work to be done in Manchester, there were friends at the University ready and willing to do their best in helping forward the scheme. And he need scarcely say that he should do all he could for them. His knowledge of Manchester and Lancashire—now extending over 25 years—led him to say that, if such a proposal were taken up, it would be carried to a proper and legitimate conclusion; and this he hoped would be done in this case.

KINDRED ASSOCIATIONS.

The subsequent proceedings took the form of a smoking concert, during which a number of toasts were submitted.

Mr. R. GINMAN, in giving "Kindred Associations," said that the Junior Associations owed a great deal to the help and assistance given them by the senior organizations; and in this connection he mentioned the valuable advice and support that were extended to Mr. Wellens, a Past-President, by Mr. T. Duxbury, of Oldham, when the Manchester Junior Association were in the course of formation. In recognition of these services, Mr. Duxbury had been made an honorary member of the Association.

Mr. W. WHATMOUGH, Hon. Secretary of the Manchester District Institution of Gas Engineers, said that what had struck him particularly when attending the meetings of the Council of the Junior Association, was the business-like way in which matters on the agenda were dealt with. He trusted that the vigour, activity, and progress of the Junior Associations, which had been so marked since their inception, would continue. Referring to the suggested scheme in connection with the Manchester University, Mr. Whatmough mentioned that as the matter was an important one, the juniors should defer definite action till the seniors had an opportunity of considering the scheme.

The PRESIDENT assured Mr. Whatmough that this point would not be lost sight of.

Mr. S. W. SHEPHERD (Bradford) also responded to the toast. He believed that the Manchester Junior Gas Association was the first of its kind; and, this being so, must be looked upon as the mother of such organizations. From the daughter—the Yorkshire Junior Gas Association—he brought them hearty greetings. Mr. Thorp had, in his address, struck a high note, and set out a high ideal. He (Mr. Shepherd) hoped very earnestly that the ideal which the new President had put forward would be fully realized. Although Yorkshire had its Chair of Fuel at the Leeds University, they would like to see Manchester follow a good second.

The toast of "Our Guests" was given by Mr. D. V. HOLLINGWORTH, and responded to by Mr. W. J. JENKINS and Mr. MATHER.

Mr. JAMES HILL gave the toast of "The Manchester and District Junior Gas Association." He said he had watched the Association grow from very small beginnings, and never dreamt that from the classes at the Technical School such progress would be made. The work the Junior Associations were doing was very important, from an educational point of view especially; and he was in hearty agreement with the suggestions made in the President's address with regard to the University. He regretted that in his younger days there were not such facilities for obtaining practical experience as was the case to-day. Not only had the Juniors the advantages of theoretical training, but they had opportunities of gaining practical knowledge in visiting different works to see up-to-date plants. All this was of value, because to assistants had to be entrusted in a great measure the carrying out of the work planned and arranged by the senior engineers.

The PRESIDENT said the Junior Associations had fully justified their existence; and, in his opinion, the whole industry had benefited by their establishment.

Mr. HILL (Stalybridge), as one of the first members of the Association, responded to the toast. He promised the scheme set out by the President in regard to the University all the support he could give it—financially and otherwise.

Before the proceedings closed, the health of the new President was toasted with musical honours.

PURIFICATION OF GAS FROM SULPHUR.

An interesting paper was read at a meeting of the Manchester Section of the Society of Chemical Industry last Friday, on "Some Points in the Purification of Gas from Sulphur," by Mr. RAYMOND ROSS, F.I.C., F.C.S. The paper was written by him conjointly with Mr. JOSEPH RACE, A.I.C.

The authors had been experimenting with an apparatus used by the United Gas Improvement Company, of Philadelphia, for controlling the oxide purification of gas by means of the iodometric titration of the sulphur contents. The authors found that certain discrepancies attended the use of the apparatus; for gas entirely free from sulphuretted hydrogen gave quite an appreciable absorption of iodine. This amount, calculated to sulphur, was largely in excess of the sulphur compounds present, which, moreover, did not react with iodine. It was evident that the discrepancies were due to another constituent of the gas other than sulphuretted hydrogen.

The authors first determined to what extent iodine solution was acted upon by various substances that are known to be present in illuminating gas—like ethylene, acetylene, benzene, carbon bisulphide, thiophene, mercaptans. These were not the cause of the discrepancy; but the deduction arrived at was that the substance was a hydrocarbon that would react easily with dilute iodine solution in the cold. By preparation of the dibromide compound, it was shown that the substance causing the discrepancy was cyclopentadiene, which has previously been discovered in crude benzene from coal tar. This was confirmed by the reduction test with ammoniacal silver nitrate, when a bright mirror was obtained. The authors conclude that the iodine test is, in conjunction with the qualitative test for sulphuretted hydrogen, a very useful method of controlling coal gas purification by oxide of iron, but is useless for carburetted water gas. The presence of cyclopentadiene in the latter can be ascertained by passing the gas through toluene kept at a very low temperature.

Lime purification was next dealt with. In the opinion of the authors, lime purification was not as regular in its action as the oxide method; it being more affected by the composition of the gases and the amount of extraneous water present. Experiments were carried out daily at the lime purifiers of the Burnley Corporation Gas-Works, for a period of three months, for carbon dioxide and sulphuretted hydrogen. Before analysis, all the limes were thoroughly spent; and the amount of calcium carbonate present varied from 63 to 70 per cent.

Purification by lime, owing to the number of reacting gases present and their variations in amount, was necessarily complex. The authors had attempted to carry out a suggestion made by Mr. Butterfield in his "Chemistry of Gas Manufacture," that the reactions might be best understood by a study of each gas individually. Reference was made to the work of Divers, Shmiddy, and Veley; and the main points of their experiments were summarized. It was found that with an excess of water at ordinary temperatures $\text{Ca}(\text{SH})(\text{OH})$ was formed; but with smaller amounts of water at higher temperatures this compound was converted into $\text{Ca}(\text{SH})_2$, and finally into CaS . The experiments pointed to the conclusion that only $\text{Ca}(\text{SH})(\text{OH})$ is active in the removal of carbon bisulphide from coal gas. The $\text{Ca}(\text{SH})_2$ and CaS may, however, be rendered active by altering the conditions so as to produce $\text{Ca}(\text{SH})(\text{OH})$.

Natural Gas in Ontario.—A consular report from Ontario states that several Canadian towns are using natural gas for light and fuel. In Windsor, natural gas piped from a spot 40 miles to the north-east was recently turned into the mains and service-pipes of the local Gas Company, who had previously been supplying the city with coal gas. The gas used for illuminating purposes is purified on the premises of each customer, that consumed for heating—its general use—is employed in its natural state. The price charged per 1000 cubic feet is 1s. 0½d. in the winter and 1s. 3d. in the summer. It is stated by experts that the supply cannot be exhausted in less than twenty years.

Calcium Chloride as a Dust Layer.—It may be remembered that sometime ago the Roads Improvement Association instituted a supplementary investigation into the value of calcium chloride as a dust layer; the judges appointed to conduct the tests being Mr. H. P. Maybury (Surveyor to the Kent County Council), Mr. A. Dryland (Surveyor to the Surrey County Council), Mr. G. W. Manning (Surveyor to the Staines Rural District Council), and Mr. W. J. Atkinson Butterfield, F.I.C., F.C.S. (Consulting and Analytical Chemist). Their report has been issued; and the following are the conclusions arrived at: "Having now had an opportunity of inspecting various sections of roads which have been regularly treated with calcium chloride during the past summer, and also of considering the reports of various surveyors in different parts of the country, referred to previously, who have used calcium chloride, we are of opinion that the treatment has the ill-effects of causing during the winter months an abnormal quantity of sticky mud, a decided tendency to licking-up, and a disintegrating action upon the macadam surface. Notwithstanding this, we are of opinion that the process is probably not more injurious to macadamized roads than the excessive watering now demanded by the public effectively to lay the dust.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

The Annual Meeting of the Western District Division of the Scottish Junior Gas Association (the concluding meeting for the session) was held in the Technical College, Glasgow, on Saturday—Mr. D. CURRIE, of Stirling, the President, in the chair. There was a good attendance.

AWARDS FOR THE BEST PAPERS.

At the meeting of the Association in November last, it was announced that Mr. A. Smith, the Manager of the Tradeston Gas-Works of the Glasgow Corporation, had offered a medal to the author of the best paper read during the session; and that Mr. Walter Grafton, the Assistant-Engineer and Manager in Glasgow, had offered a book as a second prize.

The PRESIDENT, referring to this matter, intimated that the Adjudicatory Committee had just met to consider their decision, with the result that Mr. F. L. M'Laren, of Dumbarton, had been unanimously awarded the medal for his paper on "Producers and Internal Combustion Engines;" and that to Mr. J. M. Smith, of Dumfries, they had given second prize, for his paper on "The Manufacture of Sulphate of Ammonia."*

THE WILLIAM YOUNG MEMORIAL FUND.

The SECRETARY AND TREASURER (Mr. D. Fulton, Dawsholm) read a circular which had recently been received from the Secretary of the William Young Memorial Committee, explaining their proposals.

The PRESIDENT said the Council had had the communication under consideration, and unanimously recommended the Association to contribute one guinea to the fund.

More than one member expressed the opinion that the sum proposed was too small; but it was explained that it amounted to 10 per cent. of their funds. It was unanimously agreed to vote the sum named as "a first instalment;" the intention being that if more money were required, and the Association could afford it, a further contribution might be made.

THE ANNUAL ACCOUNTS.

Mr. FULTON also read a provisional balance-sheet, which showed that the income of the Association for the year, including £18 brought forward, amounted to £51, and that there remained a balance of £21.

ELECTION OF OFFICE-BEARERS.

The following were elected office-bearers for next session:

President.—Mr. J. Fraser, of Provan.

Vice-President.—Mr. A. Kellock, of Alloa.

Hon. Secretary and Treasurer.—Mr. D. Fulton, of Dawsholm.

Members of Council.—Messrs. T. Orr, of Motherwell; F. Cuthbert, of Kirkintilloch; T. W. Saville, of Thornliebank; J. Smith, of Glasgow; and J. Grant, of Glasgow.

Auditors.—Messrs. J. Mann and J. Smith, of Glasgow.

GAS COMBUSTION.

Mr. WALTER GRAFTON then delivered a lecture on this subject, in the course of which he said:

In bringing the subject of gas combustion before you this evening, I will endeavour to be as concise as possible, and will avoid most of the history of the subject, and also much detail of the various plans which have been tried, as, although the birth of a new idea may occupy little time, the experimenting has taken long and patient application, yet it often takes still longer to convince others that a particular method or thing is worthy of adoption. Nevertheless, I must claim your indulgence for having to deal with this important matter in a very brief manner. The whole subject would take a great deal longer to describe in detail than the time at my disposal. I also claim your indulgence for omitting many details, but will try to make up for this by demonstrating my points.

When we burn or consume illuminating gas, what object have we in view? To all who value the real progress of the gas industry, the answer would be, first, that gas must be not only completely, but economically, burnt, whatever the conditions or the kind of burner used—whether atmospheric or lighting burners; second, that the best possible light or heat must be obtained from the volume of gas consumed. Now the light from the combustion of gas is not merely obtained as a result of combustion pure and simple. It must be developed. Heat, on the other hand, is independent of development. By the action of complete combustion the amount of heat evolved is absolutely the same in every case, no matter how burned; and this admits of no exception. Of course, the amount of heat varies with different samples of gas; so that all we can do is to aim at utilizing in some useful way as much as possible of the heat evolved. It is of the utmost importance, when economy is of the slightest consideration, that the burner shall be designed to obtain in regular use the best possible result for each special purpose. Let me quote a passage from the "JOURNAL OF GAS LIGHTING" for Nov. 2, 1909, p. 300, on the test-burner, to emphasize this point: "Everything possible that is effective in assisting the industry, even in respect of the proper

* Mr. M'Laren's paper was noticed in the "JOURNAL" for Dec. 7 last (p. 679), and Mr. Smith's in the issue for the 8th ult. (p. 665).

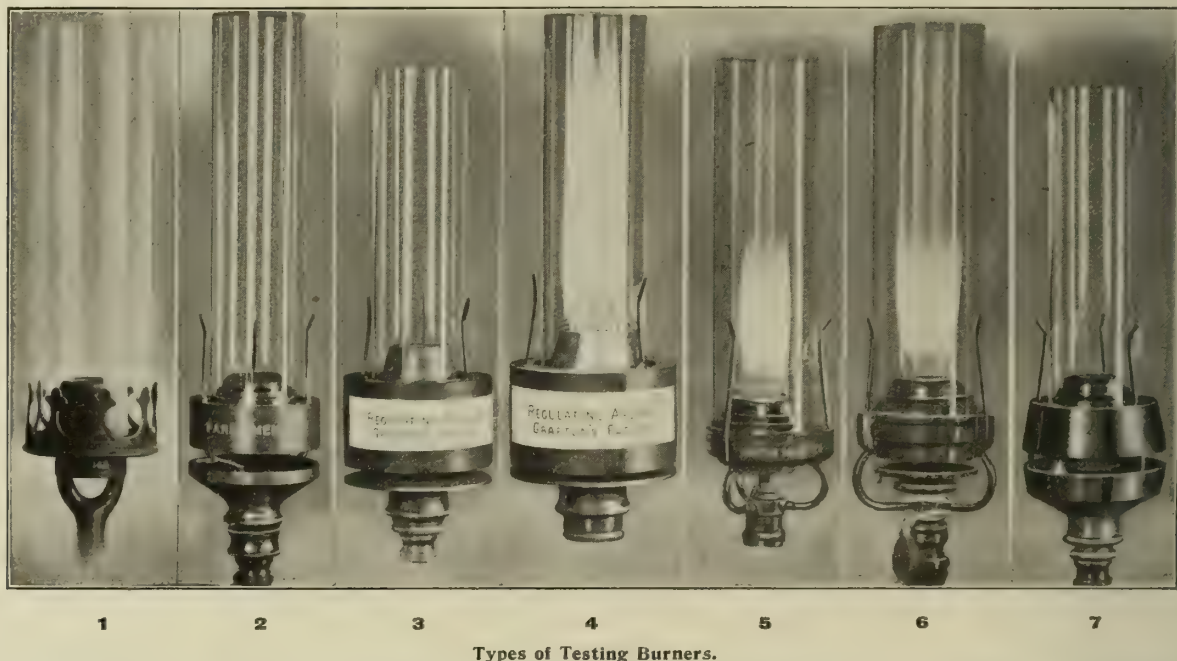
valuation of the gas supplied, must be done for the sake of progress in the right direction." By law, the burner to develop the lighting value of gas is an argand. Now this type of burner dates back over one hundred years; for I find it mentioned by our respected pioneer, Murdoch, in a paper he read before the Royal Society in 1808. Quoting from the paper he wrote: "The gas-burners are of two kinds—the one is upon the principle of the argand lamp, and resembles it in appearance, the other is a small curved tube with a conical end, having three circular apertures or perforations." Then, in the third edition of Accum's "Treatise on Gas-Lights (1816)" we read: "The burners are formed in various ways. Two concentric tubes of brass or sheet iron are placed at a distance of a small fraction of an inch from each other, and closed at the bottom. The gas which enters between these cylinders, when lighted, forms an argand lamp, which is supplied by an internal and external current of air in the usual manner." Now in Murdoch's paper already referred to, we find it stated that each of the argands in use gave "a light equal to that of 4 candles (mould candles of six to the pound);" and each of the cockspurs (referring to this type of burner) "a light equal to 2½ of the same candles." From these results one can only conclude that, besides being burnt in an ignorant and wasteful manner, the gas consumed was very deficient in illuminating value in those days.

Very little is known of the actual quality of gas supplied to the public prior to 1860. In that year, a standard of lighting value and provision for testing were first enacted in the Metropolis Gas Act. The standard of 12 candles was fixed for common gas, to be consumed at 5 feet per hour in an argand burner having 15 holes and a 7-inch chimney. There were several of this type of burner. I have here a Sugg-Letheby model for 14-candle gas, as will be seen from the mark "14 C" on the side of the burner

(fig. 1). Before the Gas Referees prescribed a burner for testing, it was very much a case of trial and rejection—trying first one burner then another, till the proper one was found. Dr. Letheby's rule was as follows: "The standard burner is arranged so that the supply of air to the interior and exterior of the column of flame shall be sufficient properly to consume the standard quantity of gas. Under no circumstances should the gas be tested for illuminating power unless it is properly consumed without over-oxidizing the flame." Let us see how this old 14-candle burner, having 15 holes and "perforated regulator for air," develops 15½-candle coal gas consumed at 5 cubic feet an hour, in other chimneys besides the 7-inch.

| Length of Chimney. | Illuminating Power of Flame. | | |
|--------------------|-------------------------------------|------------------|---------------------|
| | Air Open (Chimney Regulation only). | Length of Flame. | Character of Flame. |
| Inches. | | Inches. | |
| 4½ | 10'80 | 3½ | Good. |
| 5 | 10'37 | 2½ | " |
| 6 | 10'37 | 2½ | " |
| 7 | 10'20 | 2½ | Short. |

The 4½-inch chimney was the shortest that would allow 5 feet to burn in it, and developed the highest result; being only 0·6 candle better than the stipulated 7-inch chimney. With this old burner, the bulk of the air passes directly up the chimney without ever developing the gas-flame. This cannot happen with the modern burners, because the air is caused to flow directly to the flame; hence, if not regulated, the flame is so rapidly consumed



Types of Testing Burners.

- No. 1.—"Sugg-Letheby," fifteen-hole argand and 7-inch by 1½-inch chimney, with perforated regulator for air. No. 2.—"Parliamentary" fifteen-hole argand and 7-inch by 1½-inch chimney, with regulator having perfect control of all air. No. 3.—No. 1 "London" argand with 6-inch by 1½-inch chimney, with air regulator attached. No. 4.—Same burner, but showing the flame adjusted to the verge of smoking. No. 5.—"Ideal" or Grafton twenty-four hole argand with 6-inch chimney and flame. No. 6.—No. 2 "Metropolitan" with 6-inch chimney, showing the third air supply shut and resulting flame. No. 7.—The "Universal" twenty-four hole argand with 6-inch by 1½-inch chimney, and regulator controlling all air supply.

that it only develops heat instead of light, which is of no advantage whatever to the consumer, and simply brings discredit to the manufacturer. Yet I might say this burner was used all over the world. It was clearly too early in the history of gas lighting to prescribe maximum value; and we do not find any such provision until the London Gas Act of 1868. This Act required the Gas Referees to prescribe the burner to be used, and that "it shall be such as shall be the most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer." In pursuance of this requirement, the Gas Referees prescribed, on March 31, 1869 (just 41 years ago), Sugg's "London" argand (that size having 24 holes, then called "No. 1" but now known as "No. D") as the standard test-burner for London. Its dimensions were altered about Dec. 10, 1870, particularly the centre aperture (0·47-inch diameter), and again, on July 25, 1876, Dr. Pole sent Mr. Sugg the settled dimensions of the standard argand test-burner, providing for chimneys for 16-candle and 14-candle gas.

The No. 1 argand has been used in very many ways, with but one object—to better develop the light from the gas burnt in it. From an old note book given me by the late Mr. William Sugg, I glean: "That an argand burner for the economical burning of gas requires its regulating apparatus for the admission of air as much as an argand burner for burning oil." As near as I can tell, this was written by him in 1867, yet, strange to say, was never acted up to other than the fixed dimensions laid down by the Gas

Referees. The No. 1 "London" argand burner is subject to variation in the quantity of air drawn in by the volume of flame in the chimney, let alone the effect of temperature, volume, and kind of gas consumed in it. This I have now altered, with what success will be best judged by the results given in the lower part of Tables I. and II. I regret, however, the burner cannot be made more perfect without structural alterations, leaving out of consideration my earlier structural modification (figs. 2 and 3). The results, nevertheless, are very interesting, as showing what can be done by proper control of the air supply, and are, in many cases, better than those by the No. 2 "Metropolitan" argand. The flame can be actually raised above the top of chimney before smoking, as fig. 3 clearly shows. If nothing else, the figures go to prove that any advance in the quality of the gas is not the result of the change of burner, but simply and solely a matter of air regulation bringing out of the gas that which is in it "without over-oxidizing the flame," as Dr. Letheby specified for but never realized. With carburetted water gas the old 16-candle flame basis of using the burner with full air is superior to the Metropolitan regulation method.

The opposition to anything good if new is passingly strange. The opposition to-day to the general adoption of a change of burner is not, however, new. In 1869, Mr. T. W. Keates, F.C.S., considered the No. 1 "London" argand burner raised the lighting power of common gas by 16 per cent., to the detriment of the common fish-tail burner for the public. But I contend the

consumer was, and is, no worse off by the better apprizement of the gas. In those days the flat-flame burners were not so good as at the present time, and 6, 7, and 8 candles per 5 cubic feet was the order of the day, or 51 per cent. as compared with the argand results. Advance has been made with the flat-flame burners (independent altogether of the magnificently economical incandescent mantle lighting) as well as with the testing burner; for the public get, on an average, to-day, over 66 per cent. of the actual value from modern flat-flame burners. In other words, 9 to 10 candles, or 1·8 to 2 candles per foot of gas, as rock-bottom value, is obtained, which is considerably more than the figures given in Table A (p. 45). I have a fine specimen of the old regulator burner, bearing the Crown coat of arms, and which dates back to 1858. The regulator consists of a plug of fine iron wire; and the results per 5 cubic feet are poor alongside the Referees' Bray flat-flame burner used to-day. Some interesting figures are given in Table B, which clearly show what can be obtained by the better blending of the burners in this day of pressure requirements.

Finality in the construction of argand burners has not been reached by the No. 2 "Metropolitan" argand, which is my "Ideal" burner (fig. 4) modified by removing the patented centre peg-head and adding the Carpenter air-regulator. Having tried all kinds, varieties, and qualities of illuminating gas in the No. 2 "Metropolitan" burner, in England, Scotland, and Ireland—and which fairly represents the gas supplied in Britain—I find that it does not bring the results within the requirements laid down by Parliament in 1868-69 and cited above. Further, Parliament, in the London Gas Act, 1905, again enacted that the Gas Referees shall prescribe the burner for testing the illuminating value of the gas supplied by the London Gas Companies, subject to this condition—that "the burner so prescribed shall be of such a pattern (not being an incandescent or similar burner) as shall be practicable for use by the consumer; and the burner and the chimney (if any) shall be the most suitable for obtaining, and in making the test shall be so used as to obtain, from the gas, when consumed at the rate of 5 cubic feet an hour, the greatest amount of light." From this the Gas Referees are under the obligation to prescribe the most suitable burner that will comply with this requirement. Also, the Model Testing Clauses provide for the use of the "most suitable burner" and the "greatest amount of light" being got from the gas.

In bygone days, the actual choice of the burner was left to the users, so long as it complied with the restrictions laid down. These, as well as the other more important requirements of modern gas supply, have to be taken and provided for when constructing an efficient argand burner that will develop the "greatest amount of light" from the gas consumed at the stipulated rate of 5 cubic feet an hour. It is no wonder that the making of such a burner has taken up so much time and ingenious skill; and the remarkable degree of efficiency to which it has been brought is testimony to the thought and perfect knowledge possessed of the principles of combustion which have been bestowed upon it. The true principles of construction are only evinced in modern argands that are capable of consuming any kind of illuminating gas to the best possible advantage, alike for the gas authority as for the consumer. The modern "Parliamentary" argand having 15 holes and a 7 in. by 1½ in. chimney is one of them (fig. 5); but I prefer a 24-hole argand, such as the No. 1 "London" or the "Ideal." The latest development in argands has 24 holes, and a 6 in. by 1½ in. chimney. It is a further development of the air-regulating type, but with total control of the air supply. One form is illustrated by fig. 6. It is on the principle of no air no gas combustion. It has been called the "Universal" No. 3 because it develops the light of the three kinds of gas supplied to the public to-day. Comparative results obtained with the "Universal" and No. 2 "Metropolitan" burners, by using both in the same way, are given in Tables I., II., and III. The results clearly show that the "Universal" burner is the most suitable to the changed conditions of modern gas supply and use. Tables IV. and V. illustrate some remarkable results. Besides the earlier regulation method of setting the flame to just smoking, then opening the damper half-a-turn, the third supply of air or quantity not under control in the No. 2 "Metropolitan" burner is closed, causing the flame to smoke badly, or, if not smoking (fig. 7), the flame can be regulated in the usual manner—in either case yielding a higher value for the gas than the present regulation method. Other methods are given, clearly proving that the No. 2 "Metropolitan" burner does not develop the "greatest amount of light," but often defeats its object by yielding a lower value. Side by side are given the results by the new argand, which are much in advance of anything yet obtained by the No. 2 "Metropolitan" argand. The range of the "Universal" is greater, and the results certain and uniform; and, in the words of the Act, the "greatest amount of light" obtainable from the combustion of 5 cubic feet an hour is secured. We want success and not failure. The "Universal" burner is full of atmosphere of the right kind, void of all personal element in yielding the value of the gas if properly regulated.

Lighting value is the only true criterion by which the value of illuminating gas may be judged for all domestic and public lighting. Blue gas in a lamp, inside or outside, is no security to life or property without a mantle; and it is for this good purpose that we require a lighting test—certainly not a flat-flame test, because, knowing the candle value of a gas by the argand, we also know the relative value by a good flat flame. This latter is at once secured by means of a Bray's No. 7 economizer being placed over any "rough" old fish-tail "friend," increasing the light as shown in Table B, which is self-explanatory. These tests are more severe on the burners than those given in Table A. A calorific standard

is out of the question, for it has taken us a hundred years to learn how to arrive at the true illuminating value. Many may think be industry's troubles would cease by having a heating test. It do not think so. They may; but when are you going to start—that is, in fairness to the gas industry. I suggest that 31 B.Th.U. net per candle is a fair and desirable heating value for 14-candle gas as a fixed unit of heat, with a margin of 5 per cent. before any penalty be imposed, because one must not forget that the lighting value test will guard the calorific value. Mr. E. H. Stevenson was much of this opinion when he, some time ago in the House of Commons, said: "The calorific value of the gas is very well known if you know what the illuminating power of it is."

To-day, economies are pressingly necessary in the interests of the consumers, especially seeing that the industry has to fight a

TABLE I.—Illuminating Value of Coal Gas.

| No. 2 "Metropolitan" Argand 6 in. by 1½ in. Chy. and 5 Cub. Ft. per Hour. | | "Universal" Argand No. 3 6 in. by 1½ in. Chy. and 5 Cub Ft. per Hour. | | Increase in Value. | |
|---|--|---|--|--------------------|-------------|
| Regulation Method. Carpenter Regulator. Flame Set to Verge of Smoking. | | Grafton Regulator. Flame Set to Verge of Smoking. | | Candles. | Percentage. |
| Candles. | | Candles. | | | |
| 13'08 | | 14'17 | | 1'09 | 8'33 |
| 13'71 | | 14'71 | | 1'00 | 7'30 |
| 13'87 | | 14'75 | | 0'88 | 6'34 |
| 14'16 | | 15'07 | | 0'91 | 6'33 |
| 14'18 | | 14'97 | | 0'79 | 5'57 |
| 14'19 | | 14'96 | | 0'77 | 5'43 |
| 14'68 | | 15'28 | | 0'60 | 4'09 |
| 14'76 | | 15'70 | | 0'94 | 6'09 |
| 15'10 | | 16'37 | | 1'27 | 8'41 |
| 15'74 | | 17'04 | | 1'30 | 8'26 |
| 18'79 | | 19'62 | | 0'83 | 4'42 |
| 19'18 | | 20'15 | | 0'97 | 5'05 |

| No. 2 "Metropolitan" Argand 6-in. Chy. and 5 Cub. Ft. | No. 1 "London" Regulating 6 in. by 1½ in. Chy. | | | |
|--|--|---|-------------------------------------|--|
| | 5 Cub. Ft. per Hour. | | 16-Candle Flame. | |
| Regulation Method. Carpenter Regulator. Flame to Verge of Smoking. | Full Air Supply. | Grafton Regulator. Flame to Verge of Smoking. | At Full Air. Candles per 5 Cub. Ft. | Then Regulated to Verge of Smoking. Candles per 5 Cub. Ft. |
| Candles. | Candles. | Candles. | | |
| — 13'84 | 11'93 | 13'54 | 13'48 | 13'85 (a) |
| — 14'19 | 12'75 | 14'00 | 13'84 | 14'27 (a) |
| — 14'66 | 12'80 | 14'42 | 14'32 | 14'87 (a) |
| Open 14'23 | 15'70 | 17'00 | 15'88 | 17'18 (b) |

(a) Coal Gas.

(b) Carburetted Water Gas.

TABLE II.—Illuminating Value of Mixed Coal and Carburetted Water Gas.

| No. 2 "Metropolitan" Argand 6 in. by 1½ in. Chy. and 5 Cub. Ft. per Hour. | "Universal" Argand 6 in. by 1½ in. Chy. and 5 Cub. Ft. per Hour. | Increase. | | Calorific Value. | |
|---|--|-----------|-------------|------------------|--------------|
| | | Candles. | Percentage. | B.Th.U. Gross. | B.Th.U. Net. |
| Regulation Method. Carpenter Regulator. Flame to verge of Smoking. | Grafton Regulator. Flame set to verge of Smoking. | | | | |
| Candles. | Candles. | | | | |
| 13'90 | 15'32 | 1'42 | 10'22 | | |
| 13'92 | 15'37 | 1'45 | 10'42 | 553 | 498 |
| 14'01 | 15'48 | 1'47 | 10'50 | | |
| 14'10 | 15'41 | 1'31 | 9'30 | 551 | 515 |
| 14'24 | 15'50 | 1'26 | 8'85 | | |
| 14'56 | 15'79 | 1'23 | 8'45 | | |
| 14'76 | 15'98 | 1'22 | 8'46 | 537 | 492 |
| 15'22 | 16'49 | 1'27 | 8'34 | | |
| 15'25 | 16'92 | 1'67 | 10'95 | 540 | 504 |
| 16'44 | 17'82 | 1'38 | 8'39 | | |
| 17'01 | 17'97 | 0'96 | 5'64 | | |
| 18'30 | 19'31 | 1'01 | 5'52 | | |

| No. 2 "Metropolitan" Argand 6 in. Chy. and 5 Cub. Ft. | | No. 1 "London" Argand Regulating 6 in. by 1½ in. Chy. | | | | "Wands- worth" 7 in. Argand 7 in. by 1½ in. Chy. and 5 Cub. Ft. | |
|---|---|--|--|---|---|---|--------|
| | | 5 Cub. Ft. per Hour. | | 16-Candle Flame. | | | |
| Full Air Supply. | Regulation Method. Carpenter Regulator. To Verge of Smoking. | Full Air Supply. | Grafton Regulator. To Verge of Smoking. | At Full Air Supply. Candles per 5 Cub. Ft. | Then Regu- lated to Verge of Smoking. Candles per 5 Cub. Ft. | Chimney not Full of Flame. | |
| Candles. | Candles. | Candles. | Candles. | | | | |
| 11' 22 | 13' 90 | 11' 00 | 13' 88 | 13' 67 | 14' 18 | .. | |
| 10' 54 | 13' 92 | 10' 42 | 13' 93 | 12' 95 | 14' 00 | .. | |
| 12' 08 | 14' 56 | 11' 91 | 14' 90 | 13' 28 | 14' 52 | .. | |
| 10' 35 | 14' 76 | 10' 52 | 14' 02 | 13' 20 | 14' 77 | .. | |
| 11' 24 | 14' 24 | 12' 32 | 14' 33 | 14' 14 | 14' 86 | | 13' 66 |

TABLE III.—Illuminating Value of Carburetted Water Gas.

| By No. 2 "Metropolitan" Argand 6 in. by 1½ in. Chy. and 5 Cubic Feet Per Hour. | | | By "Universal" No. 3 Argand, 6 in. by 1½ in. Chy. and 5 Ft. | | Increases. | | Calorific Value. | | |
|--|--|--------------------------------|---|------------------------------------|------------|---|------------------|---------|------|
| Full Air Supply. | Regulation Method. Carpenter Regulator. Flame Set to Verge of Smoking. | Regulator Half Turn More Open. | Flame Regulated to Verge of Smoking. | Half Turn Above Regulation Method. | | "Universal" Above No. 2 "Metropolitan." | | B.Th.U. | |
| Candles. | Candles. | Candles. | Candles. | Candles. | Per Cent. | Candles. | Per Cent. | Gross. | Net. |
| 6'90 | 11'38 | 12'33 | 14'14 | 0'95 | 8'25 | 2'75 | 24'05 | | |
| 7'92 | 13'78 | .. | 16'66 | .. | .. | 2'88 | 20'90 | | |
| 10'60 | 15'59 | 15'71 | 17'56 | 0'12 | 0'77 | 1'97 | 12'64 | | |
| 10'62 | 15'06 | .. | 16'81 | .. | .. | 1'75 | 11'62 | 473 | 440 |
| 11'24 | 13'97 | 14'45 | 17'05 | 0'48 | 3'50 | 3'08 | 22'04 | 477 | 445 |
| 12'37 | 15'63 | .. | 18'00 | .. | .. | 2'37 | 15'16 | .. | .. |
| 14'50 | 16'03 | 16'92 | 18'11 | 0'89 | 5'55 | 2'08 | 12'97 | 489 | 454 |
| 15'11 | 16'40 | 17'30 | 19'04 | 0'90 | 5'50 | 2'64 | 16'10 | .. | .. |
| 15'75 | 16'56 | 17'65 | 19'13 | 1'09 | 6'58 | 2'57 | 15'52 | .. | .. |
| 16'25 | 17'38 | .. | 20'03 | .. | .. | 2'65 | 15'24 | .. | .. |
| 16'73 | 17'46 | .. | 19'85 | .. | .. | 2'39 | 13'69 | | |
| 17'00 | 17'39 | 18'47 | 19'53 | 1'08 | 6'21 | 2'14 | 12'30 | | |
| 17'48 | 17'39 | 19'05 | 19'69 | 1'66 | 9'54 | 2'30 | 13'22 | | |
| 17'55 | 17'35 | .. | 20'33 | .. | .. | 2'98 | 17'17 | | |
| 18'35 | 18'16 | .. | 21'15 | .. | .. | 2'99 | 16'46 | | |
| 18'37 | 18'24 | 19'16 | 20'19 | 0'92 | 5'04 | 1'85 | 10'14 | | |
| 18'40 | 18'22 | .. | 20'67 | .. | .. | 2'45 | 13'44 | | |
| 18'60 | 18'10 | 19'24 | 19'88 | 1'14 | 6'30 | 1'78 | 9'83 | | |
| 18'65 | 17'95 | 19'02 | 20'09 | 1'07 | 6'00 | 2'14 | 11'92 | | |
| 18'75 | 18'15 | 19'21 | 20'20 | 1'06 | 5'84 | 2'05 | 11'29 | | |
| 19'73 | 18'73 | .. | 20'16 | .. | .. | 1'43 | 7'64 | | |
| 20'48 | 19'77 | .. | 21'42 | .. | .. | 1'65 | 8'34 | | |
| 21'04 | 20'01 | .. | 21'86 | .. | .. | 1'85 | 9'24 | | |
| Average of six | Less gas than | 5 ft. = 4'6 ft. | | | | | | | |
| 21'59* | 20'98 | 22'64 | 24'82 | 1'66 | 7'91 | 3'84 | 18'30 | | |

* 2'97 per cent. increase above Regulation Method.

TABLE IV.—Illuminating Value of Carburetted Water Gas.

| By No. 2 "Metropolitan" Argand 6 in. x 1½ in. and 5 Cubic Feet per Hour, with 7-inch Chimney. | | | | | | | | | | | | | | The "Universal" No. 3 Argand 6 in. x 1½ in. Chimney and 5 Cubic Feet per Hour. | |
|---|---------------|--|------------------|-----------------------------|------------------|----------------------------------|------------------|--|------------------|----------------------------------|------------------|--|------------------|--|------------------|
| Full Air Supply. | Flame Length. | Regulation Method. | | Regulator ½ Turn More Open. | Length of Flame. | Third Supply of Air Shut. | | | | Third Supply of Air Shut. | | | | Grafton Regulator Set to Verge of Smoking. | Length of Flame. |
| | | Carpenter Regulator Set to Verge of Smoking. | Length of Flame. | | | Centre and Middle Supplies Open. | Length of Flame. | Carpenter Regulator Set to Verge of Smoking. | Length of Flame. | Centre and Middle Supplies Open. | Length of Flame. | Carpenter Regulator Set to Verge of Smoking. | Length of Flame. | | |
| Candles. | Inches. | Candles. | Inches. | Candles. | Inches. | Candles. | Inches. | Candles. | Inches. | Candles. | Inches. | Candles. | Inches. | Candles. | Inches. |
| 7'00 | 1½ | 11'40 | 5 | 12'34 | 1½ | 6'92 | 1½ | 10'97 | 2½ | .. | .. | .. | .. | 14'15 | 2½ |
| 12'37 | .. | 15'63 | .. | .. | .. | 15'63 | .. | 16'75 | .. | .. | .. | .. | .. | 18'29 | .. |
| 14'23 | 2 | 15'70 | .. | 17'32 | .. | 16'35 | 2 | 18'13 | 3 | .. | .. | .. | .. | 19'13 | .. |
| 15'33 | .. | 16'52 | 4½ | 17'45 | 2½ | .. | .. | .. | .. | 14'99 | 2½ | 17'20 | 3½ | 19'16 | 4 |
| 17'00 | 2 | 17'39 | .. | 18'47 | 2½ | 17'60 Smoking | .. | .. | .. | 18'26 | 2½ | 18'80 | 2½ | 19'53 | 3½ |
| 18'48 | 2½ | 18'07 | .. | 19'13 | 2½ | 19'63 Smoking | .. | .. | .. | 19'49 | 2½ | 20'64 | 3½ | .. | .. |
| 18'64 | 2½ | 17'95 | 4½ | 19'02 | 2½ | .. | .. | .. | .. | .. | .. | 19'94 | 3 | 20'09 | 3½ |
| 18'60 | 2½ | 18'10 | 4½ | 19'24 | 2½ | .. | .. | .. | .. | .. | .. | 19'96 | 3½ | 20'25 | 3½ |
| 18'75 | 2½ | 18'15 | 4 | 19'21 | 2½ | .. | .. | .. | .. | .. | .. | 20'27 | 2½ | 20'29 | 4 |
| Smoking badly, so reduced gas to verge of smoking 21'70, rate 4'4 cubic feet | | | | | | | | | | | | | | | |
| All open full air 20'65, rate 4'4 cubic feet | | | | | | | | | | | | | | | |
| Air regulated to verge of smoking 18'70, rate 4'4 cubic feet | | | | | | | | | | | | | | | |
| 19'48 | .. | 18'18 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 20'98 | 2½ | Brown flame 19'73 | 4½ | .. | .. | .. | .. | .. | .. | 22'53 | Smoking badly | .. | .. | .. | .. |

TABLE V.—Illuminating Value of Carburetted Water Gas.

| By No. 2 "Metropolitan" Argand. | | | | | | | | | The "Universal" Argand 6-inch Chimney. | "Wandsworth" Argand 7 in. by 1½ in. Chimney. | Parliamentary Argand 7 in. by 1½ in. Chimney. |
|-------------------------------------|----------------------|--------------------|---|---------------------------|---|----------------------|---|---|--|--|--|
| Full Air Supply. | Cubic Feet per Hour. | Length of Chimney. | Regulation Method. Carpenter Regulator Set to Verge of Smoking. | Third Supply of Air Shut. | Reduced Gas Consumption. | | | | "Grafton" Regulator Set to Verge of Smoking. Candles per 5 Cubic Feet. | No Regulator, would not Burn 5 Cubic Feet; Gas reduced to 4½ Cubic Feet. Chimney Full. Candles per 5 Cubic Feet. | Gas Reduced to Verge of Smoking. Candles per 5 Cubic Feet. |
| | | | | Flame Smoking Badly. | Full Air Supply. | Cubic Feet per Hour. | Carpenter Regulator. Set to Verge of Smoking. | Third Supply of Air Shut. Verge of Smoking. | | | |
| Results calculated to 5 Cubic Feet. | | | | | | | | | | | |
| Candles. 21'40 | 5'00 | Inches. 6 | Candles. 20'76 | Candles. 21'40 | Candles. 22'32 | 4'40 | Candles. 20'51 | Candles. 24'26 | 24'35 | 20'10 | .. |
| 21'22 | 5'00 | " | Verge of smoking | .. | | | | | | | |
| 22'05 | 4'50 | " | .. | 22'80 | 21'97 | 4'30 | 20'98 | 23'71 flame 3½ in. | 23'90 | .. | .. |
| 21'16 | 5'00 | 5 | 20'77 | 20'70 | { 23'07 4'30 20'23 24'31 3½ in. Third air supply shut gas to just smoking Full air supply } | | | | .. | .. | .. |
| 21'49 | 5'00 | 7 | 20'06 | .. | 23'54 | 4'55 | 19'03 | 22'62 | .. | .. | .. |
| 22'16 less gas | 5'00 | 6 | 21'87 | .. | .. | .. | .. | .. | .. | .. | 25'67 |
| 24'00 | 4'40 | .. | 19'33 | .. | .. | .. | .. | .. | .. | .. | .. |

TABLE A.—Flat-Flame Results of Gas in 1860-1868.
[Illuminating power by 15-hole Argand burner, 7-inch chimney, consuming 5 cubic feet per hour, gave a light of 14-candles.]

| Burner. Batswing. | Pressure in Tenths of an Inch. | Quantity of Gas Consumed. | Illuminating Power. | Value of 1 Cubic Foot of Gas. |
|----------------------|--------------------------------------|---------------------------------|------------------------|-------------------------------------|
| | | Cubic Feet. | Candles. | Candles. |
| No. 3 | 20 | 5'0 | 6'00 | 1'20 |
| " | 15 | " | 6'50 | 1'30 |
| " | 10 | " | 8'00 | 1'60 |
| No. 4 | 5 | " | 8'90 | 1'78 |
| No. 6 | 25 | 12'5 | 9'75 | 0'78 |
| " | 10 | 11'0 | 7'05 | 1'41 |
| " | 5 | 5'0 | 9'00 | 1'83 |

The slits in the burners were slightly enlarged, with the following results:—

| | | | | |
|-----------------|----|-----|------|------|
| No. 3 | 10 | 5'0 | 9'00 | 1'80 |
| " 4 | 10 | " | 9'50 | 1'90 |

| With Newcastle Gas. | | | | |
|------------------------|----|-----|------|------|
| Large 15-hole argand { | 3½ | 7'0 | 22'0 | 3'14 |
| Batswing No. 7 . . . | 4½ | 5'0 | 14'0 | 2'80 |
| " " 5 | 4½ | 5'0 | 9'0 | 1'80 |
| Fishtail " 6 . . . | 6½ | 5'0 | 8'6 | 1'72 |
| " " 5 | 9 | 5'0 | 9'3 | 1'86 |
| " " 5 | 9 | 5'0 | 6'3 | 1'26 |

From this table, to quote the late Mr. Sugg in 1867-8, "the standard argand burner will, when consuming common gas, be found to produce a light from each cubic foot of gas 50 per cent. superior to the large batswing."
Then again in 1883, Mr. T. Fairley, F.R.S.E., of Leeds, carried out many tests of gas by flat-flame burners. I need only give a few to show that in those days the gas was either not so good as credited by the argand or the burners were poor developers of light, which amounts to the same thing.

| Burner. | Pressure in Tenths of an Inch. | Consumption per Hour. | Illuminating Power per 5 Cubic Feet. | — |
|---------------------|--------------------------------------|-----------------------------|--|---|
| | | Cub. Ft. | | |
| Fishtail— | | | | Quality of gas 19 candles by the standard No. 1 "London" argand. |
| No. 3 regulator . | 10 | 4'80 | 7'20 | |
| " " " | 15 | 6'20 | 6'05 | |
| No. 4 " " | 15 | 8'20 | 8'80 | |
| Batswing— | | | | |
| No. 3 regulator . | 10 | 5'64 | 14'80 | |
| " " " | 15 | 7'83 | 13'40 | |

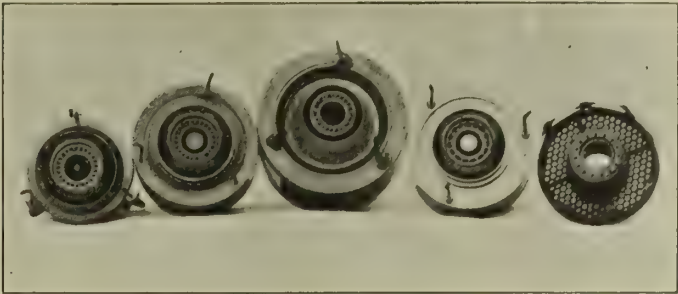
The above tests are of the flat side of the flame.
In Table B are given the results of gas tested at the rate of 5 cubic feet per hour, with special reference to the pressure required in order to ensure this, and the illuminating value of gas under examination.

TABLE B.—Gas Tested at 5 Cubic Feet per Hour.
[Flames at an angle of 45° to the disc.]

| | | | |
|---|---|---|---|
| No. 4 regulator flat-flame. Candles. 8'81 at 6-10ths. | 5 on 4. Candles. 14'01 at 9½-10ths Increase 59'0 in light } p.ct. | 7 on 4. Candles. 15'30 at 7-10ths 73'6 p.ct. | W. & D. on 4. Candles. 13'7 at 6½-10ths 55'5 p.ct. |
| | | | |
| No. 3 regulator. 5'54 at 10-10ths. | 5 on 3. 13'02 at 13-10ths Increase 134'2 p.ct. | 7 on 3. 15'46 at 11-10ths 180'5 p.ct. | W. & D. on 3. 13'65 at 9½-10ths 145'5 p.ct. |
| | | | |
| No. 2 regulator. 3'47 at 14-10ths. | 5 on 2. 12'53 at 15-10ths Increase 261'4 p.ct. | 7 on 2. 15'57 at 13-10ths 348'7 p.ct. | W. & D. on 2. 13'40 at 12½-10ths 286'1 p.ct. |
| | | | |

NOTES.
W & D. = Williams and Dean's thimble.
5 on 4 = Bray's No. 5 economizer on No. 4 fishtail.
7 on 3 = " No. 7 " " No. 3 "

competitor absolutely unfettered in its actions. Again, some men claim that a reduction of the standard price chargeable for the gas should be imposed by way of compensation for any advantage that would follow the adoption of a change of burner. I do not support, whole heartedly, such a course, because, supposing a gas company were supplying 14-candle gas, and ultimately obtained sanction to use a better burner but still supply 14-candle gas, the value of the gas is the same from a lighting point of view. The candle power is not cut down. The candle referred to is a standard candle; and although one or more is obtained for the gas by the change of burner, the consumer gets practically all the benefit of the change, which undoubtedly allows us to take advantage of any improved method of manufacture. Anything that enables us to sell gas more cheaply is in the public interest, and, again I say, it is what the whole industry is striving for to-day—full justice to be done to the gas. Fig. 8 shows the structure of the



8
Types of Testing Burners.
No. 8.—Showing the general structure of the holes and air-ways of the Sugg-Letheby; Parliamentary; No. 1 "London;" Ideal; and No. 2 "Metropolitan" argands.

holes and the outlet air-ways of the Sugg-Letheby parliamentary No. 1 "London" argand with complete control of the air supply, and the "Ideal" and No. 2 "Metropolitan" argands.
As the time is getting on, I must leave the practical and utilitarian side of the heating value of gas until another time; but I want to show you another new step—a red-hot gas-flame. We have all seen a blue atmospheric gas-flame of one degree or other of the Bunsen character in the cooker, the gas-fire, and incandescent burner, each playing its part more or less economically. The most urgent improvement is needed either in the way we burn our gas in our gas-fires, or the gas-fires themselves must be remodelled. I predict that the truly ideal gas-fire is not invented; but it will come. Here we have a red-hot and an ordinary good Bunsen blue flame. Hard glass is not affected by the blue flame; but in the red-hot one it readily melts to dropping point. This is a valuable flame, and it is one that I am trying to utilize more effectively.
In conclusion, I have to thank all those who have in one way or other rendered me assistance, whether in Scotland or England, and for your attention this evening. I am glad of one thing—that two steps in advance have been made in Glasgow for the gas industry, and particularly so when it is considered that it was in Glasgow in the year 1820 that the union-jet burner had its origin, in the joint invention of Mr. James B. Neilson, the Manager of the Glasgow Gas-Works, and Mr. James Milne, the founder of the firm of Milne and Son, of Glasgow. Therefore your city is already famed in gas history.

Discussion.
The PRESIDENT intimated that Mr. Grafton had kindly consented to throw open his lecture to discussion, and said he would be very pleased to answer any questions.
Mr. A. H. WHITELOW (Glasgow) thought the question of the red-hot flame had interested everyone in the meeting. The lecturer said it was not so fully aerated as was the bunsen flame; and yet it had a higher temperature. He (Mr. Whitelaw) would require to see this tested by a pyrometer before he could thoroughly comprehend it. He was always under the impression that the hottest flame they could get was the bunsen flame. They had seen experiments in which primary air driven in raised the temperature, and the flame became smaller up to a certain point, beyond which the temperature fell again, and finally they had the flame going out. There they had a flame which was not fully aerated, and yet they were told that it had a higher temperature than the bunsen flame. He had his doubts on the matter. As regarded this flame being useful in gas-fires, he sincerely hoped it might be; but it seemed to him to be a flame which was easily acted upon by draughts, whereas they wanted one that would stand a good deal of knocking about with wind. A flame in a gas-fire would have to be one that could do this if it was to be the success that was desired.

Mr. J. M'LEOD (Greenock) said he was much interested in the point of the flame which Mr. Grafton had shown them, and he would like to have a little more explanation with regard to it. He considered it extremely interesting to see that the new test-burner—the "Metropolitan" argand No. 2, of which they all thought so highly—was only a transition burner after all, and that they were still looking out for something better. He thought Mr. Grafton had demonstrated that he could achieve better results than could be obtained by the use of the new burner. He (Mr. M'Leod) had no doubt himself that the tests were absolutely right. In his own experience, he found that with the old argand he could get better results than with the Silber No. 1 "London" argand, which was the test-burner in use up to the time the "Metropolitan" burner was brought into use. This showed that even the standard test-burner was not the best for developing the illuminating power of the gas. In the same way, he thought, the "Metropolitan" must give way to Mr. Grafton's "Universal" burner.

Mr. J. NAPIER MYERS (Saltcoats) remarked that he was not at all an expert in photometry; but he was certainly impressed with the great care displayed by Mr. Grafton in connection with the information he had laid before them, and he was sure they were all extremely indebted to him. They could see, as the outcome of very careful experimenting, how varied the results were. It was apt to make the impression that the business of testing light

was still in a very elementary stage. This impression was not of recent origin, so far as he was concerned. He remembered reading, many years ago, a lecture by Mr. Sugg on the science of photometry, in which he indicated the many points to be watched in getting careful results. He recommended that small tubes should be frequently cleaned, and that attention should be given to the temperature of the room, in regard to heat and moisture, until the impression was made upon him (the speaker) then, as it was now, that the business was far too intricate for a practical man to look upon as a reliable means for maintaining the quality of his product equable. He had felt that the durability test was a very convenient and suitable one for use in gas-works; and he thought that next to this a calorific standard would probably be of more ready service for maintaining the gas of an equable character.

Mr. GRAFTON, in reply, said Mr. Whitelaw had remarked that he (Mr. Grafton) restricted the air supply. This was perfectly true; but he had omitted to note the simple way in which the gas was burnt to give the red-hot flame. It was not a question of stifling the air supply, but of burning the gas in an improvised way. In the place where he experimented, there was no trouble with draughts. From the red-hot flame he got a far greater radiation of heat than was obtained from an ordinary gas-fire. They did not want convected heat, but a beautiful glow, perhaps without the nuisance of smoke and such like. This was what he was aiming at. He was very much obliged to Mr. M'Leod for the kindly way in which he had dealt with the subject. He had sent round the Silber burner to let the members see it. It was not a bad burner; it was one about which there was some litigation with Mr. Sugg in bygone days. With regard to this particular burner, it had simply and solely been developed on the one idea. He had tried, as Mr. Carpenter had done, to establish that it was useless to build up an argand burner from the handling of the three air supplies. Mr. M'Leod was quite right in saying that the "London" argand No. 1 was often used to-day in preference to the "Metropolitan" argand No. 2 for testing carburetted water gas. In conclusion, Mr. Grafton expressed the hope that his lecture had been of service to the Association.

VOTES OF THANKS.

The PRESIDENT proposed a vote of thanks to Mr. Grafton, who, he said, had dealt with a subject which was of very special interest, not only to people connected with the gas industry, but to the public at large; and he had done it in such a manner that they would all benefit by his lecture when they had time to peruse it in the Technical Press.

Mr. GRAFTON having acknowledged the vote,

The PRESIDENT asked that a similar compliment should be paid to Mr. Vass and Mr. M'Leod for adjudicating upon the papers.

The request was cordially complied with.

Mr. J. FRASER proposed a vote of thanks to the President, for his services during his year of office.

The PRESIDENT assured the members that anything he had been able to do for the Association had been a pleasure to him. In attending the meetings he had gained what had more than recompensed him for any labours he had undertaken.

This closed the proceedings.

Presentation to Mr. William Maltster.

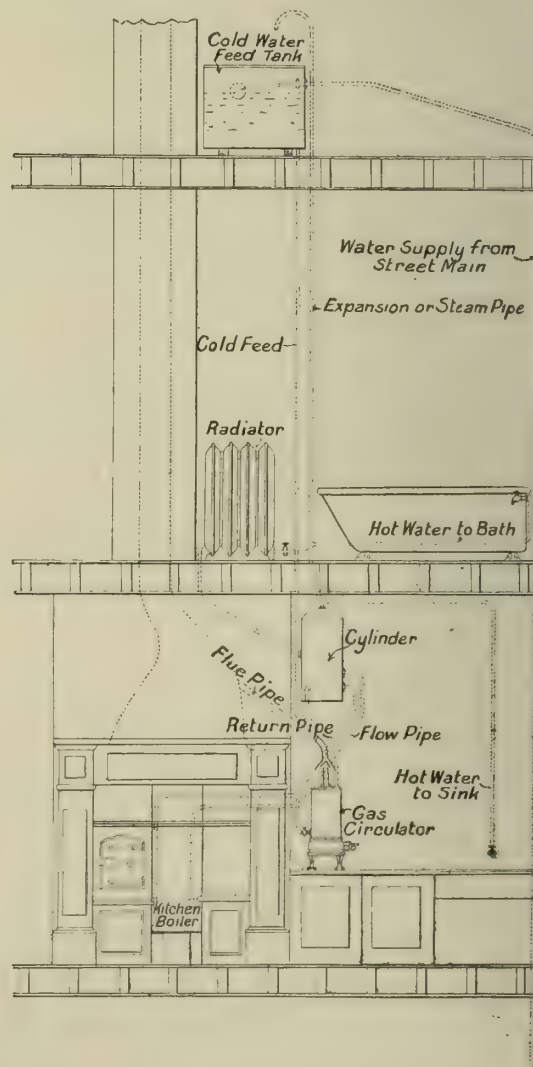
Mr. William Maltster, who for the last thirteen years has been principal foreman at the works of the South Suburban Gas Company, has just retired to enjoy the pension to which he is entitled under the Company's superannuation scheme. He has been in the service of the Company altogether about thirty-one years. Prior to his appointment as chief foreman, he had charge of the sulphate-works, where he carried out some important improvements, including the invention of a system of discharging the sulphate from the saturator, which is extremely ingenious and economical. Last Saturday, the employees of the Company met to say farewell to Mr. Maltster. The Engineer (Mr. S. Y. Shoubridge) presided, and was supported by the Workman-Directors (Messrs. Waller and Ross), the Assistant (Mr. J. W. Whimster), and others. Mr. Shoubridge said their meeting that day reminded them that the years were passing rapidly by, and that they were all fast hastening on to their journey's end. Mr. Maltster, who had gone in and out of the works every day for the last thirty-one years, would do so no longer, and they would all miss his familiar presence. By his long and faithful service, he had earned his right to rest and ease; and they were glad to know that the pension to which he is entitled would enable him to enjoy the remainder of his days in comfort and happiness. They did not suppose that Mr. Maltster was ever likely to forget his friends at Lower Sydenham, nor was it possible that those who had worked with him there would ever forget him. But they could not let him go without some tangible proof of their regard and esteem; and this had taken the form of a gold chain, which he hoped would serve to bind him to them for the rest of time. Before the presentation was made, Mr. Waller and Mr. Ross expressed the regard which they felt, and which they were sure all the employees felt, for Mr. Maltster, who they hoped would long be spared to enjoy the pension he so well deserved. In acknowledging the gift, Mr. Maltster said he could not find words adequately to express his thanks for all the kinds things that had been said of him, and for the handsome chain which had been presented to him. He should never forget their kindness, nor the happy time he had worked together with them.

WATER HEATING BY GAS CIRCULATORS.

After the proceedings reported as having taken place at the last meeting of the Yorkshire Junior Gas Association,

Mr. R. HALKETT, Assistant Superintendent in the Distribution Department of the Leeds Corporation, read a paper in which he dealt at length with the fixing and working of gas circulators. He was able to show a Wilson circulator in operation; and after explaining its advantages and capacity, he referred to the carrying out of internal fitting.

In many towns, said the author, all internal fitting is left in the hands of plumbers and ironmongers; but the gas undertakings would reap a veritable harvest if they undertook the control of such matters themselves. If, however, the gas suppliers cannot see their way to take over this department, some arrangement could surely be entered into by which fires and heaters, when fixed by local tradesmen, should be inspected and approved by an official of the undertaking. In this way, some check can be kept upon appliances being fixed where the conditions are unfavourable, upon faulty connections, for undue consumption of gas, &c. Where internal fitting is under the control of the gas undertaking, the work can be made as nearly perfect as possible, and gas appliances can be intelligently pushed. A good way is to get in touch with architects and builders in the neighbourhood. By their instrumentality, gas appliances, &c., can become more general, as they have frequent opportunities of recommending such things to probable consumers, when consulted by them, and people will often be guided by their advice. Then, again, with reference to new houses in the course of erection, builders and architects can be consulted as to the leaving of tees in suitable positions, when fixing up the flow and return pipes of an installation, so as to simplify the fixing of a circulator at any future time. Of course, a fixed charge would be allowed them for this consideration, after inspection by the undertaking.



In the case of fixing a circulator, it is essential that it shall be large enough to do the work demanded of it. All makers guarantee a certain size circulator to heat a given quantity of water; and therefore, when you know the quantity of water to be heated, it is an easy matter to ascertain the correct size of circulator to be used. Therefore the inspector, or the one supervising the job, will, on his first inspection of the work, note the size of the cylinder, the length of the flow and return pipes, and the conditions under which the pipes are placed, and so deduce the size of the circulator required. Heat is lost by radiation; and therefore the nearer the circulator is to the cylinder, the more econo-

mically it will work. In some installations, cold water has to be drawn off before any hot water is obtained; and considerable heat is lost in this way—the whole length of cold pipe having to be heated as the water travels. Therefore, from an economical point of view, this system is not to be recommended. If it is desired to estimate the cost of maintaining a constant supply of hot water, it is necessary to take the length of the flow pipe, and as 1 cubic foot of gas is equal to 3 square feet of heating surface per hour, it will be seen that an approximate length of 10 to 11 feet of 1-inch pipe can be kept sufficiently heated by 1 cubic foot of gas per hour. The amount used in different houses varies to a great extent, and it is impossible to consider this when estimating; but the above calculation will assist in giving an idea.

Explaining, by means of a sketch, the working of a hot-water installation on the cylinder principle, the author remarked that the flow and return from the cylinder to the boiler should have a gradual fall, and as few bends as possible. All sharp bends and square elbows (the latter particularly) are exceedingly detrimental, causing great friction on the flow of water; but it is sometimes impossible for them to be entirely avoided. Some installations are fitted up with iron pipes, and others with lead pipes. He prefers the latter where the water is hard, as lead pipes do not corrode. The drawback is that they are apt to sag, and thus become harmful to circulation. But this can be prevented by having them run on boards and fixed with clips, or supported by pipe-hooks, placed at regular intervals of not more than 18 inches apart. With a lead-pipe, a gradual sweep can be obtained, instead of a sharp bend as would be necessary with an iron pipe; and this would be of additional advantage to the circulation.

If the installation is in good working order, there is very little trouble in fixing the circulator to it. All supplies of water for domestic use should be taken off the top portion of the cylinder, or the expansion or steam pipe. When fixing the circulator, have the points chosen to which it is desired to connect the flow and return pipes, so as to be able to run them in such a position as to avoid as many bends and elbows as possible, bearing in mind that the fewer there are of these the better will be the circulation. After making the necessary connections, place the circulator and connect up to them. Either lead or iron pipes can be used to connect it to the flow and return pipes. Mr. Halkett prefers lead in this case also (unions, of course, being connected to the lead pipes with wiped joints), as often the distance for connecting is so limited that where iron pipe would throw a great strain on the connections to the heater lead pipe will yield in connecting up. A gradual rise, too, can be obtained with it, which is of great assistance to the circulation. Any bends or elbows used in connecting between the heater and the return pipe of the installation tend to make the circulation sluggish; and therefore it is advisable to make the connection in as direct a line as possible. If the main pipes are vertical, it is impossible to avoid one elbow or bend on the hot-water pipe, as this connection comes off the top. If all these points are carefully observed, there should not be any trouble with the water supply. The gas supply hardly calls for comment; but the supply should run direct from the meter, and nothing less than ½-inch pipe should be used. The flue-pipe is a very important point in fixing a heater, as it has great influence upon the calorific value received by the heater from the gas. One great point to be observed is that the heater derives the full benefit of the gas before it enters the flue; and this is greatly controlled by the way the flue is constructed, and the conditions under which it has to be worked. Owing to the baleful influence of condensation, it is best to use sheet copper for the flue-pipe, as it will better withstand the action of the vapour.

Sometimes it is possible to go directly from the heater to the kitchen flue with only one elbow on the flue-pipe; but at others as many as three or more elbows are required. These two different methods of fixing would require different treatment. In the first instance, a baffle should be fixed to prevent the keen draught drawing away the heated gases before the heater has derived full benefit from them. For the second case, a baffle should not be fixed, unless troubled with a down-draught, because the number of elbows would make the draught sufficiently sluggish, and by the addition of the baffle it would be too sluggish in its action. Where there are elbows on a flue-pipe, there should be no square elbows, but obtuse elbows; for on every square elbow fixed, you lose a considerable part of the bore. When connecting the flue-pipe to the chimney flue, one should always get direct into the flue, and not into the pocket of the chimney; for if this should happen, the heat would strike directly on the woodwork of the floor above, with what might be serious results. The flue-pipe should not be extended through the pocket into the main flue; for it is possible after a time for the pipe to perish, and then the results would be the same as in the previous case.

A source of trouble with the flue-pipe, when the baffle is fixed, is the condensation. This condensation, which takes place in the flue-pipe, naturally runs downward, with the result that it drops on to the heater. To overcome this difficulty, makers have fitted a drip-box to the iron stand of the heater, and on the inside of the baffle have formed a channel, in which the vapour collects, and whence it is conducted by a ½-inch brass tube to the drip-box, thus dispensing with the dripping. In cases where no baffle is fixed, it would descend through the flue of the heater into the drip-box. The only preventive of this condensation is to keep the flue as warm as possible, so that the cooling process cannot take place. It can be covered with slag wool, or some other non-conductor; but in many instances this would be regarded as unsightly by the

consumer. Almost a necessity to all heaters such as the circulator, would be a safety-valve fitted at the top.

These circulators can also be used to heat hot-water radiators for shops, halls, offices, &c., with great success. In calculating the consumption necessary in this case, or for heating hot-water pipes, each foot of gas will heat roughly 3 square feet of heating surface; and as there is roughly an area of 3 square feet in a double loop of a 36-inch radiator, each loop of a radiator requires 1 cubic foot of gas to keep it hot. But in this case, as in all others, it is advisable to have a little surplus heat at first, so as to heat up the water quickly, and then reduce the gas for maintaining the temperature afterwards. It is not wise to simply arrange for sufficient heat to maintain the temperature; it is necessary to raise the temperature quickly to begin with, and then, by means of a lever-tap or a thermostatic valve, to reduce the gas when the water is heated.

The paper was illustrated by a large glass-fronted working model, specimens of the circulators described (open, so as to admit of inspection), some loose parts of same, thermostats, gas burners and fittings, &c., lent by Messrs. Wilsons and Mathiesons, of Leeds.

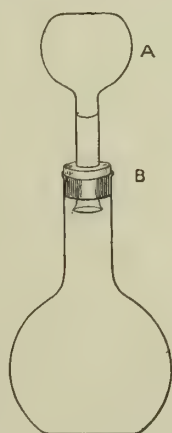
Following the paper there was a more or less informal succession of queries as to details of construction, fitting, costs, and applicability to various conditions which were described. Mr. Halkett is chief assistant to Mr. Hole at Leeds, and has had, both there and at other places, considerable experience in hot-water engineering and the application of gas thereto. He was consequently thoroughly at home in dealing with the questions that were put to him as to circulators, radiators, &c.; and a very profitable time was spent by the members.

ESTIMATION OF CARBON DIOXIDE IN GAS.

Modification of the Pettenkofer Method.

The current number of the "Chemical News" contains the following article, by Mr. Arthur Marsden, describing a modification of Pettenkofer's method for estimating carbon dioxide in coal gas.

A 50 c.c. graduated flask A is fitted by means of a rubber stopper B into the neck of a Jena flask C of approximately 600 c.c. capacity. The flask C is carefully dried and filled with gas by inverting it over the source of supply, and expelling the air by passing through five or six times its volume of gas. The flask A is filled to the mark with a solution of barium hydroxide, and



brought under the mouth of the flask C, which is then raised above the open end of the supply-tube, and A is connected to C by means of the stopper. The solution in A is allowed to run into the flask C, and is mixed with the gas by vigorous shaking for five to ten minutes or longer; then 10 c.c. of the solution are withdrawn and titrated with standard acid, using phenolphthalein as indicator. The strength of the barium hydroxide solution should be approximately decinormal. After titration, the volume of acid used is subtracted from the titre number of 10 c.c. of barium hydroxide solution, the remainder being the volume of hydroxide which has entered into combination with the carbon dioxide. Knowing the volume of the gas, the number of cubic centimetres of barium hydroxide taken up, and the volume at normal temperature and pressure of carbon dioxide equivalent to 1 c.c. of the barium

hydroxide solution, the percentage of carbon dioxide in the sample can be readily calculated from the formula—

$$P = \frac{E(B - A) \times 5 \times 100}{V}$$

P = Percentage of carbon dioxide in sample.

V = Volume of gas taken.

A = Volume of N/10 H₂SO₄ required for 10 c.c. of the solution after mixing with the gas.

B = Volume of N/10 H₂SO₄ equivalent to 10 c.c. of Ba(OH)₂.

E = Volume of carbon dioxide in cubic centimetres equivalent to 1 c.c. of the barium hydroxide.

In an estimation, the values obtained were—

V = 600 c.c. A = 8.0 c.c. B = 10.0 c.c. E = 1.119 c.c.

Whence—

$$P = \frac{1.119(10 - 8) \times 5 \times 100}{600} = 1.86$$

This method is accurate to the second decimal place when employed for gas containing more than 0.5 per cent. of carbon dioxide. If the gas contains either ammonia or sulphuretted hydrogen in more than traces, it must be removed before estimating the carbon dioxide.

The death occurred last month, at Exmouth, of Mr. Richard Darlington (at the age of 79), for thirty-two years connected with the Kent Water Company's works at Shortlands.

ILLUMINATING ENGINEERING IN AMERICA.

Further Views on Recent Progress.

In the last number of the "JOURNAL," we gave some extracts from an article by the Editor of our American contemporary "Illuminating Engineering," on the progress made last year in the lighting branch of engineering. In order to obtain a general review of the year's progress, a letter of inquiry was sent to a number of representative manufacturers and others; and the following are some of the views expressed.

Mr. E. N. Wrightington, the Second Vice-President of the Boston Consolidated Gas Company, said it was gratifying to note the decrease in the number of cases of flagrantly ill-arranged lighting systems, and the constantly growing number of installations laid out according to the best tenets of illuminating practice. They had had their share of these in Boston; and the outlook for a healthy growth in this direction was very encouraging. The inverted burner lent itself admirably to the most efficient arrangement, and supplied a long-felt want in this regard. It was very pleasing to note the rapidly increasing amount of satisfactory glassware made for use with gas-mantle lights of all kinds; and at present there was every reason to believe that the current year would see a supply suitable for every possible requirement of art or efficiency.

Mr. Irvin Butterworth, the Vice-President and General Manager of the Detroit City Gas Company, replied as follows: "I feel that there has been some progress in Detroit during the past year in applying the principles of scientific illumination. For instance, more attention has been paid to the distance between lights and their height from the floor. I believe also that the standard of illumination has been considerably increased; more light being demanded, and the users being more discriminating as to its quality and distribution. We installed a large number of so-called gas arc lamps last year, more than two-thirds of which were of the inverted type. We placed several thousand single inverted burners, and expect to place twice as many this year, which shows the tendency of gas lighting in Detroit."

Mr. W. J. Clark, the Vice-President of the Westchester Lighting Company, Mount Vernon (N.Y.), expressed the opinion that in no like period since the advent of the illuminating engineer had his art made such great strides as during the past year, particularly in the matter of gas lighting. This was markedly evidenced by the holding of a joint meeting of the New York Section of the Illuminating Engineering Society and the National Commercial Gas Association at the convention which took place in December last year. Mr. Clark considers that the gas industry is at length waking up to the importance of this great factor in the satisfactory growth and output of its community. A number of progressive companies have regularly employed men who are experts in illumination, and many of the gas companies who have not had their regular force of illuminating engineers are making a practice of calling in the services of these trained men in the solving of lighting problems. The Consolidated Gas Company of New York have done a very commendable work in the equipping of a building, under the direction of an illuminating engineer, with the latest gas lighting devices. Not only does it contain a very instructive demonstration as to what may be done in the way of the distribution and diffusion of light, but shows a clever manner of redistributing points for radiants where the gas-piping in old buildings was fixed at the time the building was constructed. Having this entire building at its disposal gives the Company an opportunity for demonstrating a great variety of lighting, such as would be useful in the home, office, and shop; the latter including a very beautiful window installation. Mr. Clark adds: "The progress made towards the perfecting of the inverted gas-mantle burner has given the gas man a new impetus in the lighting field, and has made possible the adapting of a more sightly and ornate, as well as more useful, fixture, than was possible with the upright mantle burner."

The Manager of the illuminating engineering laboratories of the Welsbach Company, of Gloucester (N.J.), Mr. Norman Macbeth, replied that the progress made last year in illuminating engineering in the field in which the Company are particularly interested was beyond their most sanguine expectations; and he said the outlook for the current year was particularly bright. Whatever doubt may have existed as to the value of illuminating engineering as applied to gas sources has, in his opinion, been thoroughly dispelled. The inverted lamp and its accessories has to a greater extent than the upright one been made a subject of illuminating engineering study and application. The output of these lamps now exceeds 70 per cent. of that of the regular uprights which have been on the market for more than twenty years—that is to say, of the Company's output in lamps consuming upwards of 3 cubic feet of gas per hour, 40 per cent. are reflex. "Illuminating engineering," said Mr. Macbeth, "requires that we should have a variety of lamps to properly meet the varied conditions imposed on us by service. The day has passed, if it was ever here, when any one lamp or type of lamp could be considered a panacea for all the ills presented in the broad field of artificial illumination. Extensive research has been under way for several months along the lines of standardization, not only of mantles, for efficiency, colour, and life, but of burners, to determine the equipment which will give the best results for any particular set

of gas conditions, of pressure, and so forth. The information secured is startling in many of its phases, and, with proper application, will do a great deal to advance the better kind of incandescent gas illumination. Investigation along these lines is of vast importance to the gas industry at large, and represents an enormous amount of original work, as little of the work reported in the past has been systematic."

COAL-TAR COLOURS—TINCTORIAL INDUSTRY.

At the recent Annual Meeting in Manchester of the Society of Dyers and Colourists, the retiring President (Professor R. Meldola, F.R.S.) delivered an address on "Tinctorial Chemistry—Ancient and Modern." In it, he referred to the development of the coal-tar colour industry in connection with dyeing; his remarks (for which we are indebted to the "Chemical Trade Journal") being as follows.

Previous to the Perkin era, dyeing and calico-printing establishments were not so dependent upon coal-tar colours as at the present time, but had to rely upon a limited number of vegetable dyestuffs. These primitive dyestuffs in about half-a-century have been supplanted by the introduction of hundreds of coal-tar derivatives. Such a revolution in a venerable industry in so short a period has never been witnessed in the progress of science. In his opinion, the rapid increase in the manufacture of coal-tar dyes was due to the development of the science of organic chemistry. From the discovery of mauve by Perkin, it had been nothing but science all along the line; and by science he meant the determination of the chemical constitution. Research was necessary; and the discovery of new materials to help the manufacturer was the business of scientific research.

Professor Meldola next dealt with the period of fifteen years—1870–1885—in the development of the colour industry. He said that after the Franco-Prussian war of 1870, it was seen that the Continental manufacturers began to reorganize their industries; and some ten years later we in this country experienced the first symptoms of serious competition. About 1870, the list of known aniline dyes was limited, and a good green for dyeing was unknown. At the time of his connection with the industry in 1877, he saw the change that was coming over the industry; and on his severing his connection with it in 1885, the change had progressed with such speed that he foresaw the approaching decline of our supremacy in the colour industry. The period from 1870 to 1885 was almost given over to the discovery of new types of colouring matters. It was this or the ascertainment of the chemical constitution of the old ones which preceded industrial developments. During a period of thirteen years, twenty-four colouring matters were discovered—some ultimately displacing dyestuffs, the manufacture of which alone had been keeping some of our works going.

The Professor then traced the new discoveries down to synthetic indigo in 1880, and again emphasized the point that chemical research was the prime factor in the development of the coal-tar industry. He said the period of fifteen years he had been discussing was the commencement of the stagnation and decay of the British coal-tar industry. Most of the discoveries were made abroad, and the English contribution to the industry was quite insignificant as compared with Germany. It was amazing that there was any doubt that the secret of the other countries' success was "Research," writ large. It was true that when the facts of the new discoveries became noised abroad, a few of our manufacturers began to adapt themselves; but research chemists were lacking. He happened to be one of the few; but what could three or four do against scores who were working under favourable conditions, and who were highly trained University men? Our faulty patent laws and restrictions on the use of industrial alcohol were not entirely to blame. The blame should be laid on our neglect of science. Instead of attributing the decline of our colour industry to the imperfection of our patent laws, it should be laid against our want of initiative. At the period referred to (1870–1885), the German patent laws were also very faulty, and some of the older German discoveries of colours were never patented, but were worked in secret.

In conclusion, Professor Meldola pointed out that the great industry on which they now depended for their colouring matters was but a transitory phase in the history of applied science. Our coal seams would not furnish everlasting supplies; and sooner or later the end must come. It was a matter of a few centuries, and then the supply of coal tar would cease. The same remark applied to petroleum and mineral oils.

Producer-Gas Fired Furnaces.—We have received from Dr. Oskar Nagel, Consulting Chemical Engineer, of New York, a copy of his work on the above-named subject. It contains detailed descriptions and illustrations of practical producer-gas fired furnaces employed in the chemical, metal, metallurgical, and other industries. It is a handbook for the use of engineers, chemists, manufacturers, superintendents, and students; and the text is fully illustrated. We shall take an early opportunity of noticing it more fully.

PROTECTING WATER-WORKS FROM LIGHTNING.

A report on the subject of the protection of water-works from lightning, with special reference to the requirements of those of the Birmingham Corporation in the Elan Valley, has been made by Sir Oliver Lodge, F.R.S., the Principal of the Birmingham University.

According to an abstract of the report contained in a recent number of the "Electrician," in water-works the chief danger to be apprehended from lightning, apart from ordinary house risks, lies in the possibility of the dams being struck and the shock conducted to the centre of the dam, where unseen damage might be done; while, even if the flash escaped by metal paths to the water underneath the lake surface, the shock would be as great as that caused by a small charge of dynamite placed in the same position. Protection, therefore, involves one of two things: Either keeping the lightning to the surface without letting it penetrate into any interior, or taking care that, if it does so penetrate, it shall have plenty of metallic surface by which to reach the water in a quiet and unexplosive manner. In achieving either or both of these ends, it is natural and proper to take advantage of any metal work already existing for other purposes; indeed, all such metal work must be taken into account, whether it constitutes a source of danger or a means of protection.

In regard to exposure and relative altitude, it might be thought that water-works such as these, being in a valley and surrounded by hills, would be fairly well protected by Nature. But this is not the case. In a mountain district, lightning has often been known to strike down ravines; and any part of a valley may be struck, though, of course, the likelihood is less in some places than in others. Moreover, it must be remembered that a flash, if a strong one, is often by no means a simple linear discharge, but that it may be, as it were, a "bush" or number of flashes, striking a number of points simultaneously or in rapid succession—the occurrence of one discharge weakening the air and making another, for the moment, more easy. Whenever a violent flash occurs, it always means some danger; and if a flash can be avoided by relieving the strain through a sufficiency of quiet point discharges, that is the best plan. Such point prevention is always aimed at, though not always achieved.

Sir Oliver then goes on to describe the actual steps that should be taken for the protection of the water-works. At the Craig Goch tower dam, which is perhaps the most important part of the works, there are a number of pipes which might be used for protection purposes; but it is thought better to keep the lightning outside the tower. Ordinary arrangements might be used at the top; but, owing to the fact that the level of the lake alters by as much as 40 feet, it is recommended that the north face of the tower, from a foot above high-water level to as far down as can readily be managed, should be covered with sheet copper, and that similar sheet copper should extend as a horizontal band 1 foot wide round the five most northerly of the octagonal faces of the tower, just above high-water mark. It is recommended that a copper ribbon or tape should be run up each of these five northerly faces, and be thoroughly joined to the copper dome at the top and to the copper band at the bottom. It is also suggested that a ring or crown of points be placed round the copper dome of the tower, each point protruding about a foot clear from obstruction.

At another tower it will be necessary to connect electrically the upper dome with the rest of the tower—the same arrangements being used at the base; while on a third the existing rain-water pipes can be adapted for use in this connection. At one of the other dams there is danger owing to the fact that hydraulic pipes are sunk in the interior, which might be affected if lightning struck the dam tower. It is therefore proposed to fix a point erection on at least one, or preferably on four, of the six pillars on which the tower is supported. All these erections are to be connected by a tape, which will be led away to the sixth pillar, which is on the up-side of the dam, whence it can be led into the water. The band at this point should be at least 6 inches, and rolled up at the bottom, so that it can be led down to lower levels if necessary. Other buildings and structure require only the usual protection; and for this purpose lead-covered iron rope is recommended.

In conclusion, Sir Oliver Lodge points out that if some kind of moored floating buoy can be arranged, especially if it happens to be considered as easy as fixing copper sheet below water-level, then it would be preferable, as being electrically better. The buoy would have a flat horizontal sharp-edged rim, and points all round, on a level with the water; and a copper rope connection would come up to it under water. One special advantage of a floating arrangement is that it would automatically make contact with the water without attention; whereas by the copper-sheeting plan a rapid lowering of the lake at some future time might leave the conductor hanging free above the water, unless it were remembered to send and unroll and fix its continuation as the water sank.

Last week's issue of "John Bull" contained the following: "We hear a funny story about the City of London Electric Lighting Company at Bankside. The Company advertise their electric radiators for heating purposes; but one of our readers says he has just fitted up their own offices with hot-water pipes, which are hidden under the floors in cases. No doubt there is another side to the question; and we should like to hear it."

WATER SUPPLY AND FILTRATION STATISTICS.

At a recent Meeting of the Institution of Civil Engineers, a paper entitled "Some Notes and Statistics on the Sheffield Water Supply," was read by Mr. L. S. M. Marsh, and also one dealing with "Statistical and Experimental Data on Filtration," by Mr. W. R. Baldwin-Wiseman. The following are abstracts of the communications.

The first part of Mr. Marsh's paper dealt with the population of the district of supply, and the various quantities of water used for domestic, trade, and other purposes; and it furnished information as to methods of supply and the prevention of waste. It also dealt with the monthly, daily, and hourly variations in the supply—tables and diagrams showing the averages of the last recorded year as compared with the average over a series of years; and some particulars were given of a metered supply to a small block of cottage property. A tabulated statement showed the actual delivery through large trunk mains and the smaller service-pipes, with their lengths, and also the loss of head. With these were given the results of some experiments connected with the discharge from hydrants, fire-hose, and jets of various diameters, with different heads, and also the discharge and loss of head in lengths of lead pipe, both with open ends and with stop-taps attached. The length of this lead pipe might be taken to approximate roughly to the ordinary length of a communication-pipe; and two experiments were given to show the force of the concussion when a tap on such a pipe is suddenly closed.

The second part of the paper dealt with the quantity of water flowing off the Redmires watershed. The author showed what portion is utilized, wasted, evaporated, or absorbed, &c.; and a table was furnished covering the period from 1879 to 1907. The particular drought of 1904-5 (May, 1904, to January, 1906) and that of 1887-8 (February, 1887, to January, 1888) were analyzed in the same way, showing the monthly quantities, as well as that of the year 1901, showing weekly quantities—these being periods when no water flowed to waste. Other tables gave the rainfall, evaporation, and absorption discharge from the watershed, &c., at the break-up of the drought of 1901; the maximum discharges over the waste-weirs, and particulars of the reservoirs and drainage areas; and yearly and monthly rainfall at Redmires.

The author discussed the bearing of these tables on the usual practice of engineers when considering rainfall and the resultant flow from watersheds during a period of three consecutive dry years; and the paper concluded with a short description of the method adopted for the prevention of the action of water on lead, with an illustration showing the apparatus specially designed for the purpose. A diagram of the water stored in the reservoirs and the weekly rainfalls for 1884 to 1907 accompanied the paper.

Mr. Baldwin-Wiseman's paper opened with a brief introduction in which he pointed out the urgent necessity for a detailed survey and a strict conservation of the water resources of the country, if good and adequate supplies are to be afforded to the steadily increasing population, and to the numbers likely to be inhabiting the land in the middle or the end of the present century. He next discussed the natural purification of streams, and referred to the several contradictory opinions and researches which have been published from time to time. He subsequently outlined the history of the researches upon slow filtration through sand; touching incidentally upon sedimentation and the development of methods of chemical and bacterial investigation of waters intended for public supply. He described at length his own experiments on the rate of flow of water through various thicknesses of British filter-sands, and the loss of pressure in them, and elaborated a formula connecting the rate of flow of water through any bed of sand under a constant difference of pressure with the superficial extent of the grains of sand and the volume of water retained by the sand. The author concluded with a general review of modern improvements in the operation and construction of slow sand filters, the advantages and the disadvantages of various types of mechanical filters operated with or without coagulants and settling-basins, and the methods of chemical purification subsidiary or auxiliary to filtration.

The death is announced of Mr. George Newell. Deceased, who was 72 years of age, was a native of Aldershot, and for about 43 years he was Manager of the water-works belonging to the Aldershot Gas and Water Company. For five years previous to that he had been in the employ of the Company; so that he had worked for them for 48 years in all. He leaves a widow, six daughters and five sons. He was taken ill just before Christmas, and a short time ago pneumonia supervened, from which he never recovered.

The many friends of Mr. J. Tysoe, the Engineer of the East Greenwich station of the South Metropolitan Gas Company, who, as already announced in the "JOURNAL," some weeks ago left England with Miss Tysoe for Egypt for the benefit of his health, will learn with satisfaction that he is now well on the way to complete restoration. He booked passages for himself and his daughter by the P. and O. steamship *Malwa*, which was due to leave Port Said on the 27th ult.; intending to break the journey at Gibraltar, and spend a week or two in the South of Spain, or possibly go on to Teneriffe, in order that he may get thoroughly well before reaching home.

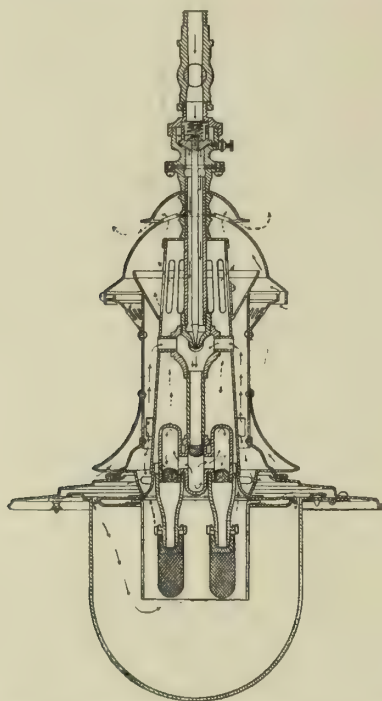
REGISTER OF PATENTS.

Incandescent Street-Lamps.

DARWIN, H., of Gravelly Hill, near Birmingham.

No. 3634; Feb. 15, 1909.

This invention has for its object "to provide an incandescent lamp capable of developing a maximum illuminating efficiency when worked with gas at low or ordinary pressures, and can therefore be used with great economy, as regards gas consumption, for lighting services that can at present only be performed, at considerable expense, by the use of high-pressure gas."



Darwin's Regenerative Incandescent Gas-Lamp.

The lamp is constructed so as to admit of the regenerative utilization of the heat of the products of combustion from an enclosed inverted burner, or from an enclosed cluster of such burners, in such a manner as to induce a continuous and ample supply of superheated and uncontaminated air both to the parts of the system in which the combustible mixture is formed and delivered to the burners, and also to the enclosed combustion area.

In the application of the invention to a street-lamp as shown, the burners are enclosed within a globe attached to, and having free and direct communication with, the lower part of a metallic flue or shaft whose upper part leads into, and terminates in, a cowl or hood having openings or perforations through which the products of combustion from the burners can escape or are discharged into the atmosphere after the heat therefrom has been regeneratively utilized. The shaft or flue is made to enclose the whole of the parts provided for supplying gas and air to the lamp, and for forming the properly-proportioned and intimately incorporated or atomized mixture for consumption at the burners, while the middle part of the shaft is surrounded by a metallic jacket or casing, from which it is separated by an annular air-space or air-heating chamber.

This chamber has communication, at its upper part, only with the air supply system of the burners and, at its lower part, with the combustion area or burner space within the globe; while its outer walls are provided with suitable orifices or openings for the admission of atmospheric air, part of which is utilized for forming the combustible mixture that is consumed at the burners, and the other part for "promoting perfect combustion" of the mixture.

The whole of the air admitted into the jacket or chamber is subjected to a preliminary heating by contact with the external walls of the inner shaft or flue which are maintained at a high temperature by the heated gases ascending from the burner; and, in addition, both parts of the air are subsequently superheated by the direct regenerative utilization of the heat from the gases.

To provide for this, as well as for promoting an injector action on the gas supply, the admission orifices into the jacket or heating chamber are arranged at a suitable point between the upper and lower ends of the jacket, but preferably nearer to the bottom than the top, so as to remove them as far as possible from the cowl or hood where the products of combustion escape, and thus ensure that the air drawn into the jacket shall be as pure as possible and uncontaminated by the vitiated combustion gases discharged from the lamp.

Incandescent Gas-Burners.

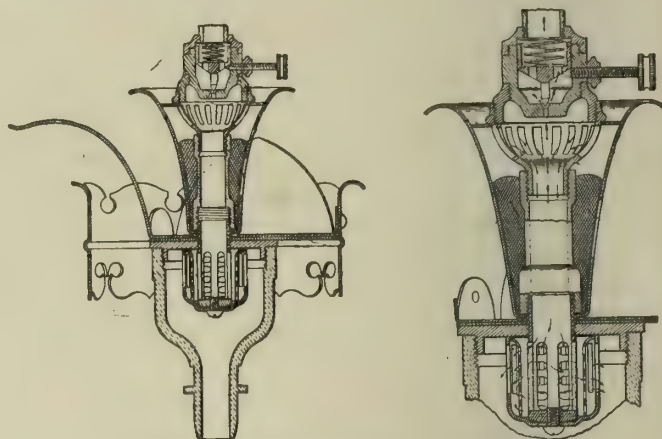
DARWIN, H., of Gravelly Hill, near Birmingham.

No. 4609; Feb. 25, 1909.

This invention has relation to inverted incandescent gas-burners of the type in which there is interposed between the gas-service pipe and the gas and air induction tube a gas-regulator, which is operated externally by a screw or other mechanical device, for the purpose of varying the area of the gas-passage into the induction tube, and thereby adapting the burner to suit the particular supply pressure or the richness or character of the town gas to be burnt in it.

The object of the invention is to provide an improved burner which embodies a regulator of the type above referred to, and is adapted to produce a thoroughly atomized and perfectly combustible mixture of gas and regeneratively-heated air, and to deliver the mixture to the point of ignition in such a condition that, when burnt in contact with an incandescent mantle, the maximum illuminating value of the gas is attained.

The regulator is constructed so as to deliver the gas in a vertical straight line or axially into an induction tube, which is supplied with regeneratively-heated air from a closed or sealed hot-air jacket surrounding the induction tube; the gas and heated air being thence conveyed to an atomizing and mixing device enclosed within a mixing-chamber communicating with the burner-nozzle.



Darwin's Inverted Regenerative Gas-Burner.

In one application of the invention (as shown), the burner comprises an adjustable gas-regulating valve in communication with the gas supply, an injection tube leading from the valve to an expansion and mixing-chamber and having a system of air inlets at its upper end, and an air-heating chamber formed by a perforated jacket or casing which surrounds the injection tube, but is separated from it by an annular air-space and is arranged within the hot region above the burner flame, whose heat is utilized regeneratively for heating the whole of the air supplied to the mixing-chamber and for superheating the mixture, so that it is delivered to the point of ignition "under conditions which ensure perfect combustion."

The first illustration represents a complete vertical section of a single-light inverted incandescent gas-burner constructed in accordance with the invention; and the second one represents, upon an enlarged scale, a vertical section of part of the burner, showing more clearly the construction and arrangement of the gas-regulator, the air inlets, and the atomizing or incorporating devices of the mixing system.

Vertical Retorts.

HERRING, W. R., of Edinburgh.

No. 5362; March 5, 1909.

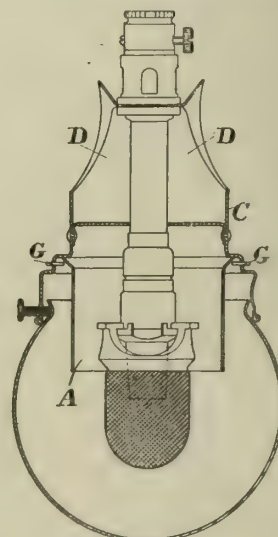
This invention, relating to improvements in, or connected with, feeding and discharging apparatus for gravitation retorts of the closed type, is fully described and illustrated on p. 33.

Inverted Incandescent Gas-Burners.

MANNESMANN, C., of Remscheid-Blidinghausen, Germany.

No. 5576; March 8, 1909.

This invention relates to a removable draught inducer or chimney for inverted incandescent gas-burners of the particular construction shown.



Mannesmann's Incandescent Burner Chimney.

The lower edge of the part A of the chimney reaches down exactly to the point where the tissue of the mantle commences; so that, on the one hand, all the products of combustion are led off by the chimney, and, on the other hand, the illuminating power of the mantle cannot be

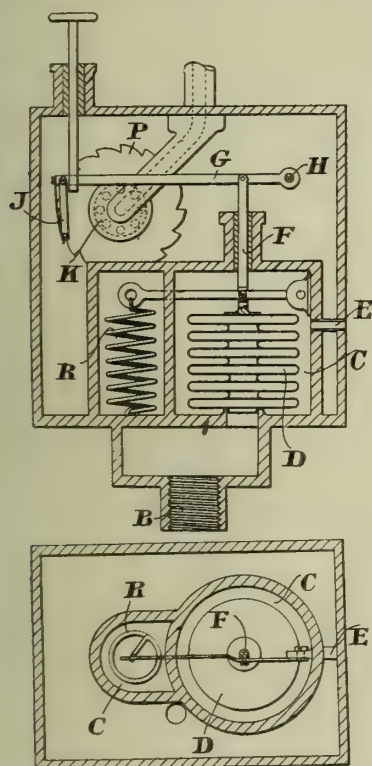
affected by being partly covered up by the chimney made of non-transparent material. The part A is connected to an upper part C, which serves as a flue, by means of two pins G, which engage the conical upper edge of the chimney. The upper edge of the flue is secured to the gas-supply pipe underneath the mixing-chamber, and is provided with two large lateral openings D, through which the products of combustion are "effectively discharged"—the upper flanges on the openings preventing them from entering the mixing-chamber.

Automatic Gas Lighting and Extinguishing Apparatus.

MACKAY, J., of Bradford.

No. 5918; March 11, 1909.

This automatic gas lighting and extinguishing apparatus has an expansible and collapsible metallic element connected with the controlling means of a gas-burner, and placed externally to the element; so that when an impulse due to a temporary change of pressure comes upon the mains, the element moves vertically and returns to its original position, having operated the controlling means to admit or prevent the access of gas to the burner. It is, however, possible to provide external means, if desired, whereby the apparatus may be operated without sending a pressure impulse through the mains, when it is required to test the burners individually.



Mackay's Automatic Gas Lighter and Extinguisher.

In one construction (as shown), a closed chamber is put in communication with the main pipe B. Within, or partitioned off from, the chamber is a small inner chamber C, in which is a closed expansible pipe D, made of thin metal with deep corrugations in planes at right angles to the axis of the pipe (after the manner of a concertina). One end of the pipe communicates with the main; so that the interior of D is subjected to the pressure which obtains in the mains. The space of the chamber C (outside the corrugated pipe) is, however, in communication with the atmosphere, either by a pipe E or a hole drilled through the wall. At the closed end of the pipe D a rod F is attached, which extends through a stuffing-box into the outer chamber, where it is attached to a lever G, pivoted at one end H, and which carries at the other end a pawl J, adapted to operate a step-by-step valve K. The pipe D is loaded by a spring R, attached to the bottom of the inner chamber, acting through the medium of a lower lever attached to the rod F which actuates the valve K through the lever G. The spring R may be replaced by weights placed on top of the pipe D itself. By thus loading it, the pipe is prevented from operating the valve K until a predetermined pressure above the normal has been attained—say, 9 lbs., when the normal working pressure is 7 lbs. per square inch. Means may be provided for preventing the ratchet wheel P, or other driven part of the controlling device, from moving under the effect of momentum if an impulse causes the pawl J to operate with excessive suddenness.

Heating, Cooling, Purifying, or Enriching Gases.

BLAKELEY, W., of Ravensthorpe.

No. 8481; April 8, 1909.

This invention relates to apparatus by which a stream of gas can be passed over the surface of a liquid, "for the purpose of heating, cooling, purifying, or distilling the liquid, or for the purpose of heating, cooling, purifying, or enriching the gas." The apparatus is of the type comprising a tower containing a series of shallow trays with intervening deflecting plates; each tray being provided with a central opening, through which the liquid falls on to a lower deflecting plate, and through which the gas rises into the space between the tray and the

next higher deflecting plate—the gas and liquid being thus brought into contact.

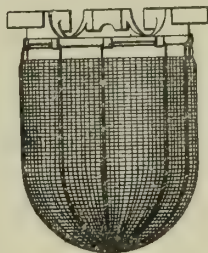
The arrangement was described and illustrated in the "JOURNAL" last year (Oct. 26, p. 246).

Incandescent Mantles.

HALL, F. H., of Wolverton Fields, near Stratford-on-Avon.

No. 6027; March 12, 1909. No. 10,376; May 1, 1909.

This combined invention consists: (1) In an inverted incandescent mantle tied or sown in the usual manner to its holder, and having



constructed around it a frame of metal so arranged as to touch the mantle and take the bulk of the weight of the same. (2) In an inverted incandescent mantle in which the fine wire of which the supporting frame is composed is looped beneath the mantle and secured to the supporting ring to which the mantle is attached in any suitable manner. (3) In a process of strengthening such a mantle, according to which the mantle, after stiffening, or a dummy mantle, is utilized as a mould over which fine strips or threads of metal or other suitable material are passed to

form a support for the mantle. (4) In an inverted mantle having a support of fine wire or other material, in which both mantle and support assist each other as regards maintenance of shape. (5) In a supporting attachment for inverted incandescent mantles as at present manufactured, according to which a ring separate from the supporting ring of the mantle is provided with points of attachment for the fine wires or other supporting material.

Charging and Discharging Gas-Retorts, &c.

MASTERS, E., of Palace Chambers, Westminster, and HANSFORD, J., of New Barnet.

No. 9057; April 16, 1909.

This invention relates to apparatus for delivering coal to, and simultaneously discharging coke from, gas-retorts and the like, of the kind in which there is used a combined charging and pushing member vertically adjustable and carried by a supporting frame having a wheeled base that can be traversed in front of a bench of retorts. It consists of improvements having for their objects "to minimize as far as possible the power required for the apparatus to perform its functions effectively, and, while making the construction as simple as possible, to economize the necessary working room and cost."

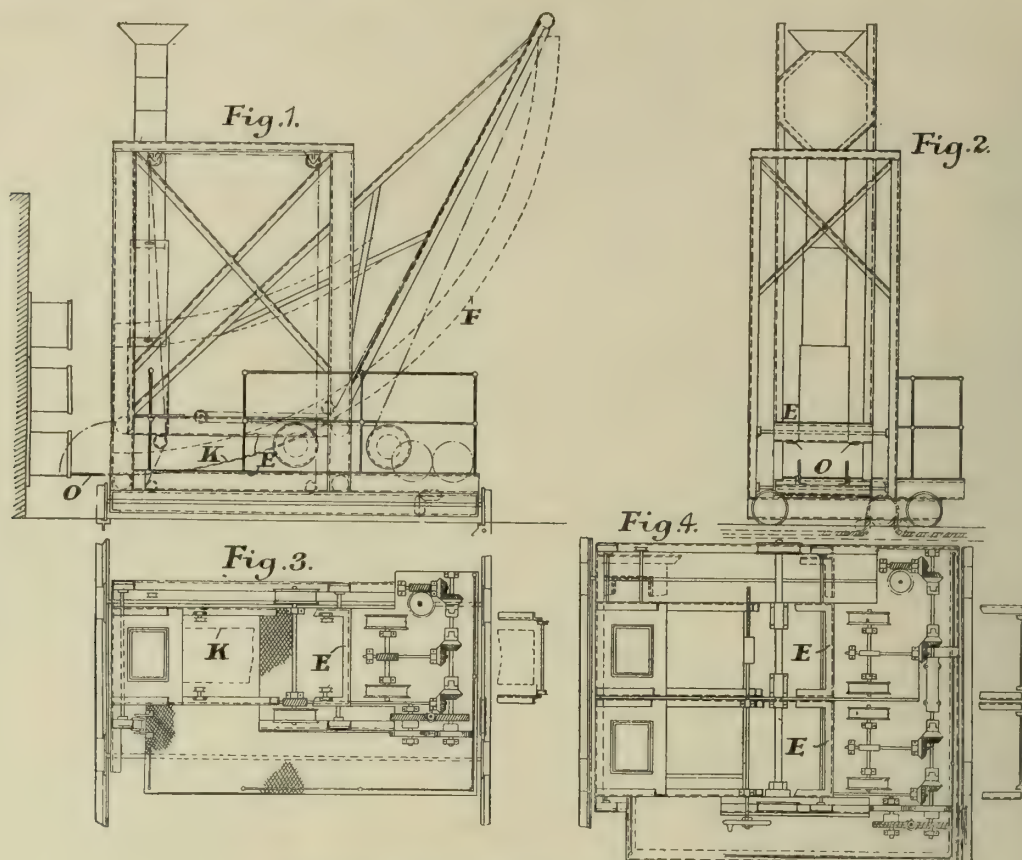
The invention is illustrated diagrammatically. Fig. 1 is a side elevation of apparatus having a single charging and discharging member that assumes a curved form in a vertical plane when in a position withdrawn from the retort. Figs. 2 and 3 are a front elevation and plan (parts of the apparatus being removed). Fig. 4 is a part plan of a similar apparatus with the charging frame in duplicate.

In figs. 1, 2, and 3 (p. 52), the main frame of the apparatus consists of channel shaped or other uprights joined together at the top and connected at the bottom to a wheeled base. On the top of the frame is a measuring hopper of the ordinary kind, into which the coal is delivered. Adapted to be guidably moved up and down in the uprights is a second or charging frame E, provided with guide-rollers that engage the outer frame. The frame is raised and lowered by ropes or chains which pass over guide-pulleys to winding drums driven by suitable gearing. The frame E carries the charging and discharging member F (in broken lines) and other parts of the apparatus.

One end of the combined charging and discharging member slidably bears, in the normal position, exterior to the retort, on a comparatively short platform K carried by the charging frame; the other end being elevated and supported by ropes or chains, which pass over guide-pulleys or the like, mounted on parts of the charging frame. These chains may be carried over winding drums and thence back to the end of the charging member. When the drums are revolved through gearing, the elevated end of the charging member may be lowered or raised, and in this way is made to assume a curved form in a vertical plane when its end is elevated; the platform K below it being likewise curved to act as a guide or support. Generally the form assumed would be a quadrant of a circle.

Hinged to the front part of the charging frame is a counterweighted apron plate O; normally in a vertical position and of such a size that it can, when turned substantially horizontal by the movement of the charging member, be pushed into the mouthpiece of the retort. The foremost push-plate, which is preferably of stronger construction than the others, is adapted in the customary way to close the lower end of the charging member, and (as the member travels through the retort) push the coke lying on the floor in front of it.

When it is desired to charge a retort, the apparatus is brought into position immediately in front. The lower end of the charging member having been made to register with one of the retort mouthpieces by raising or lowering the charging frame E, coal from the hopper is discharged through the shoot into the pockets of the charging member, the upper end of which is simultaneously lowered, with the result that its lower end slides forward on the platform, pushing the front counterweighted apron plate down and into the retort mouth over which the member glides and then passes over the floor through the retort, carrying the coal with it. During the forward movement of the combined charging and pushing member, the foremost push-plate encounters the coke lying in the retort, and pushes it forward, until it falls out through the discharging aperture at the further end in the usual way. When all the coal loaded in the charging member has been deposited in the retort, the member is withdrawn by imparting a reverse movement to it, and during this movement the push-plates take, or are given, an inclined position so as to pass over and spread the coal evenly on the retort floor. The apparatus is then ready for the operation to be repeated. By suspending the charging member in the way proposed,



Masters and Hansford's Retort Charger-Discharger

"a component of its weight will aid in pushing forward the coal and coke along the floor of the retort."

When the apparatus is constructed in multiple (for operating simultaneously on two or more retorts in line), the charging frames are placed side by side, as shown in fig. 4, and are connected together by a shaft or spindle provided with screws working in nuts carried by the respective charging frames and adapted to be actuated for adjustably spacing the frames apart, in order that the ends of the charging members may register with the mouthpieces of the retorts with which they are to co-operate. In such multiple apparatus, the shafts of the winding drums employed for raising and lowering the charging frame are provided with slidable roller bearings, and the sets of gearing for raising the charging members F are connected with each other by slidable couplings.

Manufacturing Incandescence Bodies for Gas-Burners.

HADDAN, H. J.; a communication from Bruno-Patente-Verwertungs G. m. b. H., of Berlin.

No. 12,466; May 26, 1909.

This invention relates to the manufacture of incandescence bodies (for gas-burners) from artificial filaments, to which the requisite salts of the rare earths are applied in the form of solutions, as in the case of incandescence bodies of cotton and other vegetable fibres.

The impregnation of incandescence bodies of artificial filaments does not, the patentees state, in itself present any difficulty; but considerable difficulties have been encountered in the burning of such bodies, owing to the absence of a strong skeleton of ash, and to the conversion of nitrates into oxides, accompanied by swelling injurious to the structure. To obviate this, it is essential to arrange that the formation of oxide is not due solely to the action of the flame, but is at least in part procured in advance with the aid of suitable chemical reactions. In this way, there is formed a skeleton, consisting of the oxides or hydrates of the salts, which very quickly bakes or fuses together in the flame and gives the necessary strength to the structure.

Well-known processes for this purpose are those of Blasco de Lery and Plaissetty. Blasco de Lery treats with ammonia incandescence bodies manufactured from artificial filaments, to the substance of which the salts have been added prior to the squirting; and by this means he converts the nitrates into hydrates. The latter are transformed by the burning into oxides. The process of Plaissetty hardly differs at all in its chemical aspect from that of Blasco de Lery; the only material difference consisting in the fact that the salts are embodied with the finished fabric by impregnation. Plaissetty, in the description of his process, mainly emphasizes the removal of the acids, by treating the hardened dry structures with aqueous solutions of alkalis—principally ammonia—so that easily soluble alkaline nitrates are formed. The separation of the acids is, however, inevitably accompanied by formation of hydrates or oxides of the salts; and it is precisely this latter chemical process which is essential for the production of durable structures. The process of Plaissetty is, therefore, as regards its effect, equivalent to the process of Blasco de Lery, and as regards the mode of operation the processes are also similar, inasmuch as in both cases the nitrates are converted into insoluble compounds by treatment with alkalis.

The process of Plaissetty, however, has the disadvantage that the impregnated bodies must be thoroughly dried before treatment with alkalis. Otherwise, before the reaction of the alkalis with the

nitrates, part of the nitrates goes into solution and is lost as regards the illuminating effect of the body.

In the treatment of the dried, unburnt bodies with alkalis, the further disadvantage arises that the reaction takes place comparatively slowly, and the externally formed layers of oxide or hydrate sometimes prevent complete action of the alkalis on the nitrates. In this case, "swelling is inevitable when the structure is ignited, and distortion frequently results."

The present invention is said to obviate these disadvantages, and "provides incandescence bodies of great strength, great uniformity of structure, and, consequently, of uniform illuminating power."

The process of manufacture, according to the present invention, differs from that of Blasco de Lery in the fact that the salts are applied to the fabric by impregnation. The difference as regards the process of Plaissetty consists in the fact that the final treatment is not performed on the hardened, dried bodies, but on the moist bodies, as they come from the centrifugal apparatus in which the excess of impregnating liquid is removed. By performing the final treatment with application of heat, reaction throughout the entire mass is ensured. The process differs from both the prior processes referred to in the fact that the reactions do not produce (or at least not mainly) hydrates and oxides, but basic double compounds of the metals of the rare earths.

The bodies impregnated with salts are treated in a bath at a temperature of about 40° or 50° C. The bath consists of a mixture of alkalis or amines and acids—such as benzoic acid, chromic acid, salicylic acid, oxalic acid, hydrofluoric acid, hydrochloric acid—which are capable, with co-operation of the bases, of converting the nitrates into basic double compounds. Acetic acid and other organic acids may also be used; also phenols. The alkalis or amines used must form volatilizable compounds with the acids and with the nitric acid of the salts. The formation of the basic double compounds is materially favoured by immersing the moist fabric in the heated solution of alkali or amine at the moment at which the acid is added, and at which considerable heat of formation is evolved. The conversion of the nitrates into insoluble or nearly insoluble compounds takes place almost instantaneously, so that no lixiviation of salts can take place. If the alkalis or amines are present in excess, the basic double salts are more or less converted into oxides or hydrates. The employment of an excess of alkali is, however, not necessary, since when the body is ignited the basic double salts are converted into oxides of the rare earth metals without swelling, since the acids used are all easily vaporizable.

A suitable immersion bath is prepared as follows: 2 kilos of crystalline oxalic acid are dissolved in 20 kilos. of distilled water at 70° or 75° C. To this solution are added 10 kilos of liquid ammonia. The incandescence bodies produced are asserted to be of "great tensile strength, capable of bearing 50 to 60 grammes, and are elastic and flexible."

Since the final treatment takes place *in statu nascendi*, the chemical reactions are, it is claimed, very rapid. Consequently there is no loss of rare earths; and the bodies are of uniform composition, and also characterized by uniformity of lighting power. The rapidity of the reactions is increased by the treatment of the bodies in a somewhat moist state, as described.

It has heretofore been proposed, the patentees point out in conclusion, in the manufacture of incandescence bodies, to precipitate the thorium and cerium salts by an organic base or a mixture of organic bases, and also by peroxide of hydrogen used in conjunction with organic acids and their salts; the function of the peroxide of hydrogen being to produce thorium hydrate, and the function of the acid or sal

being to convert the cerium salts into an insoluble compound. In the present invention the bath does not contain hydrogen peroxide, and converts the nitrates into insoluble basic compounds.

Inverted Incandescent Gas-Mantles.

NEMEROVSKY, J. M., EVERETT, L. C., and NEMEROVSKY, F., of Manchester.

No. 14,176; June 16, 1909.

This invention refers to the ring or support to which the mantle proper is attached, and also to the method of attaching the textile material to the ring, so as to prevent the woven material from breaking away from its support. The patentees claim: "In inverted incandescent gas-mantles a flange or projection formed around the lower portion of the ring or support in combination with loops or links connected to the woven or textile material or mantle proper for attaching or supporting the textile material to the flange, or to a projecting portion of the ring below the flange, or to hooks below the flange."

Securing the Doors of Retorts, Coke-Ovens, &c.

RIECKE, P., of Dessau, Germany.

No. 15,276; June 30, 1909.

This invention has for its object to overcome the danger of the incandescent material being automatically discharged while the door is being opened (for instance) in the case of inclined retorts, although the arrangement is more applicable to coking-ovens.

According to the invention, one or more locking or clamping bars are mounted on the door plate and adapted to be rotated in the plane thereof so that their ends engage hook-like members or catches disposed in a plane at right angles to that of the door; the locking bars being then drawn against the frame of the door so as to ensure an air-tight joint by longitudinal movement being imparted to the hook-like members. Owing to this arrangement, only a small movement need be imparted to the locking bars, and pressure is exerted on the door without any great force being expended. When the pressure on the door has been removed, the operation of the locking bars can be effected quite easily from one side of the retort opening by means of a lever; "so that there is no danger of the attendant being struck by the charge as it leaves the retort."

To prevent the door being shifted from its frame by the weight of the charge and the locking bars being thus jammed against the holding members after the pressure on the door has been released and thereby rendering it difficult to disengage the locking bars, an auxiliary pressure device is provided on the door whereby the door is still pressed against its frame after the pressure over the main body of the latter has been released.

Manufacturing Incandescent Gas Mantles.

WEBER, I., of Vienna.

No. 21,942; Sept. 25, 1909. Date claimed under International Convention, March 20, 1909.

Heretofore mantles for incandescent gas lighting have, the patentee remarks, been manufactured by drawing together a suitable length of hose at one end, either by hand or by a machine. The first-named method is "troublesome and slow;" and both methods present the defect that "a uniform contraction of the hose for forming what is called the spider is not possible, but folds of different sizes are produced irregularly and form a very thick spider, thereby producing irregularity in the thickness of the finished mantle, resulting in irregular incandescence of the mantle, as the thickened parts are less bright." The present invention has for its object to provide means for manufacturing mantles (more particularly for inverted lighting) by machinery, so that the material of the hose is uniformly distributed towards the spider, and the latter is not thickened.

The process comprises a number of steps. A tubular hose (of a length, or a multiple of the length, of the mantle to be formed) is first of all drawn on to a cylindrical mandrel, whereupon the part projecting beyond the mandrel is drawn in by members of a device acting simultaneously and uniformly from the outside towards the inside, and, if desired, the projecting surplusage is severed. The hose drawn together in this way can then either be tied on the apparatus at its narrowest place or else it can be stitched in a sewing machine for forming a smooth "spider."

APPLICATIONS FOR LETTERS PATENT.

- 7013.—MONSKI, A., "Gas-blower." March 21.
 7018.—MORGAN, J. T., "Mantles." March 21.
 7033.—SPARKS, E., "Pressure controllers for gas lighting systems," March 21.
 7039.—FERNHOLZ, E., "Inverted lamps." March 21.
 7044.—BERNARD, C., "Valves or cocks." March 21.
 7086.—TORCHEBEUF, C., and LANNEAU, E. DE, "Incandescent burner." March 21.
 7102.—MILLS, E. & A., "Bracket for gas-shade." March 22.
 7113.—PREEN, A. H., "Gas-stoves." March 22.
 7161.—SPEAR, M. H., "Pipe-joints." March 22.
 7178.—BIHELLER, S., "Gas-lamps." March 22.
 7249.—SIMPSON, F., and WOODS, A. R. T., "Measuring the flow of liquids in enclosed conduits." March 23.
 7344.—WEST, J., "Charging gas-retorts." March 23.
 7348.—TRUSCOTT, A. L., "Gas-burners." March 23.
 7355.—MASTERS, R., "Charging and discharging gas-retorts." March 24.
 7420.—K. & A. WATER-GAS COMPANY, LTD., and SMITH, H. E., "Process for the utilization in water-gas plants of fine breeze and other similar fuel of small grades." March 24.
 7441.—SCHIMEK, L., "Inverted lamps." March 24.
 7495.—GUEST, A. A., VAN MARLE, M., and GIBBONS, G. B. A., "Charging inclined retorts." March 26.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

On the re-assembling of the House last Thursday after the Easter recess, the Lord Speaker (Lord Denman) announced that the opposition to the Matlock Bath and Scarthin Nick Urban District Council Bill had been withdrawn.

HOUSE OF COMMONS.

The House re-assembled last Tuesday after the Easter recess. On Thursday, the South Hants Water Bill was read a second time and committed; and it was ordered that the Committee should have power to inquire whether the promoters have made adequate provision for the supply of water at reasonable rates to the agricultural community within the area of supply, and to any person or persons from whom any existing or natural supply is, or may be, withdrawn owing to the works or undertakings authorized by the Bill; and, further, to insert such clause or clauses as they think necessary to impose upon the promoters the obligation to provide such supply.

To-day the Select Committee on Standing Orders will have under consideration an application made to the House a short time since by the Cudworth Urban District Council for leave to deposit a petition for a Bill to empower them to erect gas-works. The Council are supplied with gas in bulk by the Barnsley Gas Company; but they are desirous of taking the matter into their own hands. The existing agreement, which was for seven years from January, 1904, is determinable by either party on giving six months' notice, to expire on the 31st of December following the close of the above-named period. It is therefore desirable that the necessary sanction for the Council's scheme should be obtained in the present session.

LITTLE HULTON URBAN DISTRICT COUNCIL BILL.

THE SUPPLY OF COKE-OVEN GAS.

House of Commons Committee.—Wednesday, March 30.

(Before Sir FRANCIS LEYLAND-BARRATT, Chairman, Mr. FLETCHER, Mr. GARDNER, Mr. GOLDSMITH, Mr. HELME, Mr. HORNE, Mr. MANFIELD, Mr. MIDDLEBROOK, Mr. CHARLES NICHOLSON, Sir W. PRIESTLEY, Mr. JOWETT, and Mr. ROCH.)

This is a Bill which proposes to empower the Urban District Council of Little Hulton to supply gas and to provide for the transfer to the Council of so much of the gas undertaking of the Salford Corporation as is situate within the urban district of Little Hulton, to confirm an agreement with the Earl of Ellesmere for the supply of coke-oven gas in bulk to the Council, and for other purposes. There was no opposition to the scheme.

Mr. JEEVES, who appeared for the promoters, explained that, with regard to the transfer of the gas-works undertaking of the Salford Corporation, the Bill originally related to the transfer of two undertakings—that of the Salford Corporation and that of the Farnworth and Kearsley Gas Company. The district was supplied by these two concerns. Last year, the Salford Corporation promoted a Bill with regard to their gas-works, in which they asked, among other things, for further capital powers. The application was opposed by certain authorities within the Salford area; and they obtained such terms that the Salford Corporation withdrew the Bill. The Little Hulton Council considered at the time that it was better that they should not continue their opposition, because the Salford Corporation promised that, if they did not oppose, they would deal fairly with them in selling the undertaking to the District Council. The negotiations were afterwards continued between the Corporation and the Council, with the result that the Corporation agreed to sell to the Council the part of their undertaking which was within the Council's limits, for the sum of £7500. When the Bill was deposited, the agreement between the Council and the Salford Corporation had not been completed; and therefore a clause had been inserted in the filled-in Bill. The Salford Corporation wanted it to appear that any arrangement come to with the Council was come to by agreement. In the outside district, the Earl of Ellesmere had extensive coke-ovens from which a vast quantity of gas was produced; and after considerable negotiations, his Lordship agreed with the Council that, if they were able to purchase either the Salford area or the Farnworth area, or both, he might arrange to supply them with gas from his coke-ovens on advantageous terms. The terms were that his Lordship should provide everything necessary, including the gasholders and purifiers. He was to provide the mains from the existing works to the new works, to erect purifiers, the gasholder, and the meter-house; and the District Council were to pay for the gas which passed through the meter according to the amount registered by it. For the gas so supplied, he was to receive 9d. per 1000 cubic feet; so that the Council were getting the gas into the holder for this price. This was a means of utilizing what was really a waste product, because while a certain amount of the gas was required for heating the coke-ovens and for driving engines, &c., there was still a surplus from which his Lordship could supply. The Earl of Ellesmere was not anxious to make any large profit out of the district; and he agreed this figure in respect of which he was not only to let the Council have the waste product, but he had to put up works which would cost him some £5000. It was an economical and favourable arrangement for the District Council; and in order to provide against the possibility of a strike with regard to the colliery in connection with which the existing works had been erected, there had also to be put up the necessary

plant to enable the gas to be produced, if found desirable on the site of the new works. This, again, was to be put up by his Lordship; so that in case of need it could be used for the purpose of fulfilling his agreement. There was a proviso that if the agreement was put an end to—as it might be after 35 years—the Council were to have the right to purchase the new works at their then structural value; and this was the reason why the Council desired to purchase the part of the Salford undertaking which was within their district. After making very liberal estimates for all the cost the Council would incur, it was expected that the sum of 5d. or 6d. per 1000 cubic feet would be saved. This saving would be effected during the time in which the capital cost had to be repaid; and the interest in respect of the capital had also to be paid. So that during the loan period there would be a saving in the price of gas of 4½d. or 5d., and probably 1d. more; and at the end of this period, the price at which they would be able to supply would be considerably reduced. Replying to a question by the Chairman, Counsel stated that the Council had arranged with Lord Ellesmere that he would give them the supply for both the Salford and Farnworth areas, and the Council had hoped to make arrangements with the Farnworth Company to enable them to purchase either on a price agreed when they came before the Committee or on arbitration terms; but the Farnworth Company were wholly opposed to it. It was therefore left over in the hope that, later on, they might be able to make some arrangement. There was some question as to whether the Council were within the statutory limits of the Salford gas supply; but so far as he had been able to follow the Salford Acts, the area was not within their statutory limits, although the Salford Corporation had for many years been supplying there. It was a question of the boundaries of old parishes. An undertaking had been entered into that they would give such a supply of gas as might be required during the 35 years, and in fact they would be able to supply a district many times this size.

Mr. J. H. Heyes, the Clerk to the Council, said a resolution for promoting the Bill was rejected at a meeting of the electors; one of the grounds for the rejection being that it would interfere with the local mining industry, as one of the local collieries supplied the Salford Corporation with coal for making gas.

Mr. E. Bury, the Manager of the Brackley Coke-Works, which are situated some 200 yards from the Little Hulton boundary, said these works consisted of fifty bye-product coke-ovens. These ovens were supplied with hydraulic mains similar to those used at gas-works, with condensers for cooling the gases and for removing the tar and liquor, precisely similar to those used in gas-works, and also with tar-fog removers, exhausters, and scrubbers. After passing through the plant, the gas was sent forward to the flues surrounding the coking-chamber. Two-thirds of the total gas made was utilized in this way; and the remaining one-third went under the boilers for raising steam. The amount of coal carbonized per day was 220 tons on an average; and the make of gas per ton (being a very good gas coal) was about 10,000 cubic feet—amounting to a make of 2,200,000 cubic feet. Of this quantity, about one-third (700,000 cubic feet) was used for the boilers. It was part of this which would be available for lighting the district. The present requirements of Little Hulton were 13 million cubic feet per year, or about 37,000 cubic feet per day for the Salford area. The plant had been duplicated and arranged in such a manner that practically there was no chance of suspension of the process for more than an hour or two. The hydraulic mains had been built in sections. The ordinary method of constructing coke-oven plant was to build it with one hydraulic main per battery, so that the gas in the whole of the ovens went into one hydraulic main. There were two batteries of coke-ovens. They had provided hydraulic mains cut in halves; so that, in the event of a breakdown at any one point, a portion of the coke-ovens could be worked which otherwise would have to be shut down. With regard to machinery, they had two rams—one electric and one steam. The electric ram was the one generally used; but in the event of a breakdown to a motor, the steam-ram could be put into operation at once. Spare armatures were kept for putting in the motor of the electric ram; so that it was impossible for a long breakdown or stoppage of the carbonizing plant to take place from this cause. There were three exhausters, any one of which was capable of doing the whole of the exhausting for the entire plant. There were two duplicate sets of high-speed steam-engine electric generating sets, which were run in turn—one working and the other at rest; and spare armatures were kept in the event of a breakdown of the generating plant. With respect to the washing plant, there was a duplicate motor in the event of the main driving motor breaking down; and in the event of any breakdown to the washing plant itself, they could bye-pass raw coal into the storage bunker which supplied the ovens. It was quite a modern process, which had run very satisfactorily with them for eleven years. The gas at Brackley was approximately equal in quality, with regard to its analysis, calorific value, and illuminating power, to that supplied by the Metropolitan Gas Companies; so that they had taken the average illuminating power of 16 candles, tested by the No. 2 "Metropolitan" argand. Its calorific value was 575 B.Th.U. Witness handed to the Committee a copy of the "JOURNAL OF GAS LIGHTING" showing the result of a large number of tests, compared with the tabulated statement for the metropolitan gas. For the purpose of their coke-ovens first-class gas coal was used; and they would be able to supply gas of a uniform quality. In the agreement, provision was made that if the District Council required the candle power to be increased above 14, they should enrich the gas at the price of ¾d. per candle power; but there was no likelihood of its being necessary to enrich. The average would be 16 candles; but they were under obligation to supply 14-candle power gas for 9d. per 1000 cubic feet. It was not likely that the gas produced would be under 14 candles; but if it did happen, there would be no difficulty in enriching it. They entered into a binding agreement to supply gas of 550 B.Th.U. without extra cost; and, supplying it of the calorific value, they necessarily must supply the candle power. If the District Council required a 20-candle power gas, they could have it by paying ¾d. for each candle.

In reply to Mr. ROCH, witness said that further capital outlay would be necessary at Brackley in order to supply the additional gas. This would be roughly £5000. The annual income from the sale of the gas would be 13 million cubic feet at 9d., which worked out at £487 a year gross. The agreement was for 35 years.

Mr. HORNE: And you are to spend £5000 for the purpose of making £500 a year?

Witness: Yes; but something will have to come off that—the working cost and, of course, depreciation of plant, and so on. This is only the gross sales.

Mr. Jesse Wallwork, Lord Ellesmere's Mining Agent, said the output of coal from the collieries was about a million tons a year. The seams from which the coal was obtained for making the coke would probably last another fifty or sixty years. With regard to the question of a strike, at the coke-works, they were on a sliding-scale agreement with the men, which had worked very satisfactorily for several years, and there had been no stoppages.

Mr. MIDDLEBROOK: Do you consider that, with an income possibly as low as £300 a year and a probability of £500 a year, this is a sound scheme for the expenditure of a capital of £5000?

Witness: We have carefully considered it. Lord Ellesmere is a very large ratepayer, and any reduction in the rates his Lordship would benefit from. I do not expect that from the present supply his Lordship would make more than £150 a year from the scheme. There are, however, large areas adjoining which might come in later; and we should be able to supply them if they did. We are not pressing the scheme by any means.

Asked whether the gas was really a waste product, witness said it was to some extent; but they used it in the boilers for raising steam.

Mr. William Newbigging said the Salford gas agreement was that for the sum of £7500 the District Council were to purchase the Salford undertaking within a particular area. The price charged for gas in Salford was 2s. 4d. per 1000 cubic feet; but in the Little Hulton area it was 2s. 7d. The profit which Salford had made out of the supply of the Little Hulton area was 10d. per 1000 cubic feet on the consumption; so that the cost was 2s. 7d. less 10d. This worked out at £544; and he had applied the multiplier of 22 years and arrived at the figure of £11,968. The Salford Corporation were not handing over any gas manufacturing plant; simply the distributing plant. From £11,968 he had deducted £4128, which represented the structural value of the manufacturing plant which Salford retained. The actual figure agreed on was £7500. This came to about 14 years' purchase so far as the distributing plant was concerned—it was 22 years' purchase, including the works. They would be entirely dependent upon Lord Ellesmere's coke-oven supply. In the £7500 goodwill was represented by some £2000. The ground had been opened up, and the mains were found to be in practically as good a condition as when they were laid down. The promoters were not paying the Salford Corporation anything for severance, nor anything for prospective value. The district which they were taking over from the Salford Corporation was 7 or 8 miles from the Corporation works. There was a considerable deposit of the light-giving hydrocarbons of the gas on the way; the consequence being that it reached Little Hulton in a more or less depreciated condition. In the agreement between the Council and Lord Ellesmere, there was a definite obligation on the Earl's part to supply all the gas the District Council might require, and an equally definite obligation on the part of the District Council to take the gas. The price to be paid by the Council to Lord Ellesmere was 9d. per 1000 cubic feet up to 400,000 cubic feet in twenty-four hours; but if the amount were to exceed that, the price was to be reduced to 7d. He was satisfied that, so long as the gas supplied was of 550 B.Th.U., the illuminating power would not fall below 14 candles tested with the "Metropolitan" No. 2 burner. If Lord Ellesmere so desired, he was to be at liberty to supply other local authorities.

The CHAIRMAN said that, before the Committee finally settled the terms of the schedule, if they granted it, they would require to be satisfied that it did not give Lord Ellesmere in any way any statutory authority except to supply this one Local Authority.

Witness said he was of opinion that the Council could supply gas at a cost, exclusive of interest and sinking fund charges, of 1s. 6½d. per 1000 cubic feet. Having made ample estimates, he said they would be able to supply gas at 2s. 2d., as against the 2s. 7d. which was now paid. He thought the gas-mains would be quite as good in 35 years' time as they were now. Recently he took up a pipe that was laid down in 1852, and found it in most excellent condition. He considered that 9d. was a fair price to the Council. In order to earn this, it would cost Lord Ellesmere fully £5000 under the arrangement. He was satisfied the quality of the gas would not suffer. The gas would be registered in the station meter after leaving the gasholder.

The CHAIRMAN pointed out that they were asking sanction to spend £7500, which was not shown on the face of the Bill, and, if something were to turn up, they would be able to go behind the agreement which had not been scheduled. In addition, it would mean a precedent which the Committee did not wish to establish.

After some discussion on the point, the room was cleared, and the Committee considered the matter privately. Ultimately,

The CHAIRMAN announced that the Committee were in favour of the purchase of the gas undertaking, and considered the preamble proved with regard to that. As to the agreement, the Committee felt that it should be scheduled to the Bill; but they adjourned the proceedings till the following day to give the promoters an opportunity of considering the matter.

Thursday, March 31.

When the Committee met this morning,

Mr. CRIPPS, on behalf of the Salford Corporation, on the question of scheduling the agreement between the Corporation and the District Council to the Bill, said that the Corporation had some objection to the precise terms of the agreement appearing on the face of the Bill.

The CHAIRMAN remarked that the important point was that the price of £7500 should go in the Bill.

After a short discussion, the Committee unanimously decided that the agreement should be attached to the schedule.

The Committee then proceeded to discuss the various clauses with regard to general provisions; but in view of the decision that the agreement with the Salford Corporation should be scheduled to the Bill, thereby necessitating the alteration of certain of the clauses, it was decided that Part II., relating to gas matters, should stand over till to-morrow (Wednesday).

MISCELLANEOUS NEWS.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Thursday, at the Offices, D'Olier Street, Dublin—Mr. W. F. COTTON, J.P., in the chair.

The SECRETARY (Mr. Francis T. Cotton) read the notice convening the meeting and the report of the Directors, which stated that the gross revenue amounted to £165,336, and the expenditure, including interest on loan capital, &c., to £128,364; leaving a balance of profit of £36,972. In accordance with the Company's Act of Parliament of last year, the share capital had been amalgamated and converted into consolidated ordinary stock, upon which the Directors recommended the payment of a dividend at the rate of 5 per cent. per annum, after which a balance of £438 would remain to be carried to the next account. This dividend was equivalent to 10 per cent. and 7 per cent. as formerly paid on the share capital.

The CHAIRMAN, in moving the adoption of the report and accounts, said that the working of the Company for the half year might be considered satisfactory. After providing for payment of interest on the debenture stock, and on overdrafts at the bankers, the Directors were able to recommend the payment of a dividend out of profits at the rate of 5 per cent. per annum on the consolidated stock—being equal to 10 and 7 per cent. on the respective shares as they stood in the Company's books up to Dec. 31 last, before they were converted into stock—whereas, in the corresponding period of last year, it was found necessary to draw upon the reserve fund to the extent of nearly £10,000 in order to pay similar dividends. During the half year under review, there had been expended under the head of capital account £16,961, of which £8911 was spent in parliamentary costs on their new Act. This sum included a charge at the rate of 5s. per cent. stamp duty on the conversion of the share capital into stock. Turning to the revenue account, there had been an increase of £2237 in gas and meter rental; and under the head of products (which included coke, breeze, tar, sulphate of ammonia, and ammoniacal liquor), £2387. There was a saving in expenditure on coal and oil of £4272—a total saving of £11,376. Compared with the corresponding period of last year, there was an increase of about 1 per cent. in the sale of gas. This was a very small increase, having regard to the cold and severe winter experienced since early in October last. However, it would seem that they were now getting over the drawback in the sale consequent on the introduction of incandescent burners and electric light. He thought they might anticipate that, in the near future, they would have a normal increase in the sale of gas from new customers, as heretofore. During the half year, they had obtained 1878 new consumers. Of these, there had been 1564 new automatic installations, in each case fitted with cooker, brackets, and pendant. The provisions of the Company's Act passed in the last session came into operation at the beginning of the year. Some consumers were put to inconvenience by reason of not having applied to the Company to have the burners changed for those authorized by the Act, though notice was advertised on several occasions in the Press that the Company were bound to supply and fit, free of charge to the consumers, new and suitable burners. As regarded the incandescent burners, they would require re-adjusting; and, as in the case of ordinary burners, the Company would have them attended to free of cost to the customers. During the passing of the Bill, there were conditions proposed by the Corporation to which the Directors, after due consideration, assented. One of these was in connection with the selling price of gas within the City of Dublin. It guaranteed that, for a period of three years, commencing January, 1910, the price should not exceed 3s. 4d. per 1000 cubic feet, provided there was no considerable rise in the price of coal. He had on a previous occasion referred to the new retort-house being erected, with all modern appliances for the economical production of gas, in the Brunswick Street station. One section of this house was completed during the half year; and, so far as present experience went, the results were most satisfactory.

The report was adopted, and the dividend recommended was declared.

Mr. MAGUIRE, in moving a vote of thanks to the Chairman, Directors, and staff, said they had to compete with an undertaking which was subsidized out of the rates, to which rates the Gas Company had to contribute a large sum—£11,000 or £12,000. This showed the evils of municipal trading.

The CHAIRMAN, in acknowledging the vote, said he understood that the total loss to the rates on the electric lighting was, up to the present, about £50,000. Even the poorest ratepayer, in a district where there was perhaps no electric light at all, had to pay his share of this loss.

The SECRETARY returned thanks on behalf of the officials.

SAN PAULO GAS COMPANY, LIMITED.

An Increased Dividend.

The Annual General Meeting of the Company was held on the 23rd ult., at the Great Eastern Hotel, Bishopsgate Street, E.C.—Mr. D. M. Fox in the chair.

The SECRETARY (Mr. G. H. Rogers) read the notice convening the meeting; and the Directors' report (noticed in the "JOURNAL" for March 22, p. 815) and the statement of accounts were taken as read.

The CHAIRMAN, on rising, said he had again the pleasure of congratulating the shareholders on the highly satisfactory report and accounts submitted for their approval. The results for the past year showed that the Company's business had continued to make satisfactory progress; but during the period under review, nothing eventful or exceptional had happened. There had been no "boom" in either the export or import trade of the State, but just the steady normal

development of the City of San Paulo. Business during the year had been generally good, and the exchange had been practically stationary throughout the twelve months at an average of about 15½d. The Company's prosperity had simply kept pace with the steady advancement of the City and State of San Paulo. He thought they might regard it as the most satisfactory and encouraging feature of their position that their increasing prosperity was proportionate to, and dependent upon, the continuous development of the city itself; and he ventured to predict that, as the City of San Paulo expanded as a commercial, industrial, and residential centre—as it undoubtedly would do—so would the business and prosperity of the Company go on increasing year by year. At the same time, he thought that he might justly claim that their progress of late years had been largely attributable to the liberal policy of the Directors, ably seconded as it was by the management in San Paulo, of improving the standard of the public and private lighting, and of lowering the price of gas, especially for the purposes of cooking and heating—at the same time affording every facility to the customers in the matter of the supply of house-fittings and other materials at low rates, thus popularizing the use of gas. This policy had been amply justified by results, in the face of the inevitable competition from electricity. This popularizing of the use of gas seemed, however, to have a tendency to cause the consumption per consumer to decrease—as was proved by the fact that, though the number of consumers during the past year increased by 14 per cent., the Company only obtained an increase of 10 per cent. in the sales of gas. This would seem to indicate that in San Paulo gas might be termed the "people's light." It was gratifying, however, to record that the advantages of gas for heating and cooking purposes were being more and more recognized among the better-to-do inhabitants. The gross receipts for the past year amounted to £179,180, which was an increase of £9628, or 5 per cent. The working expenses, including London charges, &c., were £134,501, which was an increase of £5820, or some 4 per cent. The profit was £44,679, which was an increase of £3808, or 9 per cent. As was stated in the report, to this balance of profit had to be added dividends on investments £838, and the sum of £6432 brought forward from 1908—making altogether £51,959. Out of this, provision had been made for service of debentures, the dividend on the preference shares, and other items requiring the sum of £20,398, and leaving a disposable balance of £31,561. The Board had placed £5000 to the reserve fund and £5000 towards renewals to be carried out during the current year; and they recommended the payment of a final dividend of 6 per cent. on the ordinary shares, tax free, making 9 per cent. for the year, and leaving the sum of £6561 to be carried forward to the next year's accounts. This increase of dividend on the ordinary shares would doubtless meet with the approval of the shareholders; and he would like to emphasize the fact that the Board would not have recommended such an increase had they not good reason to believe that in the future this rate would be permanently maintained. It was not his purpose to recapitulate and comment in detail upon the various items of the balance-sheet and revenue account. The figures spoke for themselves, and were evidence of the sound financial position of the undertaking. The following points might, however, be interesting. The receipts from sales of gas increased by £12,189, or about 10 per cent. As to residuals, though the quantity of coke sold was about the same as the previous year, the receipts were less by £3092; the falling-off being due to the Company having been obliged to reduce prices and afford facilities in consequence of the successful competition of electricity for power. Tar was in better demand; and an improving market was being found for pitch, refined tar, and other products. The lower price of coal prevailing last year had helped to keep down the principal item of expenditure; and improved carbonizing resulted in a higher yield of gas per ton of coal carbonized. Under the heading of repairs and maintenance, extensive alterations in progress were mainly responsible for increased charges. The work in hand, when completed, would greatly relieve the congested state of the works, and facilitate the more economical handling of coal and coke in addition to materially increasing the coal storage capacity. The distribution expenses had increased by £2500; but it must be borne in mind that the Company served a large area in proportion to the number of consumers; and the proper upkeep of the plant was of vital importance. The cost of maintaining the public lamps had increased in proportion to the number of lamps added during the year. The number of public lamps in use at the end of the year was 5818, or an increase of 598 for the twelve months; and the Company had orders for about 300 more. The replacement of lanterns of the old and unsightly type was urgently desirable, and during the current year would be accelerated. The lighting in general, he might remark, had continued to give satisfaction. The additional expenditure on capital account amounted to £22,328, of which new mains £12,491, new lamps £3812, and meters £3420 were the principal items. It would be noticed that real estate in San Paulo now amounted to nearly £20,000; a sum of £10,374 having been expended during the year on the purchase of premises to serve as the permanent headquarters of the Company in San Paulo. The necessity for this acquisition was primarily brought about by the State Government having required possession of the building formerly occupied by the Company (which adjoined the Palace and Government Offices) for the Public Service. An agreement was accordingly entered into by which the present premises were let to the State Government on advantageous terms; and the Company purchased commodious premises in the same street which, at a comparatively small cost, had been transformed into admirable central offices and city show-rooms and residence for the Manager. It would be impossible to find a more suitable situation; and a saving of an annual rent of £750 would be effected, as the Company would no longer require a shop that had been for some years rented for show-room purposes. A new house had also been built for the residence of the Company's Engineer, at a cost of about £2000. His former residence in the works was inconvenient, and interfered with the carrying out of necessary works improvements, and it was now being demolished. The tramway connecting the works with the depot of the San Paulo Railway had been relaid with grooved rails. The locomotive and waggons had arrived, and shortly the new system of traction would be inaugurated—within the time specified in the agreement with the Camara Municipal. The Company continued to be on the best of terms with the authorities

of the State Government and the Camara Municipal. In view of the report, and of what he had stated, shareholders would not be surprised to hear that the Directors proposed in April or May to make a further issue of about £57,500 of the 6 per cent. preference shares. This would make the issue of the preference shares £120,000, instead of £62,500 as at present. He was sure shareholders would have noticed with regret that their old and valued Manager and representative in San Paulo was retiring, after ten years of faithful and valuable service. But this regret would, he was convinced, be mitigated by the knowledge that they were still to have the advantage of his assistance on the Board. It would be difficult to overrate the services rendered to the Company by Mr. Gray—rendered at times under great difficulties; and he retired from active service with the esteem and good wishes, not only of his brother officers and employees, but of the President and officials of the Government of the State and of the Camara Municipal, as well as of the inhabitants of the city, among whom he lived and worked. The shareholders would be pleased to know that his retirement had been foreseen, and steps had been taken by the Directors to provide a substitute. Mr. Biddell had been trained for some time past to assume the post of representative; and the Board were satisfied as to his capacity to fill this important position. Mr. Whyte—their capable and well-tried servant—continued to be the Engineer; and the Board hoped the two would work together loyally in the Company's service. If he might conclude on a personal note, the shareholders would have noticed perhaps that this was the fortieth annual general meeting. It reminded him that he was instrumental in obtaining the original concession in the sixties; and for two years after the formation of the Company he acted as local Director in San Paulo. It was interesting, as demonstrating the enormous increase in the importance of the City of San Paulo, to note that the increase only in the number of lamps during the past year was 600—being 100 more than the total number of lamps specified in the original concession. It had been one of the pleasures of his life to have contributed, in so far as he was able, to the prosperity of so successful an undertaking. He begged to move the adoption of the report and accounts.

Mr. A. F. PHILLIPS seconded the motion.

Mr. E. CLARK said it was a pleasure to be able to attend the meeting and congratulate the Board on the high pitch of prosperity to which they had brought the undertaking. He would be glad to know how much gas per ton of coal carbonized was actually sold for lighting or for other purposes; for this was the great test as to whether or not a gas company was being successfully administered. Electrical people were very fond of showing the uses to which their own commodity could be put, and he felt sure that in the new premises which the Company had acquired the Directors would take care to make clear the reasons why people should adhere to gas, and demonstrate the fact that gas could be successfully utilized for all purposes. One or two South American companies owed their present prosperity, not to the development of gas for lighting purposes, but for heating.

Mr. PHILLIPS replied that the make of gas was about 11,400 cubic feet per ton; and the quantity brought into charge was a little over 10,000 feet. Perhaps the shareholders might consider that the difference was a large one; but he might remind them that a very considerable portion of the gas in San Paulo was sold for public lighting, and the Directors preferred to treat the lamps, in the matter of consumption, in an extremely liberal way. Rapid development was taking place in the use of gas for cooking and heating; the consumption last year for these purposes having been 28 per cent. of the total output of the Company.

The resolution was then carried unanimously.

On the motion of the CHAIRMAN, seconded by Major H. N. WEBB, a dividend was declared on the preference shares at the rate of 6 per cent. per annum, less tax; and a further dividend on the ordinary shares of 6 per cent., free of tax, making, with the interim dividend, 9 per cent. for the year.

The retiring Directors (Mr. John Barker and Major Webb) and the Auditors (Messrs. Cash, Stone, and Co.) were subsequently re-elected.

An Extraordinary Meeting.

The CHAIRMAN remarked that they had now to hold an extraordinary meeting for the purpose of passing the following resolution:—"That the remuneration of the Directors be increased by the sum of £300 per annum, and that the Directors' and Auditors' fees be free of income-tax, in the same manner as the dividends on the ordinary shares." The shareholders had, he said, heard how the Directors proposed to strengthen the Board by the election to it of Mr. Richard Gray on his return to England from San Paulo.

Mr. BARREYMAN moved the resolution, and expressed his pleasure that Mr. Gray was going to join the Board.

Mr. CLARK inquired what the Directors' fees were at present.

The CHAIRMAN: £1250.

Mr. LONGBOTHAM then seconded the proposition, and it was unanimously carried.

A cordial vote of thanks to the Chairman and Directors having been passed, on the motion of Mr. CLARK,

The CHAIRMAN acknowledged the compliment, and afterwards, in reply to a shareholder, said it was proposed to issue the new preference shares *pro rata* to the ordinary and preference shareholders. Of course, they would not offer them to debenture holders; but a holder of preference shares was as much a shareholder as was the holder of ordinary ones. They were legally advised that if they offered them to the shareholders *pro rata*, they must include all shareholders.

WANDSWORTH AND PUTNEY GAS COMPANY.

Ten Years' Record Progress—Profit-Sharing to be Introduced.

On the occasion of the annual winter dinner of the employees of the Wandsworth and Putney Gas Company, which was held recently in the Wandsworth Town Hall, under the presidency of Mr. H. O. Carr, the Company's Engineer, the toast of the evening—"Prosperity to the Company"—afforded the Chairman, as at previous similar gatherings,

an opportunity of bringing before those present some interesting particulars in regard to the undertaking in which they are engaged, and in the prosperity of which they are largely concerned. Mr. Carr said there was no doubt about their prosperity, for during the six months ended Dec. 31 last they had been pacing along with an increase of 6 per cent. in the quantity of gas consumed. They continued to supply the cheapest gas in London—a fact in which they took great pride, especially as the price had recently been reduced to 1s. 10d. per 1000 cubic feet. The prosperity of the Company and the cheapness of the gas were brought about by careful management through all ranks. First of all, they had an eminent and worthy Chairman in Mr. H. E. Jones, who was, he thought, unapproached by any other gas engineer or gas expert in the country. The Directors were mostly local gentlemen, and, of course, knew a great deal about the neighbourhood, which was an excellent thing; while the staff and workmen did their best to support the Board. He should like to draw a few comparisons between what they were doing to-day and ten years ago. In 1900, they were selling about 650 million cubic feet of gas a year; whereas now they were selling considerably more than 1000 millions. The number of consumers had grown from 12,000 to 28,000. Of late years they had made large reductions for gas for any power that was required for industrial purposes in the district; and it was interesting to note that ten years ago there was not, he believed, more than 1 cubic foot in every 100 feet used for power. To-day there were upwards of 5 cubic feet out of every 100 feet consumed for industrial and trade purposes. Just to show what a difference lighting by mantle instead of by the old flat-flame burner had made for the Company, he would remark that ten years ago the public lights which were for the most part, if not all, fitted with flat-flame burners, used 6 cubic feet in every 100 feet produced; whereas now, with mantles and a great many more lights, only 4 cubic feet in every 100 feet were used for public lighting, notwithstanding that each lamp was six or seven times as brilliant. Then they came to the most interesting of all comparisons—viz., with regard to cooking and heating. Ten years ago there were only 40 cubic feet in every 100 feet used for these purposes; and now there were more than 60 feet. Gas cooking and heating stoves went a long way to solve the domestic servant problem. The figures he had extracted only left one other item, and that was for private lighting in houses, which also was affected by mantles having superseded flat-flame burners. Ten years ago, 53 cubic feet in every 100 feet were used for private lighting; but now only about 30 feet were so employed. This showed the great change which had been effected by incandescent mantles. But he did not deprecate their use. On the contrary, the incandescent mantle had been the means of reserving the bulk of the lighting to gas companies. Some time ago, in gathering other information, they ascertained how many flat-flame burners were left in their district; and they were rather surprised to find that nearly one-half the number were of the old type. But most of these burners were in unused parts of the houses. The price of gas about ten years ago rose to 2s. 6d. per 1000 cubic feet; and now it had fallen to 1s. 10d.—a difference of 8d. This meant that it had fallen, on an average, nearly 1d. a year. If it continued to go down at this rate, in 22 years or thereabouts the public would be getting gas for nothing. This was very improbable; but at any rate they were going to try to get as near it as possible. There was one claim they could make in common with other gas companies, and that was in the clarification of the atmosphere. This winter there had been no fog; and he found from statistics which had been published that in 1905 there were 44 fogs, in 1906, 19; in 1907, 24; in 1908, 13; in 1909, 4; while in 1910 they might say that the fogs had been missed. The Wandsworth and Putney Gas Company did not lack in the matter of enterprise. They were soon going to open what would be a very fine show-room in Putney High Street, where they hoped to do a great deal of business. They would show there the latest examples of lighting and heating, and how gas might be used most effectively for cleansing and cooking. The Borough Council recently paid the Company a great compliment by stipulating in their contracts for "Wandsworth" coke, which was their own special production. The lowering of the price of gas meant a reduction in the cost of public lighting; and the more the Borough Council could reciprocate with the kindly feeling that they had lately shown, the better it would be, he was sure, in the course of years, for the price of gas.

The toast was responded to by Mr. C. W. Braine, the Secretary of the Company. He said he was certain that all did their best to further the interests of the Company; and if they were to keep the price of gas as low as it was at present, they must all pull together as one. There was nothing like honest work; and if everybody gave his best, he would have a feeling of satisfaction in having done his duty, as well as in knowing that he had contributed towards the prosperity of the Company. He had no doubt those present had read the remarks of the Chairman of the Company, at the last half-yearly meeting, with regard to the proposed scheme of profit-sharing. They had examined schemes of this description adopted by other companies, and in a few weeks the employees would hear an explanation of the scheme, which he thought they would not consider a bad one. It would, at any rate, make everyone feel that he had an interest in the Company besides being an employee.

GAS PROFITS AND RATE RELIEF AT BURTON-ON-TRENT.

Protest by the Chairman of the Gas Committee.

A Special Meeting of the Burton-on-Trent Town Council was held a few days since for the purpose of making the new rate for the current financial year. The MAYOR (Mr. T. Jenkins) presided.

Alderman COXON, the Chairman of the Finance Committee, in moving the adoption of the new rate, made an exhaustive statement in regard to the financial position of the town, and pointed out that the Council were indebted, as usual, to the Gas Committee for their generous support towards the rates, as the Finance Committee had anticipated a grant from them of £7000, as last year.

Alderman LOWE, the Chairman of the Gas Committee, protested against this proceeding; saying that the sum named had been put down without consulting his Committee in any way whatever. He

reminded the Council of the history of the contribution that the Committee had made for years past. Some time ago, the Council gradually acquired the opinion that the financial resources of the Committee were inexhaustible; and the contributions gradually increased, and their working capital almost entirely disappeared. The time came when it was necessary to make a stand; and the whole Council agreed unanimously that £5000 was a fair sum for the gas undertaking to contribute towards the rates, and also a fair one between the consumer and the ratepayer. This was adhered to for two years. But about four years ago the then Chairman of the Finance Committee said they would have to ask for £6500, or the rates would have to go up. This went on for four years; and at the end of last year Alderman Coxon said he not only could not reduce the amount, but must ask for £500 more. The Gas Committee gave way on the understanding that as soon as the then pending financial adjustment with the County Council was settled, they should go back to their normal figure of £5000. Now £7000 had been voted by the Finance Committee. He felt very much disposed to propose an amendment that the rates be reduced id. less; but he was informed that such a step would throw their finances in such chaos as prevailed in other parts of the country. He did not, therefore, propose taking such a step; but he hoped that between now and next year the Council would pass a resolution which would make it impossible for the Finance Committee to vote sums without consulting committees first. It was absurd business that they should not have an opportunity of dealing with their own finances first. The Finance Committee would never again have such an opportunity of putting things right. The Gas Committee desired to make a regular contribution to the rates of the town; but they also wished to reduce the price of gas when they were able to do so. If, however, they continued this high contribution, it was impossible for them to do this. He intended to make this emphatic protest against a procedure which was a very unwise one, and which he was sorry that the Finance Committee had adopted.

Mr. HUTCHINSON said he had never heard Alderman Lowe make a speech on the gas question with which he was so absolutely in harmony. If there was one thing that was mentioned at public meetings it was that consumers should have their gas at a reasonable figure. Here they had an opportunity. The public had been led to expect a reduction of not more than 3d. in the pound; and the Borough Treasurer had estimated 4d., while 5d. was only agreed upon after a division. Several of them felt that it was not advisable to bring the rate down to the lowest possible limit. The public only expected 3d., and would have been content with this reduction. The gas consumers had reason to complain that an opportunity of reducing the price of gas had not been taken advantage of.

Mr. KING said he asked in the Finance Committee if the Gas Committee had been consulted in this matter; and the answer was that they made no objection. Alderman Lowe had known long enough that silence gave consent; and so they took it that his Committee had decided to allow the same as last year. He thought they could afford to do it; and no doubt the ratepayers would be able to appreciate the very satisfactory reduction in the rate.

Mr. WARDLE said he had a good deal of sympathy with Alderman Lowe. He was a member of the Finance Committee, and approved of the £7000; but he was strongly against any more than this being taken,

for any advantage obtained by increased consumption should be used for the benefit of the consumers.

Alderman ROWLAND said he wished to disclaim any desire on the part of the Finance Committee to ignore the Gas Committee, or to show them any discourtesy. In face of the strong protest that had been made, he was compelled to uphold the Finance Committee. He thought the Chairman of the Gas Committee was a little to blame, for he had had the estimates before him, and knew that the next step was the calculating of the rate. With this full knowledge, Alderman Lowe made no representation to the Finance Committee; and in its absence, they did the same as before. For himself, he agreed with Alderman Lowe's principle; and it was a matter which could easily be adjusted in future. At the same time, as an outsider, he was sorry to hear any suggestion that a reduction should be made from £7000. The only argument that appealed to him against taking this amount was the possible increase in the price of coal; but against this they had to remember that there was the new gasholder and the first set of new retorts, so that there would be corresponding economies. In conclusion, he submitted that the time to make an alteration in the price of gas was when the reorganization of the works was completed.

Alderman COXON, in reply, acknowledged that the Finance Committee did, in the matter in question, take "French leave" to some extent; but he explained that there were upon the Committee two members of the Gas Committee, who thought their finances would stand the taking of the £7000. His Committee consequently went on.

The proposal was sanctioned.

HULL CORPORATION WATER SUPPLY.

Thirteenth Annual Report.

The Water and Gas Engineer of the Hull Corporation (Mr. C. B. Newton, M. Inst. C.E.) has lately issued the thirteenth annual report on the water supply of the city. It shows that the total quantity of water drawn from the wells last year was 3,884,742,000 gallons—being 1,871,764,000 gallons from Springhead and 2,012,978,000 gallons from Cottingham. The greatest quantity sent out from each pumping-station in one day was Springhead, 8,849,000 gallons, on Dec. 28; and Cottingham, 11,189,000 gallons on Dec. 17. The total quantity of water pumped was 28.3 million gallons more than in 1908. The supply per head per day within the water limits was 37.52 gallons; through meters, 9.94 gallons; and for domestic and unmetered trade purposes, 2.9 gallons. The covered service reservoir at Keldgate, which was practically completed at Christmas, 1908, was brought into use on the 30th of June last; the opening ceremony being performed by the Mayoress, Mrs. H. Feldman. The reservoir was named (after the place in which it is situated) by Mrs. Hargreaves, the wife of the Deputy-Chairman of the Water and Gas Committee. The area of the district within which the Corporation are authorized to supply water is the same as before—viz., 16,377 acres, or 25.59 square miles. In addition, they sell water in bulk to the Cottingham Urban District Council for the district of Cottingham, and to the Sculcoates Rural District Council for the Sutton and Preston districts. The estimated average population

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 19.

| Issue | Share. | When ex. Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue | Share. | When ex. Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|--------|--------------------|--------------------|------------------------------|-----------------|---------------------|------------------------|-----------|--------|--------------------|--------------------|---------------------------|-----------------|---------------------|------------------------|
| £ | | | p.c. | | | | £ s. d. | £ | | | p.c. | | | | £ s. d. |
| 1,471,000 | Stk. | Apr. 1 | 5 | Alliance & Dublin Ord. | 84-86* | + 1/2 | 5 16 3 | 4,940,000 | Stk. | Nov. 11 | 8 | Imperial Continental | 180-182 | + 2 | 4 7 11 |
| 310,000 | Stk. | Jan. 13 | 4 | Do. 4 p.c. Deb. | 98-100 | .. | 4 0 0 | 1,235,000 | Stk. | Feb. 10 | 3 1/2 | Do. 3 1/2 p.c. Deb. Red. | 93-95 | .. | 3 13 8 |
| 200,000 | Stk. | Oct. 28 | 7 1/2 | Bombay, Ltd. | 63-65 | .. | 5 5 8 | 195,242 | Stk. | Mar. 16 | 10 | Lea Bridge Ord. 5 p.c. | 120-122 | .. | 4 18 4 |
| 40,000 | Stk. | Feb. 25 | 15 | Do. New, £4 paid. | 5-5 1/2 | .. | 5 0 8 | 561,000 | Stk. | Feb. 25 | 6 | Liverpool United A. | 222-224 | .. | 4 9 3 |
| 50,000 | Stk. | Feb. 25 | 15 | Bourne 10 p.c. | 29-30 | .. | 5 0 0 | 718,100 | Stk. | Feb. 25 | 7 | Do. B. | 163 1/2-165 1/2 | .. | 4 4 7 |
| 311,146 | Stk. | Feb. 25 | 15 | mouth Gas 7 p.c. | 15-15 1/2 | .. | 4 3 7 | 306,083 | Stk. | Dec. 29 | 4 | Do. Deb. Stk. | 103-105 | .. | 3 16 2 |
| 75,000 | Stk. | Feb. 25 | 12 1/2 | and Water 6 p.c. | 250-253 | .. | 3 17 5 | 560,000 | Stk. | Nov. 26 | 5 | Malta & Mediterranean. | 4 1/2-5 | .. | 6 0 0 |
| 380,000 | Stk. | Feb. 25 | 12 1/2 | Brentford Consolidated | 187-189 | .. | 4 18 10 | 250,000 | Stk. | Apr. 1 | 5 | Met. of 5 p.c. Deb. | 100-102* | + 2 1/2 | 4 18 0 |
| 300,000 | Stk. | Feb. 25 | 9 1/2 | Do. New | 120-122 | .. | 5 0 6 | 541,920 | Stk. | Nov. 11 | 4 1/2 | Melbourne 4 1/2 p.c. Deb. | 100-102* | + 2 1/2 | 4 8 3 |
| 50,000 | Stk. | Aug. 12 | 5 | Do. 5 p.c. Pref. | 101-103 | .. | 4 2 0 | 1,775,892 | Stk. | Feb. 25 | 4 1/2 | Monte Video, Ltd. | 12 1/2-13 1/2 | .. | 5 5 8 |
| 206,250 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 213-216 | .. | 3 17 8 | 529,435 | Stk. | Dec. 29 | 3 1/2 | Newcastle & Gateshead Con | 104-105 | .. | 4 3 4 |
| 220,000 | Stk. | Mar. 16 | 11 | Brighton & Hove Ord. | 152-155 | + 1 | 5 3 10 | 55,940 | Stk. | Feb. 25 | 7 | North Middlesex 7 p.c. | 12 1/2-13 1/2 | .. | 3 15 3 |
| 246,320 | Stk. | Apr. 1 | 10 1/2 | Do. A Ord. Stk. | 116-118 | .. | 4 14 8 | 300,000 | Stk. | Nov. 26 | 8 | Oriental, Ltd. | 140-142 | + 1 | 5 12 8 |
| 460,000 | Stk. | Feb. 25 | 10 1/2 | British | 87-89 | .. | 5 1 2 | 60,000 | Stk. | Apr. 1 | 8 | Ottoman, Ltd. | 158-160* | .. | 6 10 7 |
| 199,000 | Stk. | Feb. 25 | 4 1/2 | Bromley A 5 p.c. | 104-106 | + 1 | 5 3 9 | 31,800 | Stk. | Feb. 25 | 13 | Portsea Island A. | 134-136 | .. | 5 1 0 |
| 165,700 | Stk. | Feb. 25 | 4 1/2 | Do. B 3 1/2 p.c. | 87-89 | .. | 3 18 8 | 60,000 | Stk. | Feb. 25 | 13 | Do. B. | 126-128 | .. | 5 1 7 |
| 82,375 | Stk. | Dec. 29 | 5 1/2 | Do. C 5 p.c. | 98-100 | .. | 4 0 0 | 100,000 | Stk. | Feb. 25 | 12 | Do. C. | 119-121 | .. | 4 19 2 |
| 500,000 | Stk. | Oct. 14 | 7 | Do. 3 1/2 p.c. Deb. | 98-100 | .. | 4 0 0 | 114,800 | Stk. | Feb. 25 | 10 | Do. D and E. | 100-102 | .. | 4 18 0 |
| 250,000 | Stk. | Dec. 29 | 4 | Buenos Ayres (New) Ltd. | 4-5 | .. | — | 398,490 | Stk. | Oct. 28 | 7 | Primitiva Ord. | 78-78 1/2 | .. | 4 8 11 |
| 100,000 | Stk. | Dec. 29 | 4 | Cape Town & Dis., Ltd. | 6-7 | .. | — | 796,980 | Stk. | Jan. 27 | 5 | Do. 5 p.c. Pref. | 58-58 1/2 | .. | 4 8 11 |
| 100,000 | Stk. | Nov. 2 | 6 | Do. 4 1/2 p.c. Pref. | 49-50 | .. | 6 0 0 | 488,900 | Stk. | Dec. 1 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 100,000 | Stk. | Dec. 29 | 4 1/2 | Do. 6 p.c. 1st Mort. | 56-58 | .. | 5 2 3 | 1,000,000 | Stk. | Oct. 14 | 8 | River Plate Ord. | — | .. | — |
| 157,150 | Stk. | Feb. 25 | 5 | Chester 5 p.c. Ord. | 105-108 | .. | 4 12 7 | 312,650 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 1,513,280 | Stk. | Feb. 25 | 5 1/2 | Commercial 4 p.c. Stk. | 103-105 | .. | 4 15 3 | 250,000 | Stk. | Apr. 1 | 9 | San Paulo, Ltd. | 115-115 1/2 | .. | 5 16 1 |
| 560,000 | Stk. | Dec. 29 | 5 | Do. 3 1/2 p.c. do. | 87-89 | .. | 3 12 3 | 62,500 | Stk. | Feb. 25 | 6 | Do. 6 p.c. Pref. | 11 1/2-12* | .. | 5 0 0 |
| 470,000 | Stk. | Dec. 10 | 5 | Continental Union, Ltd. | 98-100 | .. | 5 0 0 | 125,000 | Stk. | Jan. 3 | 3 | Do. 5 p.c. Deb. | 5 1/2-5 1/2 | + 1/2 | 4 17 1 |
| 800,000 | Stk. | Dec. 10 | 5 | Derby Con. Stk. | 121-123 | .. | 4 1 4 | 232,234 | Stk. | Feb. 25 | 5 | Sheffield A. | 232-234 | .. | 4 5 5 |
| 250,000 | Stk. | Dec. 10 | 5 | Do. Deb. Stk. | 103-105 | .. | 3 16 2 | 232,234 | Stk. | Feb. 25 | 5 | Do. B. | 232-234 | .. | 4 5 5 |
| 492,279 | Stk. | Dec. 10 | 5 | East Hull 5 p.c. Ord. | 95-98* | + 1/2 | 5 2 0 | 232,234 | Stk. | Feb. 25 | 5 | Do. C. | 232-234 | .. | 4 5 5 |
| 55,000 | Stk. | Dec. 10 | 5 | European, Ltd. | 243-244 | .. | 4 17 0 | 70,000 | Stk. | Oct. 14 | 10 | South African | 120-122 | .. | 7 16 11 |
| 141,995 | Stk. | Apr. 1 | 1 | Do. £7 10s. paid. | 183-189 | .. | 4 14 9 | 6,429,895 | Stk. | Feb. 10 | 5/9/4 | South Met., 4 p.c. Ord. | 120-122 | .. | 4 9 7 |
| 440,000 | Stk. | Jan. 27 | 12 | Gas 4 p.c. Ord. | 85-90 | .. | 4 9 8 | 1,895,445 | Stk. | Jan. 13 | 3 | Do. 3 p.c. Deb. | 81-83 | .. | 3 12 3 |
| 310,000 | Stk. | Feb. 10 | 4 1/2 | light 3 1/2 p.c. max. | 103-105 | .. | 3 16 2 | 209,823 | Stk. | Mar. 16 | 11 | South Shields Con. Stk. | 157-158 | .. | 5 1 3 |
| 4,000,000 | Stk. | Dec. 29 | 4 | and 4 p.c. Con. Pref. | 80-92 | .. | 3 13 2 | 605,000 | Stk. | Feb. 25 | 5 1/2 | S'th Suburb'n Ord. 5 p.c. | 121-123 | .. | 4 12 0 |
| 258,740 | Stk. | Mar. 16 | 5 | Coke 3 p.c. Con. Deb. | 93-95 | .. | 5 5 3 | 60,000 | Stk. | Feb. 25 | 5 | Do. 5 p.c. Pref. | 119-121 | .. | 4 2 8 |
| 42,500 | Stk. | Mar. 16 | 6 1/2 | Hastings & St. L. 3 1/2 p.c. | 117-119 | .. | 5 9 3 | 117,058 | Stk. | Jan. 13 | 5 | Do. 5 p.c. Deb. Stk. | 121-123 | .. | 4 1 4 |
| 700,000 | Stk. | Sep. 29 | 11 | Do. do. 5 p.c. | 178-18 | .. | 6 2 3 | 502,310 | Stk. | Nov. 11 | 5 | Southampton Ord. | 110-112 | .. | 4 9 3 |
| 1,141,000 | Stk. | Mar. 16 | 7 | Hongkong & China, Ltd. | 145-147 | .. | 4 15 3 | 120,000 | Stk. | Feb. 10 | 5 1/2 | Tottenham A 5 p.c. | 133-135 | .. | 5 1 9 |
| 65,782 | Stk. | Mar. 16 | 5 1/2 | Ilford A and C | 105-110 | .. | 5 0 0 | 453,940 | Stk. | Dec. 29 | 4 | and B 3 1/2 p.c. | 112-114 | .. | 4 14 4 |
| 65,550 | Stk. | Dec. 29 | 4 | Do. B | 100-102 | .. | 3 18 5 | 149,470 | Stk. | Jan. 3 | 5 | Edmonton 4 p.c. Deb. | 59-101 | .. | 3 19 3 |
| | | | | Do. 4 p.c. Deb. | | | | 182,380 | Stk. | Dec. 29 | 8 | Tuscan, Ltd. | 94-94 1/2 | .. | 8 4 2 |
| | | | | | | | | 230,476 | Stk. | Jan. 3 | 5 | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 19 0 |
| | | | | | | | | 255,636 | Stk. | Feb. 25 | 6 1/2 | Tynemouth, 5 p.c. max. | 112-114 | .. | 4 7 9 |
| | | | | | | | | 79,416 | Stk. | Dec. 29 | 3 | Wands- B 3 1/2 p.c. | 139-141 | .. | 4 14 0 |
| | | | | | | | | | | | | worth 3 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |

Prices marked * are "Ex div."

† Next dividend will be at this rate.

supplied within the water limits during the past year was as follows : Within the city boundary, 275,552; outside, 5848; total, 281,400. During the past year, 22,628 yards, or 12·85 miles, of new mains were laid and 173 fire-hydrants fixed, and 6788 yards of mains were taken up or disused; making a net increase of 15,840 yards, or 9 miles. The total length of mains on Dec. 31 was 267·39 miles.

NEW WATER-WORKS FOR ST. IVES (CORNWALL).

The new water-works for the supply of St. Ives (Cornwall) were formally opened yesterday week. Members of the Corporation attended the ceremony, and there was a large gathering of inhabitants of the town. Mrs. Read, wife of the Chairman of the Water Committee, opened the valve which allowed the water to flow into the town; and the Mayoress (Mrs. Williams) laid a commemoration stone. The new works were rendered necessary by the resumption of mining operations in the neighbourhood from which the town had for some years derived its water, and the mine has since attained considerable public notoriety as the one in which pitchblende, the source of radium, is found. In the new works, situated on Bussow Moors, provision is made for a supply of 250,000 gallons per day. Mr. A. P. I. Cotterell, the Engineer, originally suggested the construction of a reservoir to hold 14 million gallons; but, on the advice of the Local Government Board, it was decided that the reservoir should have a capacity of 22 millions. The catchment area amounts to upwards of 600 acres. Filter-beds are provided, and two mains, one 9 inches and the other 6 inches in diameter, convey the water to the town. Mr. A. Carkeek has carried out the work, the contract price for which was £14,640.

In explaining the construction of the works, Mr. Cotterell said the reservoir was eight acres in extent, and the top water-level 400 feet above the mean level of the sea. They had had to erect a large dam, which in one part was 40 feet deep and 15 feet wide. The mains would carry 800,000 gallons a day, if necessary; and there were three large mechanical filters, through which all the water would pass.

Alderman Read stated that the Corporation took over the water supply from a body of Trustees in 1899, and were entirely satisfied with it when the old mine workings were sold, and it became necessary to look out for a fresh source of supply. After much negotiation, it was arranged that they should have a lease of the water rights of Bussow Moor for 200 years, on a cash payment of £3000. The Local Government Board had insisted upon them having a larger scheme than was first contemplated; and he believed they were right, for a good and abundant supply of water was a valuable asset to a town which attracted so many visitors as St. Ives.

The Directors of the Imperial Continental Gas Association announce a dividend of 4 per cent. for the six months ended Dec. 31, tax free.

NOTES FROM SCOTLAND.

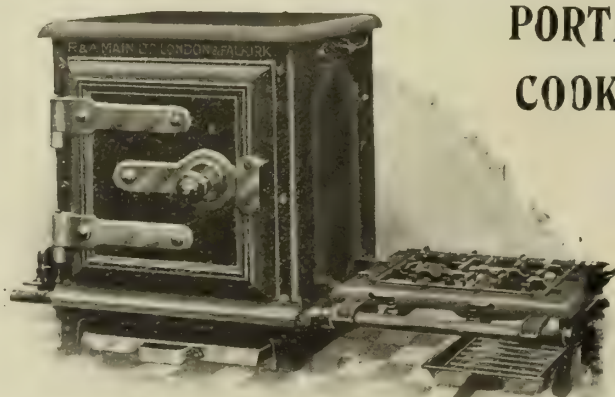
From Our Own Correspondent.

Saturday.

The hearing of the Glasgow Corporation Gas Consolidation Bill begins before a Committee of the House of Commons on Tuesday. There have been thirteen petitions lodged against the Bill. The principal opponents are the burghs of Govan, Partick, Pollokshaws, Rutherglen, and Clydebank, and the County Council of Lanark. These oppose the repeal of the clause in the Gas Act of 1862 under which the Corporation are bound to charge all consumers for lighting and domestic purposes at an equal rate, whatever the quantity of gas consumed; whereas now the Corporation are seeking power to charge consumers on a graduated scale, according to the quantity of gas burned. The petitioners also object to the continuance of the power which the Corporation have had since 1869 to apply surplus profits from the gas undertaking to the general purposes of the Corporation. The petitioners ask the Committee to find the preamble not proved until steps are taken for the formation of a Gas Board, on which all the Authorities interested would be represented.

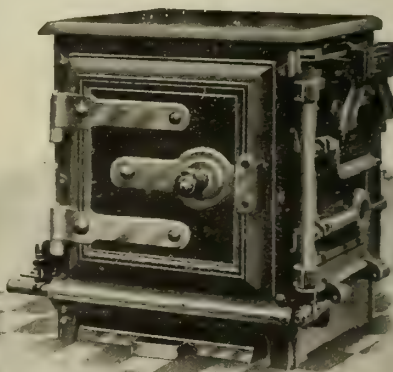
With the meeting in Glasgow to-night of the Western District of the Scottish Junior Gas Association, the technical work of the Juniors in Scotland comes to an end for the session. There yet remains, however, a joint visit with the Eastern District to the Falkirk Gas-Works, which takes place next Saturday. The Western District have had a well-sustained and useful session; a number of valuable papers having been contributed by the members. The lecture by Mr. W. Grafton this evening was the product of deep research. The subject was well presented, and so exhaustively handled that its perusal cannot fail to extend the knowledge of those who supply gas as to the principles which underlie combustion. The red-hot flame which Mr. Grafton showed can be produced, if it should be possible to make it serve in gas-fires, would be a great acquisition to the gas industry.

Professor G. H. Gemmell, of the Royal (Dick) Veterinary College, Edinburgh, delivered a lecture on "Smoke Abatement" before the Royal Scottish Society of Arts in Edinburgh on the evening of Monday last. After dealing with the injurious effects of smoke and fog upon health and property, the author went on to say that if the smoke problem was to be solved it must be by improved methods of heating and cooking in our homes. Other methods of heating were superior in every way to the open fire. A properly constructed gas-stove, with a flue to carry away the products of combustion, although for constant work it was more costly than a coal fire, from a hygienic point of view was quite satisfactory, and did not in any way vitiate the air of a room, nor did it produce any abnormal drying effect, as was popularly supposed. It would carry off from 2000 to 4000 cubic feet of air per hour. This was a valuable ventilating effect. Another point in favour of the gas-fire was that it could be easily regulated, and the heat of a room controlled in a way not possible with coal-fires. The gas-steam radiator, or flueless condensing gas-fire, was a most economical method of heating,



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especially for workshops and large spaces, where there was ample ventilation. All the products of combustion passed into the air. Less gas was required to heat a room by these means than to light it by incandescent burners. A discussion followed the lecture.

The Greenock Town Council met specially on Thursday to consider the subject of extensions at the Inchgreen Gas-Works. Provost M'Millan stated that the Provost's Committee, on receiving a report from a Sub-Committee who had visited and examined the works, recommended that they should go on with the erection of two new purifiers, at a cost of £3695, and alter the existing purifiers at a cost of £775—the former to be charged to capital and the latter to revenue. Bailie Taylor, the Convener of the Gas Committee, seconded the Provost's motion to adopt the recommendation. In doing so, he said he was somewhat disappointed, because he had fully expected that the work agreed upon by the Gas Committee, to cost £9950, would have been gone on with. Bailie Bailey, assuming that what was recommended was an instalment, supported the recommendation. He thought, however, that they must be prepared to face steadily the expenditure which the Manager foreshadowed before they could be satisfied that the works were efficient. He did not think there was any cause for serious alarm; but he should like to see the Manager supported in his request for the plant and machinery necessary to produce good results. After some further discussion, the recommendation was adopted by 17 votes to 2.

On Tuesday, an inquiry was held by the Hon. Mr. Pelham, at Dunblane, into the proposed Provisional Order of the Dunblane Gas Company, Limited. Mr. Gemmell, for the Company, said that with the existing gas-works they were unable to meet the demand for gas. The works were cribbed and confined, and there was great waste. Mr. Brown, the Chairman of the Company, said that they purchased the works in 1887. For the last ten years they had been looking for a site for new works; and at the time of the negotiations with the Town Council for a transfer, the site they had now chosen was the very one which the Council had fixed upon. They were paying £35 a year feu-duty. The price which the skilled engineers of the Town Council fixed was £8000, with a make of over 9 million cubic feet of gas. Mr. Menzies, speaking for objectors, put his case purely on the ground of amenity. The houses in the vicinity would lose their value. There was another site which he believed could be got; and the gas-works should be placed there. Mr. R. Cameron, for the Parish Council, considered that gas-works upon the proposed site would depreciate the value of property in the district. Mr. Gemmell, in reply, said that the site offered that day was not 300 yards from the objectors' property. Mr. Pelham said he would visit the ground. There was a point on which he was not quite clear—that was, where the £3000 of additional capital came from. Had the Company been spending money out of revenue which should have come out of capital? It seemed to him that the original shareholders were getting 12½ per cent. for every £100. If so, it was not quite fair to the consumer. He would be glad if any further particulars as to the floating capital of the Company were sent to him in London. He had not had time to study the reserve fund.

He added that the report to the Town Council by their expert might also be sent.

The shareholders of the Baillieston Gas Company, Limited, met on Tuesday, and agreed to the proposal that the undertaking of the Company should be sold to the Corporation of Glasgow at the price of £10,000, and empowered the Directors to proceed with a transfer on this footing.

At the end of last week, an extraordinary general meeting of the shareholders of the Carluke Gas Company was held, at which the Directors reported that when they built the new works in 1898 they thought they had made ample provision for any likely increase in the consumption of gas; but the increase had far exceeded their most sanguine expectations. In the last year of the old gas-works, the quantity of gas sold was 6,337,400 cubic feet; last year the quantity sold was 16,274,600 cubic feet. In eleven years the consumption had increased nearly three times; and this year the increase will be nearly a million cubic feet. The Directors have had an extension of the works under consideration for some time, and had asked Mr. L. Hislop, of Uddingston, to inspect the works and advise them. He had advised them that they should use the present retort-house as a coal-store, and build a new retort-house on the upper side, with five arches of seven retorts each, only filling three arches in the meantime with the most up-to-date system. This would give them twenty-one retorts, and with a further extension, at a very small cost, up to thirty-five. At present there are only twelve retorts. Mr. Hislop also recommended the erection of a steel gasholder tank, with a gasholder of 120,000 cubic feet capacity, which could be telescoped, increasing its capacity to 250,000 cubic feet. The estimate of the total cost was £4000; but the Directors proposed to raise £4500. They recommended Mr. Hislop's proposals, and asked power to procure the money to defray the cost. A motion of approval was unanimously adopted.

On Tuesday, a poll was taken of the ratepayers of Fraserburgh upon the question of the adoption of the Burghs Gas Supply Act of 1876. Out of an electorate numbering 2095, only 486 recorded their votes. Of these, 412 voted in favour of the adoption of the Act, and 74 voted against adoption.

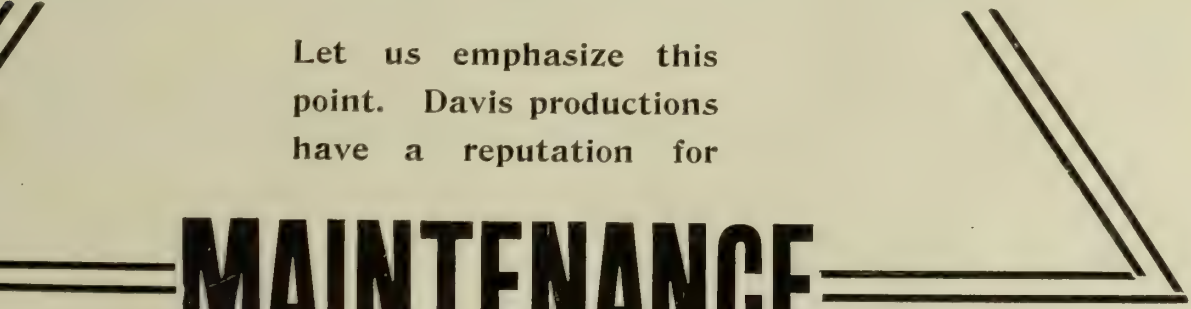
Electric Short-Circuit Fires a Woman's Hat.—It may be remembered that one of the witnesses at the Clapham fire inquest stated that the breaking of an electric lamp as the result of a short-circuit would lead to fire by the dropping of the filament. A case in point recently occurred in Berlin, according to the correspondent of the "Daily News" in that city. It appears that a young woman, wearing a gorgeous spring hat, was looking into a shop-window when a short-circuit took place close to her. A spark alighted on her hat, and in a moment the straw and feathers of which it was composed were in flames. The young woman's screams brought a crowd to her aid; but in their haste to save her from the flaming hat they tore away a considerable quantity of her hair. She at once entered a claim for compensation and damage against the proprietor of the establishment.



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MAINTENANCE

The Davis Gas Stove Co., Ltd., Luton.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, April 2.

To some extent a holiday feeling has pervaded the market throughout the week, and new orders for export have been rather scarce. There has, however, been no pressure to make sales; and this fact, together with a continued good demand for home consumption, has tended to prevent any material decline in values. Prices have nevertheless again given way slightly; and the closing quotations are £12 3s. 9d. per ton f.o.b. Hull, £12 6s. 3d. per ton f.o.b. Liverpool, and £12 8s. 9d. per ton f.o.b. Leith. For future delivery no fresh business has transpired; and makers are still asking £11 17s. 6d. to £12 per ton f.o.b. at the best ports, according to the position inquired for.

Nitrate of Soda.

This article is quiet on spot, and quotations have been reduced to 9s. 9d. and 9s. 10½d. per cwt. for ordinary and refined qualities respectively.

Tar Products.

LONDON, April 4.

The markets for tar products have been very firm throughout the past week. Pitch has shown a tendency to improve in value, and closes at decidedly higher figures. Creosote is quiet, though an improvement is looked for. Benzol is firm both for prompt and forward delivery; and for prompt delivery particularly some very good prices have been paid both in London and the North. Fifty-ninety per cent. benzol is improving in value both on account of 90 per cent. and toluol. The latter article appears to be decidedly scarce for prompt delivery; while there are numerous inquiries for forward. Solvent naphtha is very firm, and continues to be exceedingly scarce, especially in the Manchester district. Carbolic acid is quiet, and business has been done on the east coast at 1s. per gallon for delivery to the end of June. Crystals are still neglected. Cresylic acid is steady, with a tendency to improve in price. Creosote salts are in good demand. Naphthalene is selling at poor figures. Tar is very firm indeed.

The average values during the week were: Tar, 16s. 9d. to 20s. 9d. ex works. Pitch, London, 33s.; east coast, 33s.; west coast, 32s. to 33s. f.a.s., 33s. f.o.b. Benzol, 90 per cent., casks included, London, 8d.; North, 8d.; 50-90 per cent., casks included, London, 9d.; North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4d. to 4½d. solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4½d.; North, 1s. 3d. to 1s. 5d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, east and west coasts, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article is certainly quieter, and the demand is not quite so good. To-day, actual Beckton is quoted at £12 10s.; and outside makes upon Beckton terms are £12 5s. In Hull, £12 3s. 9d. to £12 5s. is asked; and in Liverpool, £12 6s. 3d. to £12 7s. 6d. In Leith, the price is £12 10s.; and in Middlesbrough, £12 3s. 9d. to £12 5s.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a more active trade at the Northern collieries; but prices have varied of late, according to the changes in the prospects of the working of collieries. In the steam coal trade, the demand is fair, but is met by the supply, even though some collieries are still idle. Best Northumbrian steams are from 12s. 6d. per ton f.o.b.; second-class steams are from 10s. 6d. to 11s.; and steam smalls are firm and rather scarce at from 7s. to 8s. The gas coal trade shows a smaller home demand, but there are enlarging exports. Prices of the usual classes of Durham gas coals are from 10s. 3d. to 11s. 3d. per ton f.o.b., according to the quality; while for "Wear specials," from 11s. 4½d. to 11s. 9d. is quoted. A number of contracts for gas coal for delivery over the season have been concluded—including Rostock and Horsens gas coal supplies; and it is believed that for special Wear coals about 11s. 3d. per ton f.o.b. rules in these contracts. A larger one for St. Petersburg has also been given out; and the price that is named is 14s. 6d., at the Russian port, for best Durhams, to the extent of 36,000 tons. As yet, nothing appears to have been done in the great contracts for gas coal for the South. Coke is firm; and for good gas coke the current price varies from 14s. to 14s. 3d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Trade has undergone little change. If anything, the demand for splint is slightly easier; and the same may be said of ell for shipment. The quotations are: Ell, 9s. 9d. to 10s. 6d. per ton f.o.b. Glasgow; splint, 10s. 6d. to 10s. 9d.; and steam, 10s. to 10s. 6d. The shipments for the week amounted to 329,279 tons—an increase of 42,183 tons over the previous week, and of 40,321 tons over the corresponding week of last year. For the year to date, the shipments amount to 3,411,405 tons—an increase of 552,328 tons upon the corresponding period.

It is reported that one day last week, at Cottingham, near Hull, a young servant named Maud Wilson was found dead in bed by her mistress. The room smelt strongly of gas; and it was evident that she had been suffocated while asleep. There were, however, no gas-brackets in the room; and it was not until a careful investigation had been made, that gas was found to be leaking from some pipes beneath the floor.

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Price of Electricity at Southampton.

Some discussion took place in the Southampton Borough Council on a recommendation by the Electricity Committee (among other reductions) that the charge for current for tramway purposes be reduced from 1½d. to 1¼d. per unit, and that the charge for current for heating and cooking be reduced from 1d. to ¾d. per unit. They further recommended, in regard to power, a revised sliding-scale of charges for long-hour users. When moving the adoption of the report (which was ultimately agreed to with four dissentients), Mr. Lewis said they had had complaints from several large firms as to the unfair manner in which the present scale of charges for current worked out. The output of electricity was steadily increasing; and there was a large amount of power to be supplied in Southampton, if they offered it at a reasonable price. In regard to heating and cooking, the Committee suggested that the price should be reduced to ¾d. per unit for those houses where a service was already laid, or would be laid, for electric light. Mr. H. F. Street (the Electrical Engineer) had estimated that at this price they would be able to compete successfully with the Gas Company in that direction. Mr. Wilding expressed the opinion that they were offering to sell their commodity at less than the cost of production, and were jeopardizing their undertaking by basing their arguments on towns which were not at all comparable with Southampton. While he had the greatest respect for Mr. Street as an Electrical Engineer, he thought he would prove mistaken as an economist; but the responsibility lay with the Council. Mr. Wood remarked that, as far as lighting was concerned, the Committee were now able to say to the public: "We can supply you with lighting as cheap as, or cheaper than, the Gas Company, for a cleaner, more convenient, better, and healthier light." Mr. M'Donnell asked if the Committee, by reducing the rate to ¾d. per unit, could enter into legitimate competition with the Gas Company in connection with heating and other purposes. Did not the Gas Company offer extremely advantageous terms in connection with apparatus, and did the Committee seriously suggest that they could compete in this direction? If all the town used electric light, he would support the Committee's proposal. He pointed out that the tramway experts of the country stated that two-thirds of the corporation-run electrical undertakings were kept alive by the excessive charges made to tramway departments. It was possible, if the Committee's scheme went through, that it would mean disaster. In reply, however, Mr. Lewis pointed out that since the Committee had made reductions in their charges, they had realized more profit.

Cape Town Water Supply.—The revenue of the Cape Town Water-Works last year was £56,779, as compared with £57,880 in 1908. In consequence of the decline in the revenue, the profit realized in 1909 was £6367, compared with £8920. It appears that consumers who took considerable quantities of water through the "dribble" system have now installed meters in many cases, and this has affected the revenue.

Matlock Bath Gas-Works Question.

In the notice of the Bill promoted by the Matlock Bath and Scarthin Nick District Council, to obtain power to construct and maintain additional gas-works, which appeared in the "JOURNAL" for Feb. 1, it was mentioned that the principal clause was for the repeal of a provision in an existing Act sanctioning the raising of money for the removal of the Council's gas-works out of the area of the Matlock District Council, and imposing a penalty for failure to do this within a specified period. As soon as the Bill was presented, the Matlock Council petitioned against it, on the ground that the penalty had been imposed at considerable cost, and should be retained. The Bill was to have come before the Committee of the House of Lords presided over by the Duke of Wellington, who commence sitting to-day; but, as the result of a conference between representatives of the two bodies, the Matlock Council decided last week to withdraw their opposition. This decision has been welcomed by the inhabitants of Matlock Bath, who are relieved of the cost of removing the works.

Claim for Water for a Saw-Mill.

At the Old Street Police Court last Wednesday, the hearing by Mr. Cluer of an adjourned summons taken out by the Metropolitan Water Board against Thomas Parker, a saw-mill proprietor, of Holmes Street, Shoreditch, for non-payment of a half-year's water rate, raised some interesting points. Mr. Arnold, the collector, proved demanding the rate, which the defendant denied was chargeable. It was stated that he had paid for some four or five years; but it was admitted that he had more than once "paid under protest." Mr. Cluer asked Mr. Collins, the Assistant-Solicitor to the Board, who represented them, what more defendant could do. Mr. Collins, after some argument, produced a Private Act (embodied in the Board's Act), and showed that a notification of non-liability could only be made in writing. The defendant denied that there was any supply to the premises for the purposes of the mill boiler, though he admitted that he occasionally took water from the private service if he wanted to use the boiler—which was only seldom. The Collector said that so long as the boiler remained on the place the rate must be paid. Mr. Collins said a supply was put on at the written request of the defendant, and an adjournment had been taken to prove this; the defendant persisting in his denial. A letter requesting a supply to be laid on was now produced; and Mr. Cluer, deciding against the defendant, told him that he could only escape further liability by giving notice in writing to the Water Board to discontinue.

A Sheffield shop has been extensively damaged and slight injury caused to several persons by a gas explosion. It appears, from the newspaper reports of the occurrence, that a man from the Gas Company's offices had gone to the place to examine the meter for a leakage. Having looked at the meter, he asked for a match; and just after it was struck, the explosion took place.

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Gas Profits at Lancaster.

Moving the adoption of the minutes of the Gas Committee at the last monthly meeting of the Lancaster Town Council, Alderman Helme, M.P., drew attention to the fact that they were asking for authority to erect a workmen's mess-room at a cost of £200, to be defrayed out of the reserve fund. The estimated income, he said, was £28,234; and they had actually received £28,466—an increase of £232. The estimated expenditure was £25,847; and the probable saving on this sum would not be less than £1594—largely owing to the fact that the Committee, instead of entering into long contracts, had preferred to purchase coal from hand to mouth, and had obtained an advantage in the reduced cost. The profits, instead of being £2386 as estimated, worked out at £4214, which was a very substantial increase. They estimated for the coming year a profit of £2978. In presenting the balance-sheet, the Gas Committee were anxious to meet the Finance Committee in the disposal of the surplus over and above the £2000 which was their regular contribution to the relief of the rates; and it was suggested that the Finance Committee should take £3200, leaving £1014 to go to the reserve fund. The Chairman of the Finance Committee had since informed him they would not require the £200, as they would not be able to utilize it satisfactorily; so that, while making a contribution of £3000 to the relief of the rates, the Gas Committee were able to add £1214 to the reserve fund, which stood at £12,046, but which had been reduced to £10,423 by various works carried out. They had before them a very important expenditure in the construction of a new retort-house, which could not be long delayed, and which would cost about £12,000. They wished to maintain the reserve at this figure, so that when the work became necessary they would not have to increase the capital account. The result of their operations was that they had been able to contribute to the relief of the rates an amount equal to a 6½d. rate. The minutes were confirmed.

The Cheapest Gas in Wales.—Addressing the shareholders at the annual meeting of the Wrexham Gas Company, the Chairman (Mr. J. Oswell Bury) pointed out that, as from July 1 last, the price of gas for lighting purposes had been reduced 3d. per 1000 cubic feet, making it the same as for gas fires, cookers, &c.—2s. 3d. per 1000 feet; the charge for power purposes remaining at 2s. These charges, he said, were the lowest in the whole of Wales; and the Directors confidently hoped that, with the development of improvements in coal carbonizing, they would be in a position to make further concessions for the benefit of the consumers. Under the co-partnership scheme, the reduction in the price of gas beneficially affected the employees, who were now entitled to a bonus of 7½ per cent. on their wages. Several of the co-partners were now purchasing the Company's stock; and he hoped to see many of the workmen present at the next annual meeting. The results of the scheme had been highly satisfactory. A dividend of 5 per cent. for the year on the ordinary stock was declared; and the Chairman and Directors, the Manager (Mr. J. Braithwaite), the Secretary (Mr. W. Heyward), and the staff were thanked for their services.

Obtaining Gas by a Trick.

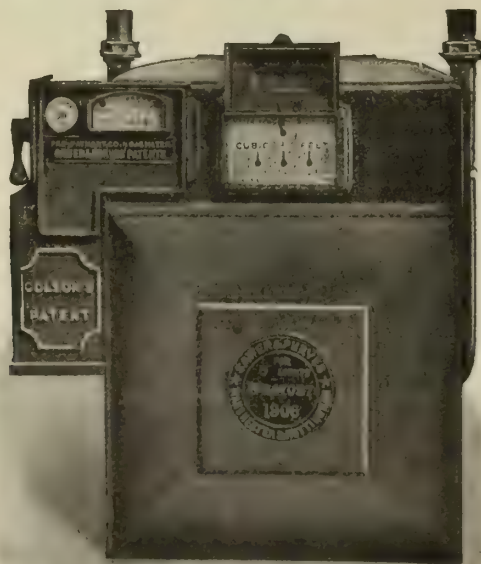
Last Saturday week, at Doncaster, several cases of gas stealing by means of a trick at Denaby were heard. The property inspector for the Denaby and Cadeby Main Colliery Company, during his inspection of the gas-meters at the houses of the Company's employees, found that a large number of cardboard and metal discs had been put into the slot-meters instead of pennies. At the house of Joseph Bradbury and his wife, at New Conisbro', the inspector found that 1760 cubic feet of gas had been burnt, and had not been paid for. This amount was worth 7s. 4d. Harry Owen and his wife had burnt 280 feet, worth rs. 2d. William Bowers and his wife had obtained 220 feet, worth 11d., by using discs. The defendants pleaded guilty to the thefts of gas. They said that they were "hard up." The Company did not press the cases, and the men were fined 10s.; their wives being bound over.

Public Lighting of Merton.—The Merton Urban District Council have received a letter from the Wimbledon Borough Council drawing attention to the lighting of Merton High Street, Kingston Road, and Coombe Lane, and pointing out that the Wimbledon sides of these thoroughfares are lighted with electricity, and the Merton sides with gas-lamps. It was asked if it would be possible to come to some arrangement for the even lighting of the streets. The letter was referred to a Committee. The Council have also had a communication from the Mitcham and Wimbledon Gas Company, stating that, in consequence of their revised charges, they would be able to make reductions which would mean a saving on the year of £26 7s. 8d. When these matters came before the Council, the significant remark of one member was: "I think our street lighting compares very favourably with that of Wimbledon."

Londonderry Gas Company.—At the meeting of the Londonderry Gas Company, the usual dividends of 10 per cent. on the old shares and 7 per cent. on the new, less income-tax, were declared. The Chairman (Mr. H. J. Cooke) remarked that for a number of years they had been spending a good deal of money on the works, to enable them to manufacture gas at the lowest possible price; and he thought the advantage of this was apparent when they looked down the list of gas prices in the different towns in Ireland, commencing with Dublin, where they found the price 3s. 4d., as against their 3s. 1d. per 1000 cubic feet. With the exception of Belfast and one other place, they were the lowest of any town in Ireland, which was a very satisfactory result. In the present year they hoped to complete the new gas purification scheme, which they expected would effect a very considerable saving under this head. The times were not what they used to be in the matter of earning dividends; but they had no room for discouragement. There was the gratifying fact that in the past year the output of gas had been a record for them, exceeding by some 3 per cent. that of any other year. A vote of thanks to the Directors and officials was responded to by the Chairman and Mr. R. J. Skinner, the Secretary and Manager.

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NOTTINGHAM.

Public Lighting of Holborn.

We learn that the Gaslight and Coke Company have obtained the contract with the Holborn Borough Council for the maintenance of the public lighting, which includes lighting, extinguishing, cleaning, remantling, and painting and renewals to the columns, lanterns, and brackets. The contract is an annual one, and was formerly held by Messrs. S. Pontifex and Co. The whole of the lanterns are fitted with upright burners; but experiments are to be carried out with a view to putting up the latest type of inverted low-pressure gas-lamps in some of the principal thoroughfares. In Shaftesbury Avenue, the Ede-Kempton lamp, fitted with two or three burners, similar to those in use in Victoria Street and King Edward Street, will be employed; and, as mentioned last week, Messrs. D. Anderson and Co. will fix up some of their "Dacolight" lamps in Gower Street, while Messrs. Falk, Stadelmann, and Co., Limited, will put up some double-burner lamps in Hatton Garden. It is the intention of the Gaslight and Coke Company to experiment with the inverted burner on the principle of the conversion of the existing upright burner lanterns to the newer form of inverted lighting. At present the public lighting plant consists of 1866 gas-lamps, 1764 of which have single burners, 82 double burners, 28 triple burners, and 22 flat-flame burners; most of the latter being temporary lights.

Theft of Gas.—At the Wimbledon Police Court some days ago, Alfred L. Bell, an insurance agent, of Merton, was charged on remand with feloniously stealing a quantity of gas, the value of which was unknown, the property of the Mitcham and Wimbledon Gas Company. Mr. Wareham, who appeared for the prisoner, submitted that it was a case which should be dealt with under the First Offenders Act; but the Magistrates imposed a fine of £2—the alternative being fourteen days' imprisonment.

Gas and Water Charges and the Rates at Batley.—The "Yorkshire Observer" says that, from being one of the least heavily rated towns in the West Riding, Batley now bids fair to become one of the most highly rated in the locality. For many years the rates of Batley were kept down to 7s. 6d. in the pound, but of late this policy has resulted in accumulating deficit balances, and last year the rates had to be increased to 8s. 6d. Even this sum, however, has not sufficed to meet the needs of the town; and very substantial increase will have to be made in the new rate. It will be necessary to increase the price of gas 3d. per 1000 cubic feet and the price of water 1½d. per 1000 gallons to make an addition of 6d. suffice—bringing the total rate to 9s. in the pound. It is felt that the price of gas at Batley (2s. 1d. per 1000 cubic feet) and the price of water (6d. per 1000 gallons) are such that the proposed increases will not be a hardship on the consumers, as the enhanced charges will still compare favourably with those ruling in most towns. A Sub-Committee of the Finance Committee have since decided to recommend the Council to raise the price of gas from 2s. 1d. to 2s. 4d. per 1000 cubic feet, and the charge for water from 6d. to 7d. per 1000 gallons.

Gas and Commercial Securities Corporation, Limited.—The Directors of the Gas and Commercial Securities Corporation, Limited, have declared an interim dividend of 4 per cent. per annum, free of income-tax, on the ordinary shares for the period to Feb. 28.

Bexhill Water and Gas Company.—At the recent ordinary general meeting of this Company, the accounts presented for the six months ended Dec. 31 last showed that the revenue was £10,437, and the expenditure £5516; leaving £4921 to go to the profit and loss account. The amount available for distribution was £5261; and the Directors recommended dividends for the half year at the rates of £7 and £4 18s. per cent. per annum, less income-tax. This, with provision for income-tax, would absorb £3997, and leave £1264 to be carried forward. In view of a demand for gas having arisen in the hamlet of Little Common, the Directors have extended the Company's mains to that area.

North Shore (Sydney) Gas Company, Limited.—In the report of this Company for the half year ended Dec. 31 last, the Directors state that the increasing demand for gas has again necessitated an extension of the manufacturing and storage plant. A duplication of the inclined retorts, machinery, and coal-store has been commenced; and an additional gasholder, having a capacity of nearly 1,100,000 cubic feet, is now in course of construction. The general strike of coal miners at the beginning of November prevented the Directors from obtaining a sufficient supply of suitable coal, even at the high prices paid. The Company consequently suffered pecuniary loss, and the consumers much inconvenience. The net profit on the sale of gas, &c., after allowing for depreciation, was £5195; and a sum of £56 was brought forward. The transfer of £1048 from the reserve fund—making in all £6299—allowed of the payment of a dividend of 4 per cent. for the half year, free of income-tax.

New Inverted Incandescent Gas-Lamp Company, Limited.—The report of the Directors of this Company, which was presented at the ordinary general meeting last Thursday, sets forth that the net trading profit, after allowing for depreciation and all trade charges, is £6821. The balance of profit amounts to £6012, which, added to the sum brought forward, gives a total of £7490. Out of this sum, £500 has been written off patent account, bringing the total amount so written off up to £18,000; and from the balance the Directors recommend the addition of £1000 to the reserve, bringing it up to £8500, and the payment of a dividend at the rate of 6½ per cent., free of income-tax, leaving £1035 to be carried forward. On the 14th of January last, in pursuance of the agreement entered into, the business of the Sunlight and Safety Lamp Company, Limited, at Birmingham, was taken over by the Company; and the Directors confidently expect that the amalgamation will materially strengthen the undertaking. In moving the adoption of the report, the Chairman (Mr. G. H. Cartland) said the past year had been a rather lean one; but in spite of this, the position of the Company had been strengthened. By their amalgamation with the Sunlight Company, they would be enabled to deal with people direct as manufacturers, and not simply as factors, which would be of great benefit to them in the trade. The report was adopted.

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Dissatisfaction with the Furness Co-Partnership Scheme.

Our readers will probably remember that this time last year a co-partnership scheme was entered upon for a twelve months' trial in the shipyard of Sir Christopher Furness at the Hartlepoons. At the close of the period fixed upon, a ballot of the men was taken on the subject of its continuance. The result is 492 for and 598 against it; but a large number of the men abstained from voting. It is stated that the main cause of the opposition is that such irregularity of work has arisen as to furnish anything but a full year's employment for most of the men, and that the lower-paid workers, when they have been idle, have felt the need of even the few shillings they may have accumulated towards the shares. It is also stated that the co-partners are unable to obtain employment in other local yards, owing to the attitude of the men at those places. Moreover, the opinion seems to have gained ground that the scheme would act to the disadvantage of the Trade Union at a time of crisis. Mr. G. N. Barnes, M.P., the Chairman of the Labour party, referring to the adverse vote, says: "The scheme has come to the end I expected. If they [the men] were of opinion that a co-partnership scheme of any description would give them full and continuous employment they must have been exceedingly simple. The movement is not consistent with the principles of Trade Unionism, because it isolates the men from their fellows. The effect of such schemes is to split up workmen into groups, and make them selfish." Mr. Barnes, referring to the co-partnership scheme of the South Metropolitan Gas Company, says: "There you have the men living in a world of their own, knowing practically nothing about the outside world of industry."

Publication of Coal Contracts at Salford.

The "Manchester Courier" says that, after an agitation extending over a number of years, during which the question of the publication of coal contract prices has been one of the main planks in the programmes of candidates for municipal honours, the Salford Council, on July 7 last, passed the following resolution: "Publication of contract prices—That in future the prices paid for coal and cannel by the Gas and Electricity Committees, and the terms and conditions of agreements entered into by the Electricity Committee, shall appear on the agenda of the Council before acceptance." The result of the passing of this resolution was discussed at a special meeting of the General Purposes Committee last Friday. It was stated that the Corporation required for the ensuing twelve months about 160,000 tons of coal and cannel; and the tenders submitted disclosed an approximate increase in the price over that of last year of 1s. per ton, or an aggregate advance of £8000 per annum. The seriousness of the matter is apparent when it is pointed out that the added cost of the coal means no less than a 2d. rate in the borough. Inasmuch as the tenders were practically similar, the existence of a coal ring was said to be manifest. Prior to the passing of the resolution recorded above, the Gas Committee were enabled to negotiate for more favourable terms; and Alderman Phillips, the Chairman, has repeatedly claimed that this has been the means of saving the Corporation many thousands of pounds annually. Negotiations, however, are entirely impossible under the terms of the resolution; and it would appear that the Council have landed themselves into a quandary. After a heated discussion, the General Purposes Committee resolved to readvertise for tenders, and to intimate that the lowest offers now would be accepted.

Walton-on-Thames District Council and the Standard Burner Bill.—The above-named Council have lately been conferring with the Walton-on-Thames and Weybridge Gas Company on the subject of the proposals contained in the Standard Burner Bill, in the promotion of which they are associated with other gas companies. As a result, the Company have agreed to reduce the price of gas 1d. per 1000 cubic feet as from the 25th ult.; and the Council have withdrawn their opposition to the Bill.

Sale of Shares.—At a recent sale of shares at the Queen's Arms Hotel, Rawtenstall, £10 old shares in the Rossendale Union Gas Company fetched £21 1s. 3d. each; £10 shares (1876 Act), £12 8s. each; £10 Amendment Act shares, £16 1s. each; £10 new Amendment Act shares, £13 13s. apiece; and 5 per cent. £10 preference shares (£4 paid), £5 each. On the same occasion, some £10 "A" shares in the Haslingden Union Gas Company realized £21 7s. per share; a few £10 "B" shares in the same concern fetching £16 6s. each.

Laindon Gas-Works for Sale.—It will be seen, from an advertisement which appears elsewhere, that Mr. William Richards, of the firm of Messrs. A. & W. Richards, will offer for sale at the Mart, Tokenhouse Yard, E.C., next Tuesday, under instructions from the High Court of Justice, the freehold gas-works of the Laindon and District Gaslight, Coke, and Water Company, Limited. In addition to the works, which are about 23 miles from London, there are approximately 1½ miles of mains and services to 51 consumers. The whole will be sold as a going concern, and possession will be had on completion of the purchase.

Whitby Gas Company.—The accounts for the past year which were presented at a recent meeting of this Company showed that the revenue amounted to £9011, and the expenditure to £6834; leaving £2177 to go to the profit and loss account. The balance available for distribution was £966; and the Directors recommended dividends at the rates of £3 and £2 2s. per cent. (less income-tax) on the original and additional capital respectively for the six months ended Dec. 31; making with the interim dividends £6 and £4 4s. per cent. for the year. There was an increase of gas sold to the extent of more than 1½ million cubic feet compared with 1908. In moving the adoption of the report, the Chairman (Mr. Freeman Richardson) said the Directors had been able to reduce the cost of coal by £243, and that of purification by about £16. Wages showed a slight decrease; and the total expenditure was a little less than before. The sale of gas produced an increase of £234, which would have been highly satisfactory had not the value of residual products unfortunately fallen approximately to the same extent, due to the lower prices obtained for coke and tar. The dividends recommended were declared; and votes of thanks were accorded to the Directors, officers, and staff.

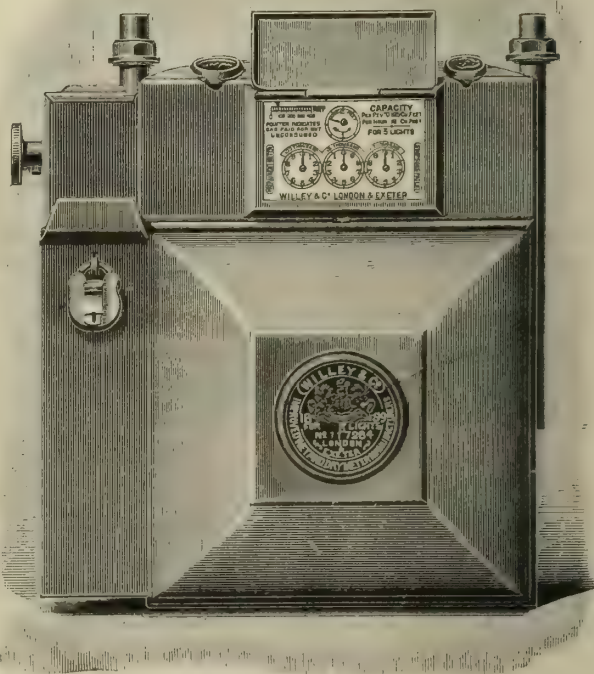
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A St. Helens man, named Harry Porter, who had suffered from influenza, was found on his bed dead, having inhaled gas through an india-rubber tube, one end of which was attached to a gas-bracket.

The Londonderry Corporation are wishful to borrow £10,000 for extensions of their electricity undertaking; and accordingly a Local Government Board inquiry has been held by Mr. P. C. Cowan. In the course of the proceedings, Mr. Macrory, the Electrical Engineer, stated the cost of production and the rates charged, upon which the inspector said it appeared to him they were losing on every unit they sold. Mr. Macrory replied that, taking the private lighting by itself, they were losing on every unit; but the public lighting came in, and owing to the fact that carbons and trimming had to be charged to the public lighting, a higher average price per unit was obtained.

We have received from the Collapsible Grill Tin and Grid Company, of Newcastle (Staffs), one of their tins and grids constructed according to the patent taken out a few months ago by Mr. A. A. T. Botteley, the Manager of the Chesterton Gas-Works. When using the ordinary shallow tin under a cooker grill, it has to be packed up if it is desired to bring it nearer the flame. This is avoided with Mr. Botteley's tin, which, by simply pressing the handle, can be lowered to the extent of an inch, or raised a corresponding height by a slight pressure of the thumb on a ring that slides through the handle, without drawing the tin from under the grill. The new grill tin should prove a useful adjunct to the gas-stove.

The Aldeburgh Town Council, at a special meeting last Friday, passed the following resolutions: "(1) That the Corporation make application to the Board of Trade for the grant of a Provisional Order under the Electric Lighting Acts, 1882 to 1909, for the supply of electricity in the borough, including the districts of Thorpe and Hazlewood; and subject thereto (2) that the Committee submit to the Board of Trade for its approval the Rural Electricity Supply Company, Limited, as the Company to be named in the clause to be inserted in the Provisional Order, to accept a transfer of the powers of the Corporation, and to execute the works under the Order, subject to such provisions, stipulations, and conditions as may be approved by the Board of Trade."

One by one the few survivors of the Balaclava charge—the "noble six hundred"—are dropping off. One of the latest to join the majority was William Freestone, a private in the 4th Hussars (the old 4th Light Dragoons), who served throughout the Crimean War, and was in receipt of a special campaign pension. After leaving the Army he joined the Metropolitan Police, and while on mounted duty at Ascot sustained concussion of the brain through stopping a racehorse which had escaped from the paddock. As the result, he was invalided on pension. He subsequently obtained employment as gatekeeper at the works of the Wandsworth and Putney Gas Company. While engaged in his duties he, by a strange coincidence, recently fell downstairs and fractured his skull.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT DRAUGHTSMAN. No. 5211.
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LAINDON GAS-WORKS. By Auction. April 12.

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Stocks and Shares.

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SOUTHEND WATER COMPANY. April 19.

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BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by April 25.
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Boilers (Gas).

DARWEN GAS DEPARTMENT. Tenders by April 23.

Coal and Cannel.

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ISLE OF THANET GAS COMPANY. Tenders by April 20.
SALFORD GAS DEPARTMENT. Tenders by April 13.

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CEFN MAWR AND RHOSYMEDRE GAS COMPANY.
LIMERICK GAS COMMITTEE. Tenders by April 18.

Gasholder, &c.

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General Stores—

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Oxide.

LIMERICK GAS COMMITTEE. Tenders by April 18.

Pipes.

DARWEN GAS DEPARTMENT. Tenders by April 23.
WIGAN GAS DEPARTMENT. Tenders by April 18.

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CEFN MAWR AND RHOSYMEDRE GAS COMPANY.
LIMERICK GAS COMMITTEE. Tenders by April 18.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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GEO. NEWTON, Limited,
Wires: "AUTOMATIC, MANCHESTER."
40 YEARS' REPUTATION.
WET, DRY, ORDINARY and PREPAYMENT,
STATION METERS, &c.
Late of Oldham—Note new Address:—
39, RIVER STREET, HULME, MANCHESTER.

METER INDICES
WITH AND WITHOUT DIALS.
A. ROUX & CO., Limited,
9, SOUTHAMPTON STREET, HOLBORN, W.C.
MOVEMENTS FOR CLOCKS, PHOTOMETERS AND
BAROGRAPHS, WHEELS, PINIONS, AND WORMS.
WORKS, HANDSWORTH, BIRMINGHAM.

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges
at One Stroke.
See Advertisement, March 8, p. III. of Centre.
ALDRIDGE AND RANKEN,
89, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: "MOTORPATHY, LONDON." Telephone: 5118 WESTMINSTER.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SATURATORS made or Repaired.
Reasonable Terms (workmanship guaranteed) by a
30 Years' Saturator Maker (Labour and Plant only),
at per Hour or Contract. Saturators improved. Per-
fect Mixing and Noiseless.
DAVIES, General Chemical Plumber and Leadburner,
117, Gallaway Road, SHEPHERD'S BUSH, W.

GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

GAS-WORKS requiring Extensions
should Communicate with **FIRTH BLAKELEY,**
SONS, AND CO., LIMITED, Dewsbury, who make a
Speciality of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
faction Guaranteed.

CAST-IRON Pipes. Spigot and Socket
or Flanged. Special Quality—9 feet or 12 feet
Lengths. When buying, Write us.
A. LOWCOCK, Limited, SHREWSBURY.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

APPLICATIONS FOR APPOINTMENTS.
Do you appreciate how much success
depends on well-considered and lucid present-
ment of your qualifications? I make a Speciality of the
Preparation of Applications, and am continually re-
ceiving complimentary letters from clients. Write now
for Particulars.
HERBERT GREATOROX, Beechwood, MATLOCK.

ADVERTISER, with Twenty Years' Ex-
perience in best Class of Gas-Fitting in Gentle-
men's Country Mansions, seeks Re-Engagement as
FOREMAN or LEADING HAND at ACETYLENE
or PETROL LIGHTING. Well up in Converting and
Re-Lacquering Fittings and Estimating. Highest
References.
Address No. 5214, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

DRAUGHTSMAN (Assistant) wanted.
One accustomed to Gas Lighting, Heating, and
Cooking Apparatus preferred.
Apply, by letter, giving the Names of Firms where
previously employed and stating Age and Salary re-
quired, to No. 5211, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

THOROUGHLY up-to-date and pushing
TRAVELLER required by a well-known Gas
Fittings and Apparatus Firm for London and Suburbs.
Only those with a sound Connection among Gas Com-
panies and Ironmongers need Apply. Salary no object
to the right man.
Apply, by letter, to No. 5210, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

**TO GAS MANAGER'S OR GAS ENGINEER'S
SON.**

SUITABLE Man Wanted to Act as
CLERK OF WORKS during Erection of an
8 Million Cubic Feet Works, Take Charge of Laying
Mains and Services, and later on to Act as MANAGER
and SECRETARY. Preference will be given to one
investing a fair amount in Shares. Splendid Prospects.
Apply, by letter, stating Age, Experience, and Wages,
to No. 5209, care of Mr. King, 11, Bolt Court, FLEET
STREET, E.C.

FOR SALE—One 150-Burner Complete
Plant made by the National Air Gas Company,
Limited. Nearly new and in good order.
Can be seen by Appointment at Messrs. CHARRINGTON
AND CO., LTD., Anchor Brewery, MILE END, E.

WANTED, a Reliable Second-Hand Gas-
METER TESTING PLANT. Must be in
thorough working order.
Address, giving lowest Price and full Particulars, to
No. 5212, care of Mr. King, 11, Bolt Court, FLEET
STREET, E.C.

GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap for
immediate Sale.
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

AMENDED ADVERTISEMENT.
THE Gas Committee invite Tenders for
the Supply of COAL and CANNEL required at
their Works during a period of One Year.
The lowest prices must be quoted, as no reduction of
or rebate in such prices will be expected.
Forms of Tender may be obtained on Application to
Mr. Wm. W. Woodward, Engineer, Gas Offices, Bloom
Street, Salford.
Sealed Tenders, endorsed "Tender for Coal," ad-
dressed to the Chairman of the Gas Committee, Town
Hall, Salford, to be delivered to me not later than
Three p.m. on Wednesday, the 13th of April, 1910.
L. C. EVANS,
Town Clerk.

**GAS COMMITTEE FOR THE CITY OF
LIMERICK.**

TO RETORT SETTLERS AND OTHERS.
THE Gas Committee are prepared to re-
ceive TENDERS for RETORT-SETTING, &c.,
required by them at their Works, Dock Road, Limerick.
Full Particulars and Form of Tender can be obtained
from the Engineer and Manager, Mr. H. Hawkins.
Tenders, endorsed "Retort-Setting, &c.," addressed
to the Chairman, Gas Committee, Gas Offices, William
Street, Limerick, to be sent in not later than Five p.m.
on April 18, 1910.
The Committee do not bind themselves to accept the
lowest or any Tender.

By order,
H. HAWKINS,
Engineer and Manager.
Gas-Works, Limerick,
March 22, 1910.

**GAS COMMITTEE FOR THE CITY OF
LIMERICK.**

TENDERS FOR OXIDE, &c.
THE Gas Committee for the City of
Limerick invite TENDERS for the Supply of
200 Tons of NEW OXIDE, to be delivered at the Gas-
Works, Dock Road, Limerick; also for the purchase of
about 250 Tons of SPENT OXIDE, delivered f.o.b.
Limerick Docks.
Samples of the New OXIDE tendered for must be sent
with each Tender with full Particulars.
Tender Forms can be obtained from the Engineer
and Manager, Mr. H. Hawkins.
The Committee do not bind themselves to accept the
lowest or highest Tender, as the case may be.
Tenders to be sent in not later than Five p.m. on
April 18, 1910, addressed to the Chairman, Gas Com-
mittee, Gas Offices, Limerick.

By order,
H. HAWKINS,
Engineer and Manager.
Gas-Works, Limerick,
March 22, 1910.

BOROUGH OF COLNE. (GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Surplus TAR made at their Works during the Twelve Months ending March 31, 1911. Particulars may be obtained on Application to the undersigned.

Sealed Tenders, endorsed "Tar," must be addressed to the Chairman of the Gas Committee, Gas-Works, Knotts Lane, Colne, Lancashire, and delivered not later than Saturday, the 16th day of April, 1910.

The highest or any Tender not necessarily accepted.

FRED. THORPE,
Engineer and Manager.

Gas-Works, Colne, Lancashire,
March 23, 1910.

BOROUGH OF DARWEN.

TENDERS FOR GAS SLACK AND NUTS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Supply of Rough GAS SLACK and NUTS for One Year, to be delivered at the Gas-Works Siding in Corporation Waggon.

Forms of Tender and all Information as to Quantities may be obtained on Application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Gas Slack," must be delivered to the undersigned not later than Saturday, the 23rd day of April, 1910.

No Tender necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, March 23, 1910.

BOROUGH OF DARWEN.

TENDERS FOR TAR.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for all the Surplus TAR produced at their Gas-Works for One Year.

Further Particulars and Forms of Tender may be obtained on Application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Tender for Tar," must be delivered to me, the undersigned, not later than Saturday, the 23rd day of April, 1910.

The highest or any Tender not necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, March 23, 1910.

BOROUGH OF DARWEN.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Supply of the following GOODS for One Year:—

- Benzol.
- Wrought-Iron Tubes and Fittings.
- Cast-Iron Mains and Specials.
- Brass Fittings.
- Gas Wash Boilers.

Full Particulars and Forms of Tender may be obtained on Application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed and Endorsed Tenders must be delivered to me, the undersigned, not later than Saturday, the 23rd day of April, 1910.

The lowest or any Tender not necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, March 23, 1910.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

GAS-WORKS EXTENSION.

PERSONS desirous of Tendering for the Erection of a THREE-LIFT GASHOLDER of 600,000 Cubic Feet capacity (and alternatively, for a TWO-LIFT GASHOLDER of 400,000 Cubic Feet capacity) are requested to send their Names and Addresses to Messrs. Corbet Woodall and Son, Palace Chambers, Bridge Street, Westminster, S.W., not later than Monday, the 11th day of April, 1910, together with a deposit of £3 3s. (by Cheque) for Copies of Drawings, Specification, Form of Tender, and Bill of Quantities.

The Deposit will be returned on receipt of a *bond-fide* Tender.

The lowest or any Tender will not necessarily be accepted.

JOHN D. FIDLER,
Clerk to the Council.

Council Offices,
Sutton-in-Ashfield.

COUNTY BOROUGH OF WIGAN. (GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of STORES over the Year ending on March 31, 1911, as follows:—

- (a) Wrought-Iron Tube and Fittings.
- (b) Brass and Copper Tube and Fittings.
- (c) Lead Gas Pipe.
- (d) Cast Mains and Connections.
- (e) Sulphuric Acid.
- (f) Surplus Tar.

Forms of Tender may be obtained from the undersigned.

The Committee do not bind themselves to the acceptance of any Tender.

Tenders, sealed and endorsed with the name of the article tendered for, to be delivered to Harold Jevons, Esq., Town Clerk, Wigan, on or before Monday, the 18th of April next ensuing.

A Sample of each Article to be forwarded, addressed to the Gas Engineer.

JOS. TIMMINS, M.Inst.C.E.,
Engineer, &c.

Borough Gas-Works,
March 30, 1910.

CEFN Mawr and Rhosymedre Gas Company, Limited, Ruabon, invite TENDERS for one GENERATOR or REGENERATOR SETTING OF SIX RETORTS, with MOUNTINGS, HYDRAULIC and FOUL MAINS Complete, and Sectionizing of Two existing Beds.

Further Particulars from Mr. MOULT, the Manager.

BRIDGEWATER COLLIERIES COKE-WORKS. (THE EARL OF ELLESMERE.)

TENDERS are invited for the Crude BENZOL produced at the above Works (estimated at 8000 to 10,000 Gallons per Month) testing 80 per cent. at 120° C., during the next Three, Six, Nine, or Twelve Months, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway, or at the Brackley Siding on the Little Hulton Mineral Branch of the London and North Western Railway.

Tenders, endorsed "Tender for Crude Benzol," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Offices, 4, Chapel Walks, Manchester, not later than the 25th inst.

Manchester, April 5, 1910.

KILMARNOCK CORPORATION. (GAS DEPARTMENT.)

THE Gas Department of the above Corporation have for DISPOSAL at their Langlands Street Works, Kilmarnock, the following SECOND-HAND PLANT:

RETORT BENCH MOUNTINGS, consisting of Mouthpieces, Ascension, Bridge, and Dip Pipes, Hydraulic Main, Connections, Valves, Bench Binding Frame, &c.; one Kirkham, Hulett, and Chandler Horizontal Rotary WASHER SCRUBBER, One Million Cubic Feet per day capacity, Complete with driving gear; One GAS EXHAUSTER COMPENSATOR; One TRAVELLING LIFTING CRANE for Purifiers; Cylindrical STATION METER, with Bye-Pass Complete; Tangles STEAM PUMP for Tar; COAL TESTING PLANT, Complete for a Charge of ½ cwt.; Three Tons per day "Gillespie" SULPHATE PLANT, Complete in every respect.

In addition to the above, there is a large assortment of CAST-IRON GAS-PIPE CONNECTIONS 12-inch to 15-inch diameter, as well as an assortment of COAL BOGIES, COKE BARROWS, and GAS-WORKS TOOLS.

Particulars will be supplied on Application. Offers for any portion of the foregoing Plant will be received up till Tuesday, April 26, 1910.

WM. & CHAS. FAIRWEATHER,
Joint Managers.

Gas Offices, Kilmarnock,
April 2, 1910.

ISLE OF THANET GASLIGHT AND COKE COMPANY, MARGATE.

TENDER FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for the Supply of COAL for One Year from May 1, 1910, for their Works at Margate.

The quantity required is 30,000 Tons (comprising 10,000 Tons of Good Yorkshire Washed Nuts, and 20,000 Tons of Good Durham Unscreened Gas Coal), such Nuts and Coal to be delivered at the Quayside, Margate, in Monthly Quantities according to Schedule.

The Gas Company will unload the Nuts and Coal into their carts, and will also pay the Pier and Harbour Dues of 1s 3d. per Ton. All other costs and charges must be paid by the Vendor; and it is to be noted that barges can generally be accommodated, or steamers, having a draught of about 10 or 11 ft., at Spring tides only. The Company have their own steam crane at the Quayside, Margate, and can discharge at a Maximum Rate of about 200 Tons per day.

Tender Forms and any further Information required will be supplied on Application to the Company's Engineer and Manager, Mr. J. M. Campbell.

Sealed Tenders, endorsed "Tender for Coal," addressed to the Chairman, are to be sent in not later than the 20th of April, 1910.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
THOS. C. FULLER, F.C.I.S.,
Secretary.

Offices: Addington Street,
Margate, March 31, 1910.

THE Owner of Patents No. 90, of 1906, and No. 14,189, of 1906, relating to "Improvements in Tubes made of Spirally Wound and subsequently Soldered Metallic Strips and Process of Manufacturing the same," and "Improvements in Machines for the Manufacture of Tubes from Metal Strips," desires to Negotiate with Manufacturers with the view of Granting LICENSES under them upon Reasonable Terms. For Information, Apply to LLOYD WISE and Co., Chartered Patent Agents, 46, LINCOLN'S INN FIELDS, W.C.

THE Proprietors of the Patents Nos.

24,218 of 1901 and 83 of 1901, for "IMPROVEMENTS relating to MACHINES FOR THE MANUFACTURE OF MANTLES EMPLOYED IN INCANDESCENT LIGHTING" and "IMPROVEMENTS relating to MACHINES FOR THE MANUFACTURE OF INCANDESCENT GAS MANTLES," are desirous of entering into Arrangements, by way of LICENSE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to HASELTINE, LAKE, and Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

WANTED, Shares in a Sound Gas Company.

State lowest price to No. 5213, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the **SOUTHEND WATER-WORKS COMPANY.**

NEW ISSUE OF 1000 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 19, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

In the High Court of Justice, Chancery Division,
Mr. Justice Joyce. 1909, L. No. 1586.

THE FREEHOLD GAS-WORKS

OF THE

LAINDON AND DISTRICT GASLIGHT, COKE AND WATER COMPANY, LIMITED,

Situate about 23 miles from London, within a short distance of the Laindon Station on the London, Tilbury, and Southend Railway. The Works comprise: Retort House with Eight Retorts, Vertical Condenser, Cast-Iron Scrubber, Tar-Tank and Pump, Two Purifiers, with Lifting and Traversing Apparatus, Gasholder, 400-Light Station Meter, together with the Mains, Services, Meters, and Tools, the whole to be sold as a Going Concern and with Possession on completion of the purchase.

MR. WILLIAM RICHARDS, of the Firm of MESSRS. A. & W. RICHARDS (the person appointed by the said Judge), will SELL THE ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, April 12th., at One o'clock, precisely in One Lot.

The Works may be viewed, and Particulars with Conditions of Sale obtained, of J. MONTAGUE HASLIP, Esq., Solicitor, 6, Martin's Lane, CANNON STREET, E.C.; of HARRY BARKEF, Esq., Chartered Accountant, 6, OLD JEWRY, E.C., and of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

THE

Sir John Cass Technical Institute, **JEWRY STREET, ALDGATE, E.C.**

The following Special Courses of Instruction will be given during the Summer Term, 1910:—

TECHNICAL GAS ANALYSIS.

By CHARLES A. KEANE, D.Sc., Ph.D., F.I.C.

A Course of Practical Work suited to the requirements of those engaged in Chemical and Metallurgical Industries. Wednesday Evenings, 7 to 10 p.m. Commencing **Wednesday, April 20, 1910.**

FUEL ANALYSIS.

By C. O. BANNISTER, Assoc.R.S.M., M.I.M.M.

A Course of Laboratory Work in the methods employed for the Analysis and Examination of Fuels arranged to meet the requirements of Technological Students engaged in Chemical and Metallurgical Industries. Monday Evenings, 7 to 10 p.m. Commencing **Monday, April 18, 1910.**

Detailed Syllabus of the Courses may be had upon Application at the Office of the Institute, or by letter to the **Principal.**

A HANDSOME F'CAP VOLUME GIVING AN ACCOUNT OF THE

GRANTON GAS-WORKS

of the Edinburgh and Leith Corporations' Gas Commissioners,

Their Design, Construction, and Equipment, with Illustrations, Plates, and Details of Costs.

By W. R. HERRING, M.Inst.C.E., &c.

Bound in Cloth, price 16s. net cash, free delivery in United Kingdom.

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

THOMAS DUXBURY & CO.,

16, DEANSgate, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

ARMSTRONG'S

PATENT

CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

MIRFIELD GAS COAL.**UNEQUALLED.**

Sperm Value 878'85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.

LONDON: 16, Park Village East, N.W.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,

STOURBRIDGE,

Manufacturers of

FIRE-BRICKS, LUMPS, TILES,**GAS RETORTS,**

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED
FOR SHIPMENT.**LUX'S****Gas Purifying Material**

is now used in many Gas-
Works throughout Scotland
with gratifying success.

FRIEDRICH LUX**Ludwigshafen-am-Rhein**

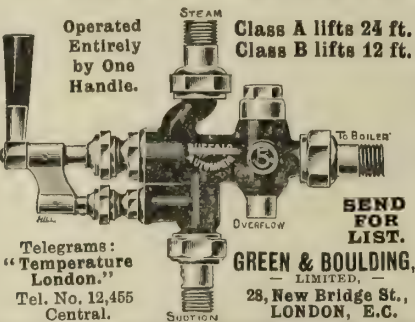
Sole Agent for Scotland:

DANIEL MACFIE

1, North Saint Andrew Street, EDINBURGH

Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.

*Testing Instruments*ALEXANDER WRIGHT & CO., LD.
WESTMINSTER.**'BUFFALO' INJECTOR****JOHN COATES & CO., LTD.,**

Gas and Water Works Engineers;
Inspectors, and Merchant Shippers,
5, Laurence Pountney Hill, LONDON, E.C.

NOTE. Much expense and trouble is often saved by Colonial and Foreign Gas and Water Companies, and City Corporations, by having their requirements from Great Britain bought or properly inspected by practical men. We have a staff of experts for Buying, Shipping, and Inspection, of Gas Plant and Machinery of every description, Cast Iron Pipes, &c., and may add that our Engineering Branch is under the direction of Mr. John Coates, M.Inst.C.E., and Shipping Branch under Mr. Alfred J. Kingdon, both with over 20 years' experience.
J. C. & Co.

*** BRASS AND STEEL**

*** PINION WIRE**
any lengths.

John Rigby & Sons, Ltd.

Rawfolds Wire Mills,
CLECKHEATON.
Head Office & Works:
Adelphi Wire Mills,
Salford, MANCHESTER.
Also IRON and STEEL WIRE of all descriptions.

HEATHCOTE GAS COAL

from the

GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AVE, E.C.**NEWBATTLE CANNEL.**

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
or without planed joints, COLUMNS,
GIRDERS, SPECIAL CASTINGS, &c., re-
quired by Gas, Water, Railway, Telegraph,
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
lets; doing away with Bolts, Nuts, and Covers,
and rendering Leakage impossible.

THOMAS TURTON
AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF

FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,

AND ENGINEERS' TOOLS GENERALLY.

London Office:

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HARRIS & PEARSON,
STOURBRIDGE, ENGLAND.

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

Workmanship and Materials
of the Highest
Quality.

PECKETT'S LOCOMOTIVES.
Built to any
Specification or Gauge.

PECKETT & SONS,
ATLAS LOCOMOTIVE WORKS, BRISTOL.

GRAETZIN LIGHT

Important Improvements.



BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

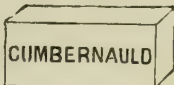
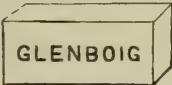
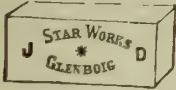
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE
MARKS.



The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

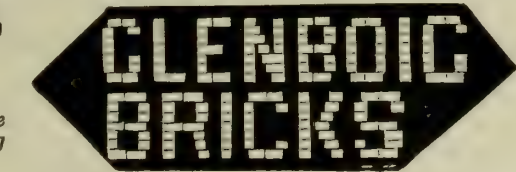
The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Underrated we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.



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Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas
of Honour.

Highest Award wherever exhibited.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET, LONDON, E.C., September 21st, 1909.

DEAR SIR,
I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

| | Raw. | Fired. |
|------------------------|--------|--------|
| Silica, free | 3.03 | 3.49 |
| Silica, combined | 43.20 | 49.77 |
| Alumina | 36.55 | 42.10 |
| Ferric oxide | 1.80 | 2.08 |
| Titanic oxide | 1.30 | 1.50 |
| Lime | trace | trace |
| Magnesia | trace | trace |
| Alkaline oxides | trace | trace |
| Sulphates as trioxides | 0.92 | 1.08 |
| Loss on Ignition | 13.20 | — |
| | 100.00 | 100.00 |

PHYSICAL RESULTS.

| | |
|-----------------------------|-----------------------------|
| Density | 2.65 |
| Volume weight | 1.90 |
| Porosity | 15.4 % |
| Linear shrinkage at 100° C. | 3.70 % |
| " " 1050° C. | 4.76 % |
| " " Total | 8.46 % |
| Volume shrinkage at 100° C. | 10.7 % |
| " " 1050° C. | 12.6 % |
| " " Total | 23.3 % |
| Plasticity | 20.0 % |
| Fire Stability | 1850° C. equiv. to 3362° F. |

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,
JOHN T. NORMAN.

ADDITIONAL REVENUE FOR GAS-WORKS.

COKE SELLING . . AT 11/6 A TON
COALEXLD SELLING AT 20/- A TON
IN THE SAME TOWN.

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LANCASTER.

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LIME & OXIDE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

Coal and Coke Elevators and Conveyors.**STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.**

DETACHABLE CHAINS AND SPROCKET WHEELS.

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GROUND DAY BY DAY.**

Greatly increases Sale of Gas.

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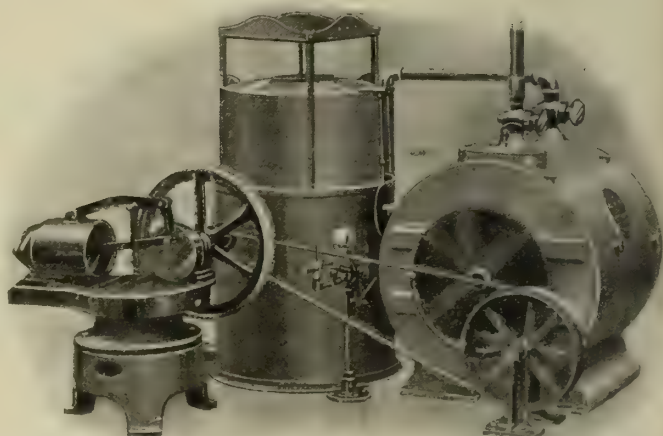
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Mansions,
Farm Steadings,
Churches, Schools,
Railway Stations.
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Plants from 100 cub. ft. per hour up to
50,000 cub. ft. per hour for Gas Works.

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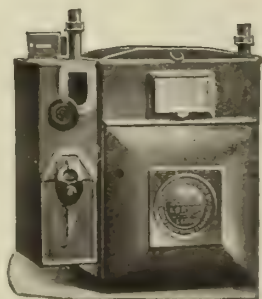
WILLIAM KEY, Engineer.



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GLASGOW.

11, QUEEN VICTORIA STREET,
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SLOT METERS

STATION METERS,

GOVERNORS, &c.



DRY METER.

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EDINBURGH.

LONDON.

GLASGOW.

LEEDS.

Welsbach

LIGHT

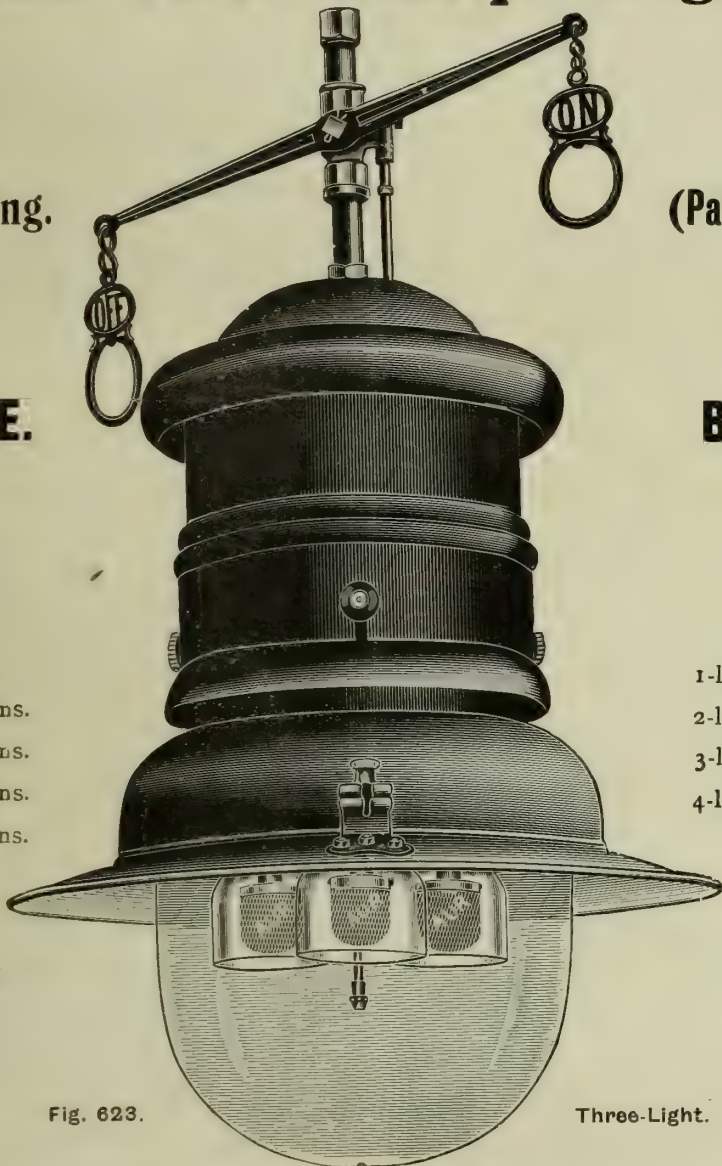
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

| | |
|---------|--------------|
| 1-light | 1 ft. 8 ins. |
| 2-light | 2 ft. 4 ins. |
| 3-light | 2 ft. 4 ins. |
| 4-light | 2 ft. 7 ins. |

Width over all.

| | |
|---------|--------------|
| 1-light | 1 ft. 1 in. |
| 2-light | 1 ft. 5 ins. |
| 3-light | 1 ft. 5 ins. |
| 4-light | 1 ft. 8 ins. |

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

| | Gas per hour. | C.P. | Steel. | Copper Case. | | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
| 2-light | 8 feet | 260 | 47/6 | 6/- extra. | 4-light | 16 feet | 550 | 72/6 | 9/- extra. |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

| | 1-Light. | 2-Light. | 3-Light. | 4-Light. | | 1-Light. | 2-Light. | 3-Light. | 4-Light. |
|-------------------------------|----------|----------|----------|----------|----------------------------|----------|----------|-------------------|--------------|
| Clear Glass Globes, each | 2/3 | 5/9 | 5/9 | 9/- | Wired Globes, extra | each | 2/- | 2/- | 2/9 3/6 |
| " " " In Case lots per dozen. | 19/6 | 57/9 | 57/9 | 93/- | Parabolic Reflector, extra | " | 3/6 | 6/- | 7/6 Not made |
| Case contains | 80 | 18 | 18 | 12 | Welsbach Mantles, each | | 6d. | subject as usual. | |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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Plants already built and under Construction :

Total capacity: 45,000,000 c.ft. of pure Coal Gas per 24 hours.

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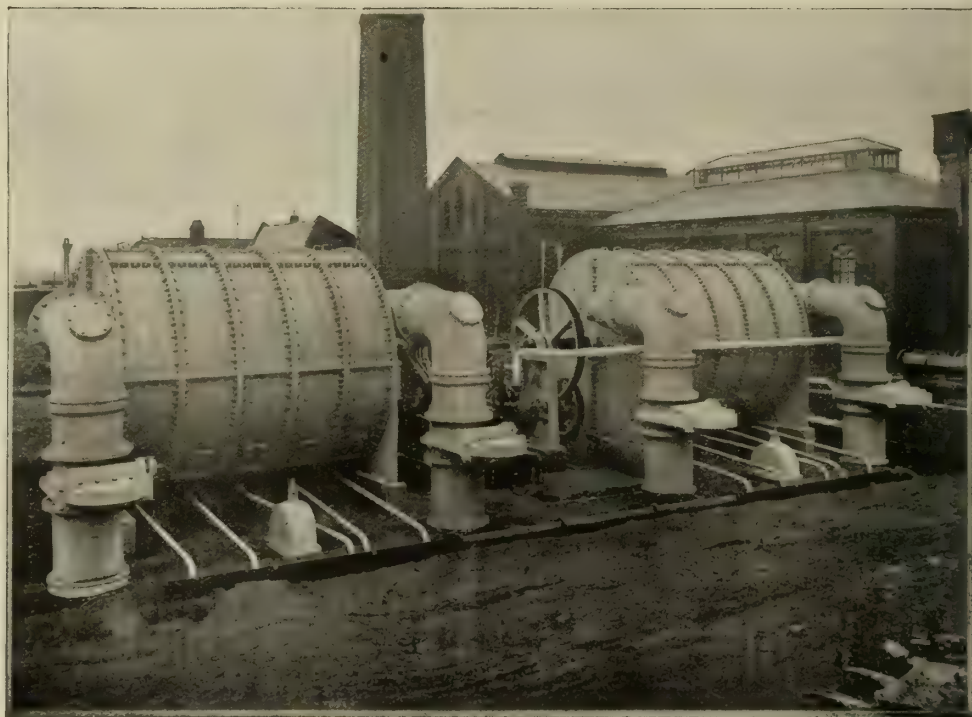
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AND A LARGE
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OF
CO₂ AND SH₂.



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Williams' and Fenner's Patent Saturator with Outside
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ADVANTAGES:—

1. Equal distribution of Steam and Ammonia.
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5. Sulphate is easily forced to point of discharge.
6. No incrustation.
7. No renewals of Cracker Pipe.
8. Capacity of output greatly increased.

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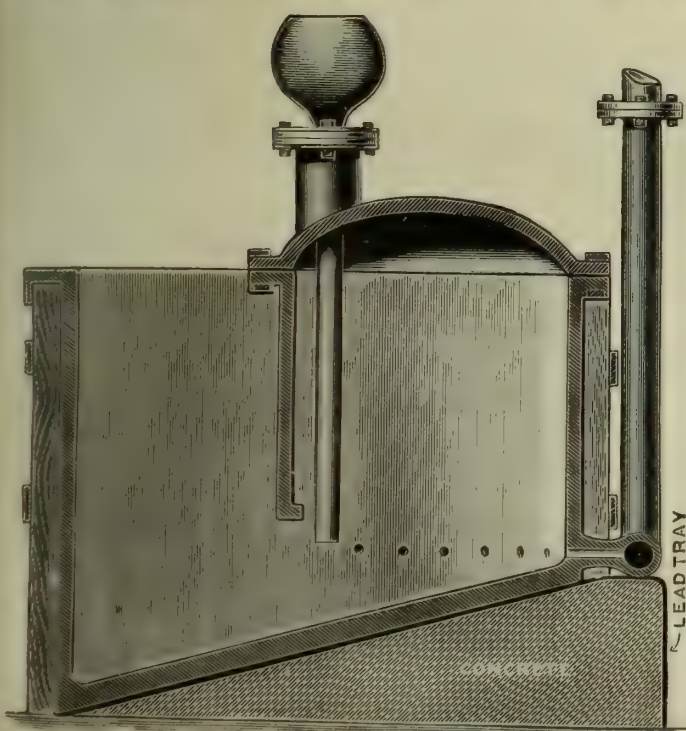
LICENCES TO MAKE MAY BE OBTAINED.

For full Particulars apply to the Sole Proprietors

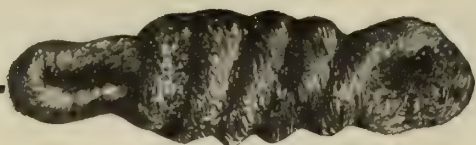
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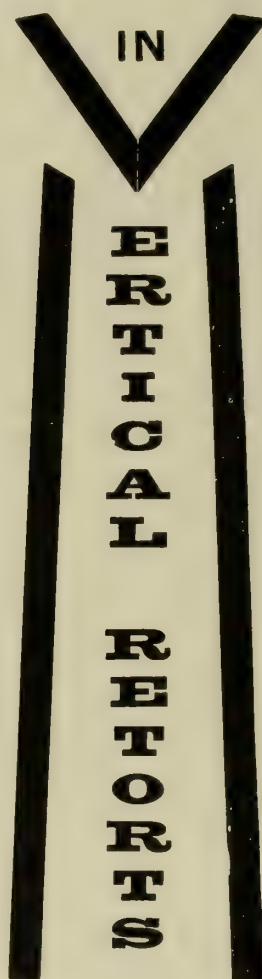


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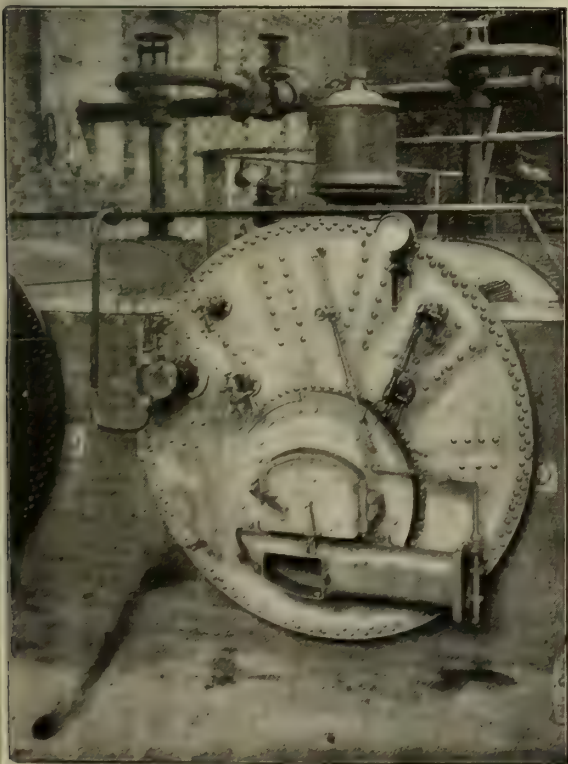
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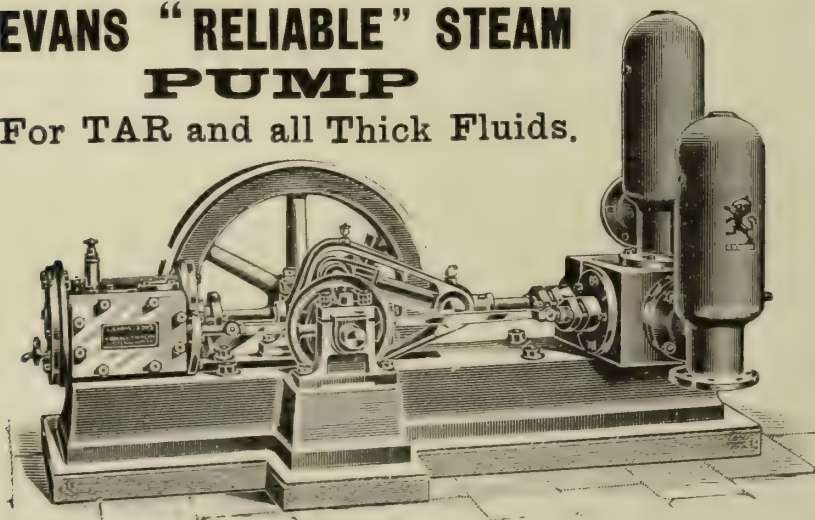
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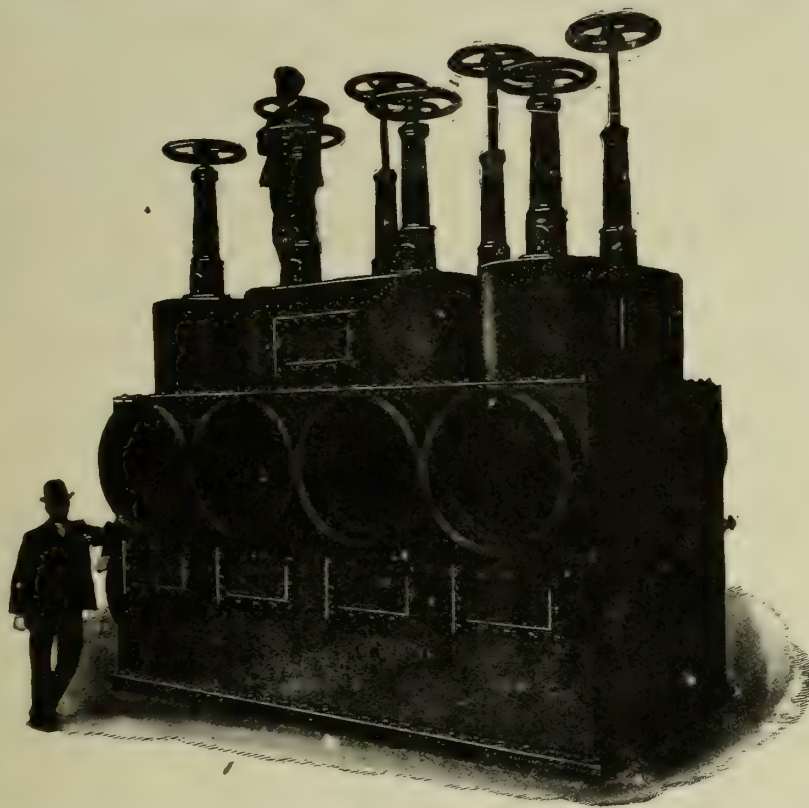
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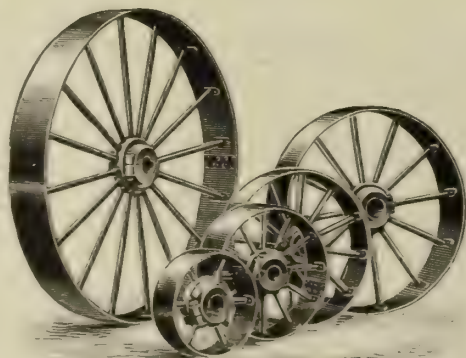
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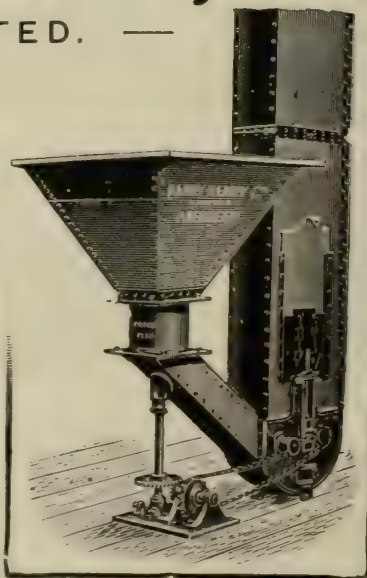
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Standard "Large" Size.
75 candle power.

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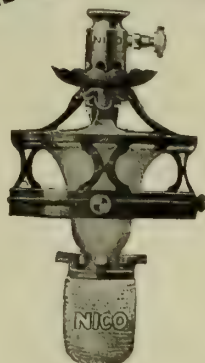
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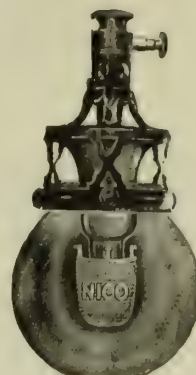
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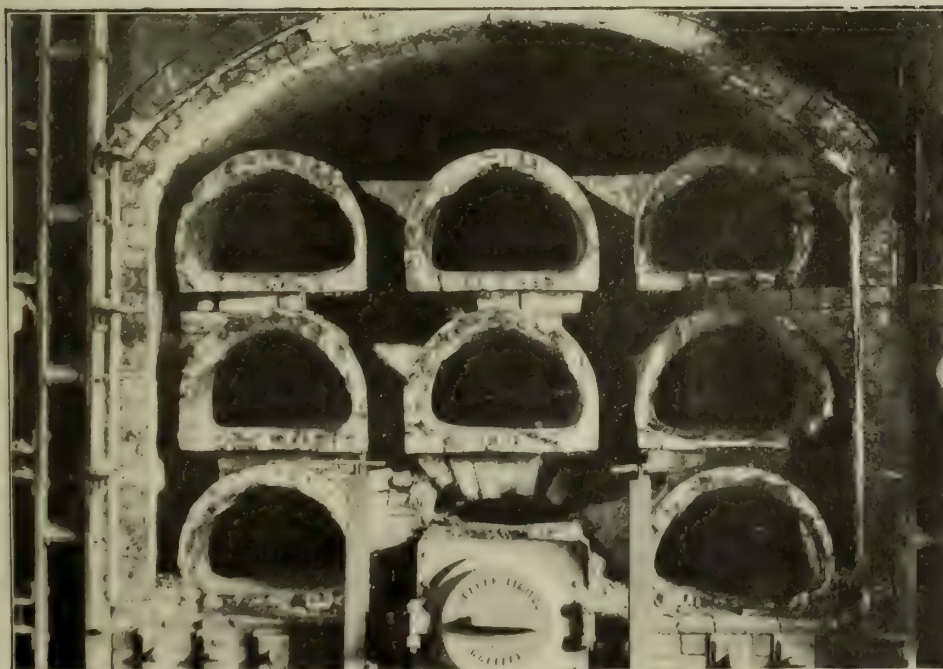
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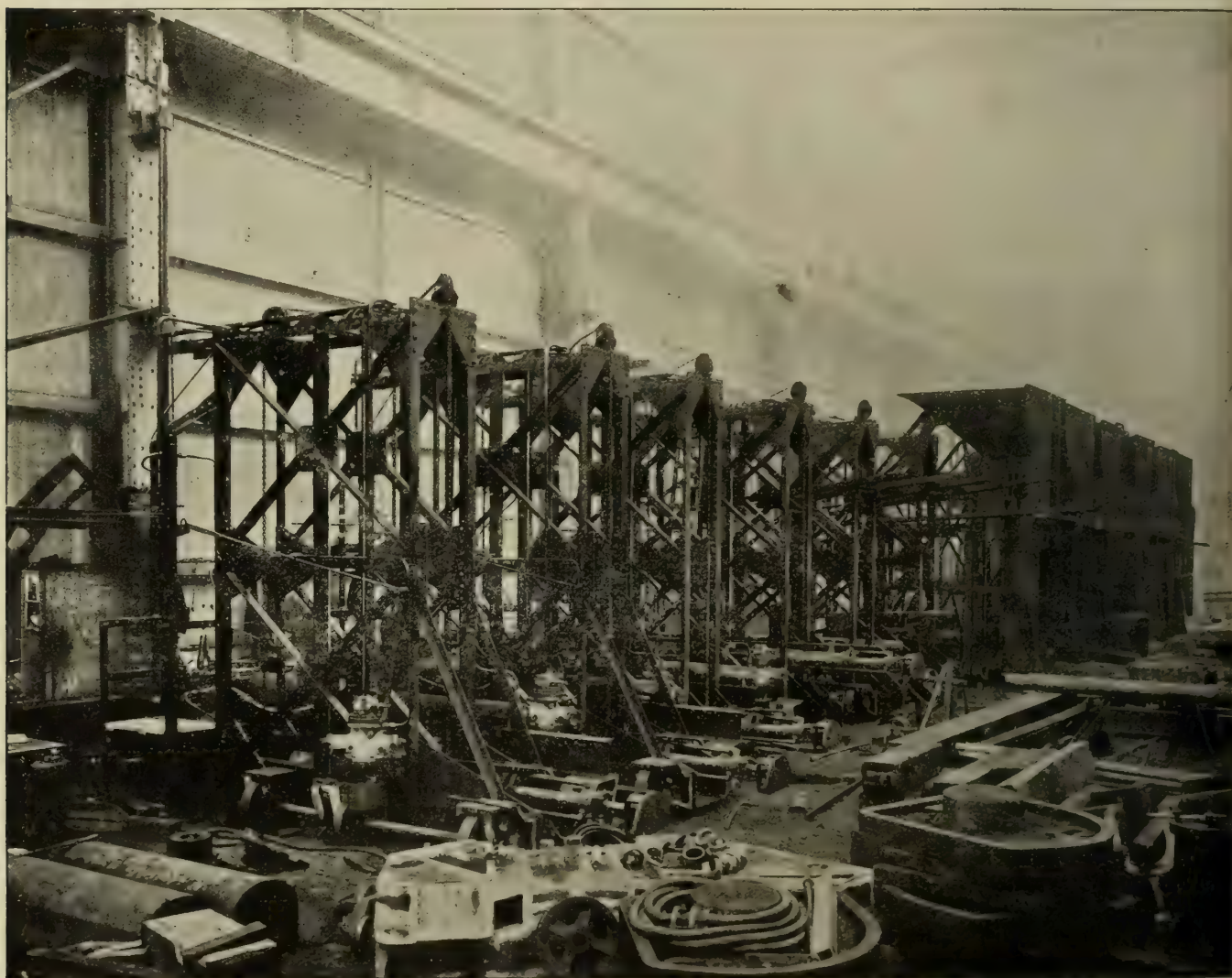
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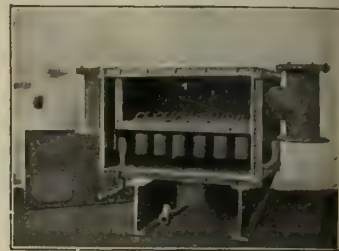
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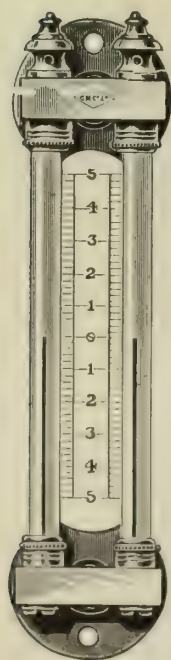
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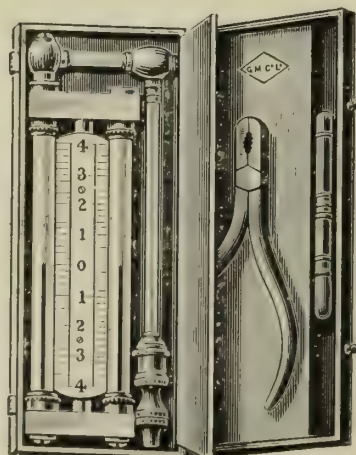
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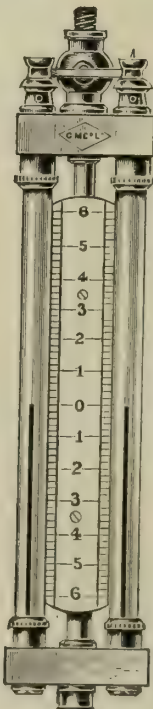


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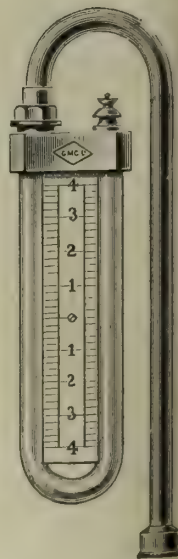
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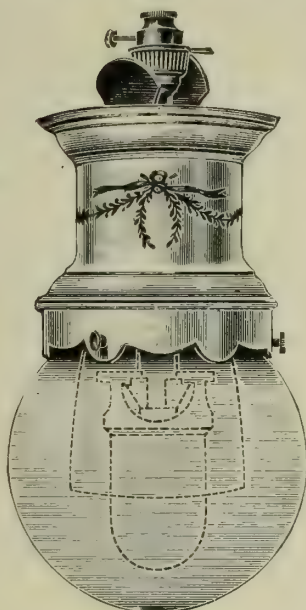
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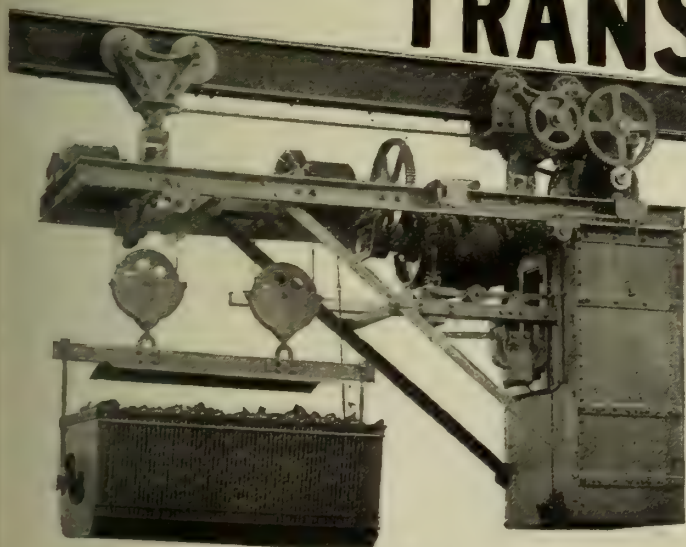
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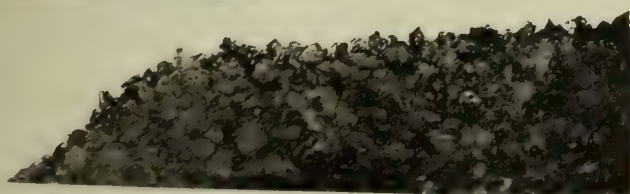
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| Brussels—Ville (3rd) . . . | 1,500,000 | Liège, Belgium . . . | 1,000,000 | Swansea (3rd) . . . | 450,000 |
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| Budapest (2nd) . . . | 1,750,000 | Liverpool (2nd) . . . | 4,500,000 | Sydney—Mortlake . . . | 500,000 |
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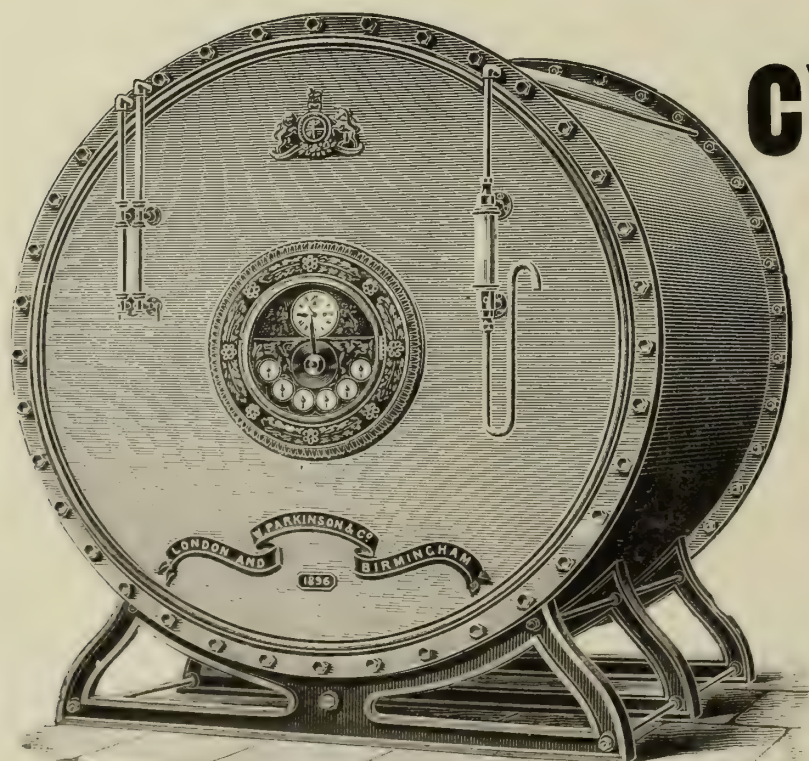
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VOL. CX., No. 2448.—TUESDAY, APRIL 12, 1910.

EDITORIAL NOTES—GAS, &c.

Standard Gas-Burner Bills—Preamble Proved.

THE great fight of the parliamentary session for the gas industry took place on Thursday and Friday last week, and was continued yesterday before Lord Ritchie and other members of the Upper House. The Bills that provoked the contest are those jointly promoted by a number of Gas Companies (under the auspices of the Gas Companies' Protection Association), for the purpose of giving them, in testing their gas, the burner that has been selected by the authorities as the most suitable one for developing the illuminating quality of gas in evaluating it whatever the standard, and so doing it justice. The tale of advantages in adopting a common standard burner applicable to all ordinary qualities of gas was again unfolded; and the fearful financial injuries that such adoption is supposed to inflict on consumers were again measured with infinite care, so much so that figures appeared on the right-hand side of the decimal point, and percentages were quoted that require much fattening to make them look at all impressively harmful. The opposition made a great mistake, and lost a fine opportunity. The burner has been sanctioned in the cases of about 80 gas undertakings in the country, supplying hundreds of thousands of consumers; but from them all (including Manchester) the opposition did not produce a single discontented consumer, a consumer who had any complaint to make, or, in short, a consumer who cares a fig about the matter. Considering the small percentage of gas now used in flat-flame burners (which it were better for consumers were not employed), all this opposition is farcical, and borders on the ridiculous. We have no sympathy at all for narrow-minded partisanship; nor have we for any insinuations as to dishonesty in deliberately doing something that is tantamount to robbing the consumers. Here we have conditions that are bound to produce their own compensations, as anyone with only fragmentary knowledge of the subject can see.

Yesterday proved itself a red-letter day for the gas industry, for just before the ordinary time for the rising of the Committee, after a very few minutes' deliberation, their Lordships found the preamble of No. 1 Bill proved. Mr. Talbot and Mr. Ram had addressed the Committee; but their speeches were ineffective performances compared with the vigorous and trenchant criticism, made with finished analytical skill, by Mr. Honoratus Lloyd. The case was clearly in his hands. He had good material to work upon in his defence of the burner, which, as a definite measuring instrument with common applicability, ought to be adopted universally, just as any other of our recognized instruments of measure. There was an attempt to get the Committee to take favourable notice of a clause suggesting that, if the Bill was passed, each promoting Company's standard of illuminating power should be raised in degree commensurate to any—slight though it be—degradation of the illuminating power caused by the adoption of the new burner. This apparently was proposed in lieu of any decapitation of the standard price. But the proposal was one that could only have found inception in the brain of the veriest ignoramus in respect of the applications of gas at the present day. The Committee absolutely ignored the proposition. The clear pronouncement of Lord Ritchie that the Committee found the preamble of the Bill proved, without any mention whatever of terms of any sort, caused some consternation among the opposition representatives; for it was recognized at once that the decision must also apply to Bills Nos. 2 and 3. There was some speculation as to whether the Committee would cut the Liverpool Gas Company out of the Bill, in view of their distinct conditions. But the Company go forward with the rest; and, in the interests of the fight for uniform gas testing, this is a matter for congratulation. We are, in fact, not at all sure that the case of Liverpool had not some influence in showing the Committee the absurdity of the existing unequal conditions in regard to gas testing in this country.

But though success has attended the Bills to this point, there are still clauses to be considered; and these will be taken to-morrow. It must not, therefore, be thought that all is finished at the moment. Calorific power and special local circumstances may be raised on clauses. But it is somewhat doubtful whether the opposition will appear to-morrow, as there was not merely whispering, but loud talk, in the corridors as to carrying the fight to the Lower House. This, however, is often the case while the heat of defeat incapacitates from making a shrewd judgment of the position. On cool reflection, and after consideration of the strength of the case for the burner, and of the examination of the character of the opposition evidence by Mr. Honoratus Lloyd, the opposition may see things in quite a different light. Before the official representatives of the promoters of the Bill left the House, there was a private conference with Counsel in one of the Committee-rooms. Nothing it is felt must be left undone to carry through these Bills. Let it be remembered that the occasion is a historical one for the gas industry. Further comment must be deferred till the next issue.

Suitable Gas, and Just Financial

Treatment for Gas Undertakings.

THOUGH titled "Informal," the proceedings at the meeting of Scottish Gas Managers held on Wednesday last, under the chairmanship of Mr. D. Vass, were of a valuable kind. When there are grievances to redress, or when there is a special policy to impress, in which there is a common interest, it is well to take counsel together. But, having done so, the matter should not be allowed to be again submerged by other current topic. In the absence of Mr. Alex. Wilson, who was (as was Mr. W. R. Herring, whose contribution to the proceedings is commented upon in another article) engaged in London upon the Glasgow Gas Bill, Mr. Councillor W. B. Smith, of Glasgow, advocated the adoption of a policy of lower grade illuminating gas as a wise step in these days; and Mr. Alex. Yuill and Mr. Vass brought matters before the meeting constituting grievances from which gas undertakings generally are, in varying ways and degrees, suffering.

With all deference to Mr. Wilson, we say that Mr. Councillor Smith admirably filled his place with his paper on "Smokeless Fuels," in which he argued, from the practical standpoint, the advantage of distributing a lower grade illuminating gas than is all too commonly the vogue in Scotland. What Glasgow thinks of this matter is stated in concise form in the few-lined clause in the Corporation Bill which proposes that the standard of the illuminating power of the gas supplied in the city shall be reduced to 14 candles. There is no gainsaying the truth that a lower grade illuminating power broadens, through its economies and applicability, the field of usefulness for gas as an illuminating agent and as a fuel; and with such a gas Mr. Smith regards the prospects for good service on the part of the gas industry as being greater and brighter than ever. Scotland has been hard to move in this matter of descent from an absurd high illuminating-power gas to a lower quality in that respect; and the advocacy of an administrator (as distinct from a technical officer) may have excellent influence with the powers that be in the places where there is still a clinging to the old ways, as though the modes of utilization had stood perfectly still. The paper shows clearly that the adherence to the illuminating quality of the past is a positive obstacle to the attainment of the highest possible efficiency. There is a little lesson in the paper for the obscurants who continue an insensate fondness for a higher grade of gas than is necessary for the purposes of the day. A gas of 14-candle power or under may have been described by consumers as a "bad" gas or a "poor" gas in the days of the flat-flame burner; but it is not so described now when the atmospheric flame for all purposes will afford the best results. A truth can often be impressed by extremes. Who would have thought at one time of day that a gas of from 20 to 25 candle power would have been characterized as

"bad" or "poor"? But it has actually come to pass. There is complaint among consumers who employ incandescent burners that such gas for such burners is both "bad" and "poor." The conditions of the popular valuation of gas have thus changed; and this our friends who ardently work in placing obstacles in the road to the adoption of the new testing-burner fail to recognize. The adherents to high illuminating grade gas open their eyes in undisguised wonder at these new complaints. But there is the fact. Such gas is gross and unsuitable for incandescent burners, and for any other purpose for which it has to be mixed with air for combustion purposes. With fouled incandescent burners—fouled by the high-grade gas—which will not efficiently perform their duty, consumers still complain of the gas as "bad" and "poor." They are right. The lower grade gas, within limits, is the better; and in paving the way to further descent in regard to illuminating power, Glasgow is doing its part well in helping forward to the goal of utilization with the utmost efficiency. We agree fully with Mr. Smith that the distribution department of every gas undertaking should incorporate a scheme of inspection for gas fires and cookers. The present satisfaction of customers is an asset of no mean value in any commercial business.

Coming to the papers in which there are presented grievances that require concerted action to produce remedy. The question of an allowance for depreciation in assessing for income-tax has been a live one since the issue of the famous circular by the Income-Tax Commissioners, instructing their surveyors to single out gas and water works undertakings for special and unfavourable treatment in this regard. By reference to chapter and verse, Mr. Alex. Yuill contends that legally the Commissioners are bound to allow depreciation; and he is supported in doing so by a pronouncement of the Chancellor of the Exchequer in 1907. There is no selective power whatever conferred on the Commissioners, enabling them to favour one class of undertaking in this respect, and to put another class in a distinctly unfavourable position. From quoted Acts and pronouncement, it would appear that the Commissioners are doing something that is *ultra vires* in setting gas and water undertakings outside the pale of equality in considerate treatment. Mr. Yuill holds that the question is too momentous to be dealt with by individual undertakings, and should be taken up by the Council of the Institution of Gas Engineers. The Council have the matter under consideration; but there seem to be few of our Scotch friends who were aware of the fact. This might be taken by the Council as a hint that the annual record of their movements is hardly sufficient to keep the memory of the existence of the Council and of their labours green in the minds of the rank and file of the Institution members.

The second paper in which there is a grievance also requiring remedy is the one by Mr. Vass on the appropriation of surplus gas revenue for the relief of the rates and for other purposes. We are in total agreement with the spirit and letter of the portion of the Burghs Gas Supply (Scotland) Act under which municipal owners of gas-works are enabled by the utilization of their surpluses to reduce the price of gas to the lowest possible figure. But there is an anomaly, in that any local authority carrying on an electricity-supply undertaking as also a gas undertaking may, owing to the position in which the law stands at the present time, notwithstanding the precise words of the Burghs Gas Supply (Scotland) Act, have recourse to the gas profits for making up any deficiency on the electricity supply undertaking. There is an injustice here; and redress is desired. But it is really the gas consumers who require to be moved in this matter. They are the long-suffering victims of indirect rating; and they should certainly insist on being released from the position of contributing the wherewithal to make good the deficiencies of commercial crookedness or administrative obtuseness. Electricity supply is not in its infancy now; and the infancy argument for preferential treatment cannot be seriously put forward to-day without bringing upon it the contempt and ridicule it deserves.

Financial Considerations Affecting the Vertical Retort System.

OF the making of literature on the newer systems of coal carbonization for gas production, there appears to be no end; and there is profit to the gas industry in the fact. We want as much as possible of critical technical examination of position and problems; for through it—through various minds and from various standpoints—is the only way to

arrive at truth, and at the correct relationship of considerations. The paper that Mr. W. R. Herring presented at the Informal Meeting of Scotch Gas Managers last week is an excellent example of the helpful type of contribution to the vertical retort question; but for the "informal meeting" and for the contribution itself, it was a pity that, as one of the technical supporters of the Glasgow Gas Bill, Mr. Herring, at the time of the meeting, was compulsorily at Westminster. There can never be too much acknowledgment of the work across the Border that has assisted so materially in laying the foundations for the design of vertical retort-settings for the carbonization of coal for gas production; and, Mr. Herring, in view of the position he occupies in Scotland, did well in placing the acknowledgment in the forefront of his paper. We are inclined to at once agree with Mr. Herring in his statement, but to disagree with the inference that may be incautiously drawn from it, that the factor that has permitted the use of the vertical retort for the production of illuminating gas is the changed conditions under which we are now working. The "use," yes; but the "changed conditions" in respect of gas utilization were not the incentive to the revived work in the attempt to make the vertical retort a practical success in the chief process of gas manufacture. The labour factor was really a stronger incentive. That in passing only. Mr. Herring favours continuous as opposed to intermittent vertical working, as he believes in rendering the process as automatic as possible. But this preference did not prevent him taking a general and impartial view of the subject, though in the survey, and in stating the claims of the vertical system, we do not think he made sufficient of the collateral advantages either in connection with the continuous or the intermittent methods of operation—such as reduction of naphthalene and sulphur compounds, and improved coke and tar.

Perhaps it is unnecessary to disclaim again that we are by no means partisans in this matter of the rival vertical systems. The attitude of all progressives—progressives in the technical sense—must be to let the aggregation of superiority in any one system be the determining factor in marking progress and in conferring favour. In this independent spirit, therefore, we think that the statement in Mr. Herring's paper that "on the face of it, it does not appear that the intermittent system will offer the same advantages under the heading of labour as the continuous system will do" needs, in the light of present information, if it refers mainly to labour costs, a little qualification. Lower down in his paper the author says that the Dessau-Sunderland plant is stated to cost 3d. per ton of coal carbonized; and the Woodall-Duckham and the Glover-West systems are estimated to amount to the same sum. From this statement, it would appear that there is a fair range in equality in the matter of labour costs, in respect of which the new Berlin setting of eighteen retorts seems to have brought about a considerable beneficial difference compared with its immediate predecessors with fewer retorts in a setting. In the Bradford report published last week (p. 35), the labour costs in connection with this new Berlin setting were put at 2.5d. per ton, which, as a matter of fact, is the lowest figure quoted in the table.

But if there is one lesson above all others to be gathered from Mr. Herring's paper, it is that the mistake should not be made of taking labour costs alone as the factor upon which judgment must be passed as to financial superiority. Taking 3d. per ton as representing the cost of labour with the verticals, labour with the inclined system at Edinburgh costs 9d.; so that there is a saving of about 6d. This, *prima facie*, is flattering for the vertical retorts. But then, taking the structural costs, Mr. Herring quotes £175 to £185 per ton of carbonizing capacity per twenty-four hours for verticals, as compared with £100 to £110 for inclined retorts, in both cases with complete equipment. Reckoning interest on these capital costs at 5 per cent. per annum, this would amount to 6d. per ton on the inclined system and 10½d. on the vertical system—that is to say, interest would amount to 4½d. per ton capacity more on the verticals than on the inclined system as worked at Edinburgh. This, however, still leaves to the advantage of the verticals 1½d. per ton, calculating labour and interest alone. The 1½d., however, may be further reduced when Mr. Herring can work his inclined retorts to their fullest advantage. But accepting conditions as they are, the 1½d. difference does not exhaust the financial advantages of the vertical process. Mr. Herring, for instance, sees no reason why the cost of repairs and maintenance should not be less; and in respect

of fuel consumption per ton of coal carbonized, it should, if anything, be "a little less." Some monetary credit, too, may be taken for improved coke, though perhaps this is a point of which overmuch should not be made, as being an uncertain quantity. While, further, the money effect is not readily definable, the reduced naphthalene and sulphur content of the gas is worth something—in relation to the former on account of the lessening of the treatment of the gas to deal with the naphthalene, or alternatively of the cost in respect of labour in remedying naphthalene troubles. Reverting to the question of fuel costs, the "little less" referred to by Mr. Herring is really of more importance than the term used expresses. It is, indeed, an important question as to really how much can be saved on the fuel account. Mr. E. Körting put this point in an exceedingly striking way in the article on "Modern Methods of Carbonization" published in the "JOURNAL" on Jan. 11 last. He said:

The economy of wages by means of further improvements is scarcely worth consideration at the present day. On the other hand, the fuel consumption clearly is very important. The wages at Berlin rates amount at the present time to about 0.3d. per 1000 cubic feet, whereas the fuel consumption in heating the settings entails a cost of about 3d. per 1000 cubic feet. Hence it will be seen that a reduction of 10 per cent. in the fuel consumed amounts to as much as the whole expenditure on wages.

Though neither in gas yield nor in financial results (regarded within the limits he takes) does Mr. Herring appear to find much advantage in the vertical retort over existing types worked according to modern approbation and mode, he is himself experimenting with vertical retorts of his own design; and he recommends those who are thinking of extending their carbonizing plant not to omit consideration of verticals. Not only Edinburgh, but Glasgow is experimenting with verticals. And we shall be watching with interest Mr. Alex. Wilson's trials with his continuous-intermittent retorts, and Mr. Herring's system which is at will changeable from continuous to intermittent working, and *vice versa*. It will be appreciated that there are coals for which, and there are times when, a reversible method of working will certainly be an advantage.

Fire Statistics.

STRUCTIVE as usual are the annual report and statistics of the Chief Officer of the London Fire Brigade—now Lieutenant Sampson Sladen, R.N. The most notable feature for our readers is that the fires in 1909 due to gas (for most part through negligence) are down to 332, compared with 366 in 1908. And this notwithstanding the many thousands of new consumers and gas fires, stoves, and other appliances connected up during the year by the three Metropolitan and the Suburban Gas Companies whose areas of supply come within the London Fire Brigade district. On the other hand, to electricity is attributed 103 fires, compared with 102 in 1908; and to the account of electricity falls what the Chief Officer of the brigade describes as "the most serious outbreak of the year." That is the melancholy, devastating fire, on Dec. 20, at Messrs. Arding and Hobbs, at Clapham Junction, in which eight persons lost their lives, and which had its origin in the bursting of an electric lamp in the neighbourhood of inflammable goods in one of the shop windows. There were also 288 fires during the year the causes of which are labelled "unknown." It cannot therefore be said how many of these were due to electricity, which sets to work at generating conflagrations in such a stealthy way, and no doubt wholly in many cases covers its originating work by the completeness of its destructiveness. When gas is concerned in the origin of a fire, there is often premonition through the smell of an escape of gas; and it may be held that there are few fires in which gas has really had an initiative part that escape being traced to its account. As the Chief Officer hints, too, if people were less careless with naked lights, there would be considerable reduction in the fires to be recorded.

Of the 332 gas-generated fires recorded in the report, no less than 115 are ascribable to curtains, blinds, clothes, and other goods coming in contact with gas-flames. These are mostly the result of carelessness. A further 100 are entered up to gas escapes, as against 108 in the previous year. To negligence is traceable a large proportion of this class of fires, as gas leakages do not usually suddenly develop themselves and get immediately fired. Quite a reverse order of things exists with electricity, which gives no warning. The foolish act of seeking for gas escapes with a light is only

responsible for eleven fires on this occasion, as compared with fifteen in 1908. And these again are due to carelessness; for no one can surely in these days plead ignorance of the danger as an excuse. If the gas-generated fires due to carelessness and neglect were deducted from the total number registered against gas, the result would be that, notwithstanding the number of new consumers connected to the mains of the three London Gas Companies in excess of that coupled up to the cables of 28 electricity undertakings serving a larger district than the three Gas Companies, the number would strikingly coincide with that of the known electricity-generated fires.

From the electricity statistics of the London County Council, we get a better knowledge than from other returns of the actual number of consumers connected to the cables of the thirteen Electricity Supply Companies and fifteen Borough Councils of London—28 in all. The statistics are for the year 1908-9; and only the Charing Cross Company omit to make a return of the number of its customers. The reticence of this Company in this matter is singular. The other 27 undertakings have, in round figures, an aggregate of 104,000 consumers; and if we assume the Charing Cross Company have 11,000 (which is doubtful), that would make a total of 115,000. But taking this number, the 103 known electricity generated fires average 1 to every 1113 consumers. In their smaller area, the three London Gas Companies have now approximately 1 million consumers, the majority of whom use, additional to lighting, gas-fires, cooking-stoves, and other heating appliances. The 332 fires last year therefore average 1 in 3012 customers, as contrasted with the 1 to every 1113 electricity customers. There is every reason for satisfaction with this average for gas, more particularly as the greater number of the gas-originated fires were of very minor character, and resulted in comparatively little loss of life and property. In fact, throughout the year in densely populated London only one life was lost through an explosion of gas, and one through clothes coming in contact with a gas-stove. We are therefore in the position to claim for gas, on the evidence of authoritative statistics, that it is a safer servant than electricity as an illuminant and otherwise, and that the majority of the fires that do occur through it are due to crass negligence and stupidity. Beyond these points, the great safety factor of warning that is an attribute of gas, is entirely absent with electricity.

Gas-Meter Testing and Registration in London.

It is not, we think, an exaggeration to say that in few cases has the custom of transferring commodities from one person to another on consideration of money payment caused more trouble between the buyer and seller than in that of the supply of gas. In what may be called the ante-measurement days, consumers were not altogether satisfied; nor were they on the introduction of the meter, which has come to be regarded by many as an instrument capable of all sorts of vagaries to their detriment, and no opportunity is lost for holding it up to condemnation. The recent publication of the annual report of the Inspector of Gas-Meters for the Corporation of London (Mr. James Stratford), the principal portions of which will be found elsewhere, afforded just such an opportunity; and it was promptly seized upon by certain writers in the Press. Mr. Stratford and his staff tested 86,383 meters last year—32,728 of them being new; and 2564 new and repaired meters were rejected and sent back to the makers for correction. When they were returned correct, they were tested again free of charge. The rejection of these 2564 meters was fastened upon, though, as a matter of fact, only 656 of them were found to be registering against the consumer, while 1007 were working slow, or against the supplier. When figures taken from such a report as the one under notice are brought before the general public, it is only fair that they should be compared with the enormous number of meters that are fixed in London in the course of twelve months, all of which have to pass the tests laid down in the Sales of Gas Act. The figures just quoted show the care taken in ensuring the accuracy of the meters before they are fixed in consumers' premises; and Mr. Stratford acknowledges that the makers "appreciate such supervision of their work." No one pretends that the gas-meter is an absolutely correct instrument, nor, for the matter of that, is the one used in the supply of electricity; for a few years ago Mr. Bellamy, the Lighting Inspector of Liverpool, rejected as inaccurate no fewer than 1089

electricity meters out of a total of 2981, or $36\frac{1}{2}$ per cent., while only 105 gas-meters were rejected out of 4654, or $2\frac{1}{4}$ per cent. Returning to Mr. Stratford's report, there were 7544 cases of disputed registration of meters in London last year; 2658 being correct and 3335 wrong. Of the latter, 1430 were fast and 1905 slow. These figures bear out a statement reported to have been made by Mr. H. Rayner, the Secretary of the Gaslight and Coke Company, to a representative of a daily paper, that "the result of testing meters is more often against the supplier than the consumer;" and this is confirmed by the results of tests contained in Mr. C. Stafford Ellery's recent Presidential Address to the Southern District Association. As to the figures in Mr. Stratford's report in regard to the meters tested for disputed registration, we have no great faith in such tests; for, as he acknowledges, these meters have to be disconnected and conveyed to the testing-station by van or otherwise, which is sufficient to disorganize any meter, and cause it to register incorrectly. With reference to the testing of meter indices, Mr. Stratford considers it would place upon gas consumers or ratepayers a burden of many thousands of pounds; and he says "the public have had no cause to desire such testing," no question of fraud having ever been suggested.

Weakness in Coalite Shares.

During the past week the shares of the Coalite Syndicate and of the British Coalite Company have been showing an instability that must be a little alarming to those of their shareholders who are not behind the scenes. Some holder or holders who know something more than the general rank of proprietors must be unloading himself or themselves of a burden that, it may be expected, will only grow lighter in respect of value. On Monday morning last week, the market report gave $5\frac{1}{2}$ -6 as the price of the Syndicate shares; yesterday morning they were quoted at $4\frac{5}{8}$ - $5\frac{1}{8}$. The British Coalite Company's shares were on Monday morning last week quoted at 12s.-13s.; yesterday morning at 10s. 3d.-11s. 3d. There must be some good reason for this unsteadiness known to but an influential few. What is that reason? Is it that there has been further trouble with the plant at any one or more of the places at which it has been installed? Is it that rumours current at one of our fashionable seaside resorts are correct that, in a little town not far distant, people are complaining that coalite plant is an undesirable neighbour, and that it has been arranged that visitors during the summer months are not to be annoyed by its working? Or is it that coalite stocks are accumulating, and that the public are not opening their cellar doors for its accommodation with the freedom that the promoters prognosticated? Warmer weather is here, and the demand for solid fuel is rapidly declining. Coalite stocks under the circumstances will have a tendency to accumulate, and then next winter season coalite—the swollen, light-weight fuel—will have to come down in price to a competitive level with other solid fuels. A further idea flits into mind as a reason—that the beautiful scheme for generating electricity by gas-engines run by the Barking coalite gas, and supplying the current to factories to spring up round about the Barking plant after the fashion of Jack's beanstalk, may not be developing any better than other coalite projects. These are suggestions that occur as accounting for the recent restlessness of coalite shares. It is not expected that from the coalite centre of activity, there will be any reply or enlightenment as to the suggestions made, because the maxim of that centre now is "the least said, the soonest mended."

Parliamentary Representation.

At the time of the recent General Election, attention was called in these columns to the members of the new Parliament who, so far as is known, have direct or indirect connection with the gas industry; and this reminds that some time ago the Gas Companies' Protection Association decided to take steps to compile a list of all members of the House who, in administrative or shareholding capacity, are identified with the industry. Such a list would be valuable for keeping such members informed on all matters that come before Parliament affecting the interests of the industry. But what is also wanted are members who shall be recognized as being specially in a position to voice the views of the industry in regard to all questions in which it is concerned that arise in Parliament, and will do so as a matter of course, and not in any perfunctory manner. When, for example, the Coal

Mines (Eight Hours) Bill was under discussion, there was no member who put before the House the views of the industry, although it uses (in round figures) some 16 million tons of coal a year. The Home Secretary at the time received a deputation from the Institution of Gas Engineers and the Gas Companies' Protection Association; courteously listened to what was said by Sir George Livesey and the other spokesmen; and, with the equally courteous dismissal of the deputation, apparently closed his mind there and then to what he manifestly regarded as mistaken views. Who was mistaken has been since abundantly proved. But within the House, the industry only had its views expressed by circularizing the members. No one stood up and specially laid the views before the House, and claimed for them consideration as coming from an important coal-consuming industry. Only incidental references were made to them. The subject now recurs on the revival by Earl Wemyss of a proposition for a resolution expressing the approval of the House of Lords that it would be for the public good that important trading and other representative societies should each name three members of the existing peerage in the current, and each succeeding, Parliament to speak and act on behalf of such societies on all questions in which they are interested, and that the names of the peers so nominated be entered in the journals of the House. The list of public bodies approving of the resolution is fairly representative of the sciences and arts and trade; but that is all that can be said for it. It is surprising that it is not more representative. The Institutions of Civil and Mechanical Engineers are not named, nor is the Institution of Gas Engineers. In the list of seventeen bodies, however, are mentioned the Gas Companies' Protection Association, Society of Engineers, Junior Institution of Engineers, London Chamber of Commerce, Machinery Users' Association, Surveyors' Institute, and Employers' Parliamentary Council—the last-named representing thirty Central Associations connected with the chief industries of the United Kingdom.

Photographic Illumination Comparisons.

Comparative photographs of lighting effects should, in fairness, be accompanied by explanatory matter, so that judgment may be made as to whether or not the conditions of lighting are approximately concordant, and thus also the value of the comparison. The "Electrical Times" has published, side by side photographs of the lighting of a street at Middlesbrough by electric and gas lamps. The picture of the street illuminated by, gas shows nothing—nothing but, as the daily newspaper reporter would put it, "cimmerian darkness"—beyond an intense light diffused over the gas lantern itself, with a halo round it, and a shadowy outlined window or two. It is marvellous how the people were able to grope their way along this street before the electric lamps were introduced. The street electrically lighted, of course, appears brilliant. But it is not explained (perhaps because it is obvious) that the street is now illuminated by electric flame arc lamps; while previously (this is not so obvious) it was illuminated by ordinary incandescent lamps of not the most modern types. The Corporation Gas Department had no opportunity of lighting the street to the best advantage with incandescent gas-lamps, as the Lighting Committee seem to have suddenly resolved to adopt electric lighting at all costs. Our contemporary makes omission also in not stating that one of the photographs is of electric lighting up to midnight; the other of "stand-by" gas lighting from midnight to dawn. The "Electrical Times" has likewise refrained from mentioning that the costs are approximately four to one, taking electricity at about 1d. per unit, and gas at 2s. 2d. per 1000 cubic feet—this being the full price of gas to all classes of consumers. The arc lamps were brought into use last August, when two side electric lamps on each column were supposed to give all the light necessary after midnight. These failing to satisfy, the gas-lamps were brought to the rescue; and the Gas Department have had to light them from midnight ever since. The Lighting Committee are now asking the Council to allow the flame arcs to remain in use throughout the dark hours. It is naturally regarded by the Electricity Committee as rather *infra dig.* to have gas-lamps of any sort acting as a stand-by to their flame arcs, and by their very use bearing silent testimony to the expense of the latter. However that is not the point of this comment, which is to show that the conditions of electric and gas lighting in this particular Middlesbrough street are so unequal as to withdraw all value from the comparative photographs of its illumination.

The Result of the Ballot.

The cloud has at last lifted from South Wales; and this time, let us hope, it has done so for good—or at least for some years to come. The ballot which was taken among the miners on the question of the acceptance or rejection of the proposed new wages agreement has resulted in an overwhelming majority—practically three to one—of votes being cast in favour of signing the agreement; the exact figures being 97,273 for accepting the terms, and 4,963 against. Thus the men have responded to the appeals made by their leaders, and by the Miners' Federation of Great Britain, and have also shown their good sense in averting a struggle in which victory to them might have proved but little less disastrous than defeat. The closing stage in the dispute was reached on Friday, when, at a meeting of the Conciliation Board, the owners were informed of the acceptance by the men of the terms, and the revised agreement was signed. The new arrangements came into operation on the following day—thus replacing the old agreement which was terminated on March 31. As the agreement now entered into is for five years, instead of three (which was the term of the last one), one should be fairly safe in assuming that peace will reign over the coalfield at any rate until the approach of March 31, 1915, after which date the arrangement will be terminable by three months' notice on either side. This will give the district a chance of recovering from the ruinous effects on trade of the strife which has been in perpetual evidence since the passing of the Eight-Hours Act. Already the prospects of a peaceful solution have had a good effect; for it is stated that a large number of buyers have come upon the market during the last few days for supplies of coal over the next nine months, and a good deal of business is now in course of being transacted. The new terms, it may be mentioned, provide for the continuance of the present rate of wages of 50 per cent. above the standard of 1879, until they are advanced or reduced in consequence of a change in the price of coal; and the fixing of a minimum of 35 per cent. with an equivalent value of 12s. 5d. per ton, and a maximum of 60 per cent. above the standard of 1879. The men shall not be under any obligation to work the extra sixty hours mentioned in the Eight-Hours Act; and the payment of six turns for five for night work shall continue, but payment for overtime shall cease. The owners do not press for double shifts in the face; but these are to be provided for in headings and for development purposes, and an effective afternoon shift will be required for clearance purposes—the payment for the latter to be similar to payments made for working present night shifts. There is also provision made for an over-riding shift, and for amending the Eight-Hours Act in order to legalize this on Saturdays.

Proposed Legislative Protection of Water Supplies.

In another column will be found the principal clauses of an important Bill affecting water companies which has been referred to a Joint Committee of the two Houses of Parliament. It provides that no water undertakers shall sink wells or construct works for obtaining their supply unless such wells and works and the sites for them have been expressly approved by Parliament. The Bill will amend the law in regard to underground water, by providing that wherever private supplies are injured by the abstraction of water for public supply by means of future works, the owner is to be entitled to compensation; and it will provide that here, by means of future works, water is taken from any district for supply to communities outside, the district whence the water is taken, and through which it is conveyed, is to be entitled to demand a share of such water for its own needs, upon terms to be agreed upon or fixed by the Local Government Board. It will be recognized that if the Bill is passed it will have a most disastrous effect on all water companies drawing their supplies from wells; and therefore their attitude should not be one of sympathy in reference to it. We understand that both the Provincial Water Companies' Association and the Association of Water Engineers have been communicated with on the matter, and that it will be considered by the latter body at their meeting in York in June. We suggest that some definite united action should be taken at once; as by the time named it may be too late.

At the meeting of the Institution of Civil Engineers last Tuesday, it was reported that the Council had recently transferred S. C. Chapman, the Water Engineer to the Torquay Corporation, from the class of associates to that of members.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 134.)

DURING the past week the leading markets on the Stock Exchange had a very fair time on the whole, though the tendency now and then was oscillating and doubtful. In spite of themselves, they could not avoid being affected by the tremendous speculation going on hard by; and its ups and downs had a cheering effect and the reverse alternately. The opening day was bright and busy for almost all. Railways were active and rising, and the gilt-edged division held firm. The Rubber gamble was at high pressure. Tuesday was quieter and dullish at first, rather overborne by the excitement in the fashionable ring. But things improved later on—Consols among them. The weak American Market mended a little. On Wednesday, movements were uneven. Government securities were in demand, and Consols rose $\frac{3}{16}$; but rails were not so good. On Thursday, most departments were weaker, owing to the sinister influence of a shaky Rubber Market. When a big building tumbles to pieces, there is no knowing who may be hit by the debris. But the gilt-edged division went their own way, calm and steady. Movements on Friday were irregular; the choicest investments being rather easier. But Rails were cheered by improved prospects in the coalfields. Americans were weak; and some of the cautious ones got out of the Rubber ring. On Saturday, however, speculation was going strong again, and most departments (except Consols) were firm. In the Money Market, the position was firm. A rise in the Bank rate on Thursday was regarded as on the cards; but it did not come about. Business in the Gas Market was a fairly good average, and the tendency showed even an improvement. A large number of undertakings, situated all over the world, advanced in value, testifying to the unabated popularity of gas as a good, steady investment. Large parcels of stock have recently been issued by tender or by auction, and have been eagerly taken up. Last week, Gaslight and Coke ordinary made an advance of half-a-point with transactions ranging from 103½ to 104½. In the Company's secured issues, the maximum realized from 88½ to 89½, the preference 105 and 105½ (a rise of 1), and the debenture 81½ and 81¾—a rise of 1. South Metropolitan was steady and more active; prices ranging from 120 to 122. The debenture made from 82 to 82½. Commercial 3½ per cent. was done at 103, and ditto debenture at 81. Among Suburbans and Provincials, Alliance and Dublin changed hands at 88, Brentford old at from 251 to 253 (a rise of 1), British at 44½, Bromley "B" at 88, and South Suburban at 121. Locally, Liverpool "A" made 223, and ditto "B" 164½. In the Continental companies, Imperial had a further rise of 1, with business at from 181½ to 182½, ditto debenture made 94½ and 95 (a rise of 1), Union from 98½ to 99½, ditto preference 139 and 140½, European fully-paid 24½ and 24¾ (a rise of ½), Malta 41½ and 5, and Tuscan 9½ and 9½. Among the undertakings of the remoter world, Bombay realized 6½, Buenos Ayres 15, Cape Town 4½, Monte Video 13, Oriental from 141½ free to 142½ (a rise of 1), Ottoman 6 and 6½, Primitiva 7½, and ditto preference 51½ and 51½.

ELECTRICITY SUPPLY MEMORANDA.

Fixed-Price Project—How a Weymouth Journalist meets Criticism—Look before you Leap—Interest of the Electricity Industry in Gas Restrictions—Innocent Clauses at Bath—A Lamp Maker's Imagination.

IN the "Memoranda" on March 29 there appeared three-quarters of a column of criticism (not a column and four-fifths, please) of an article published in the "Weymouth and Portland Standard" on the fixed-price-per-lamp project, which criticism caused the Editor of our contemporary to devote the whole of his editorial matter—to the extent of upwards of a column—in a succeeding issue to what he thought fit to say about us, and not the fixed-price scheme, which is the real bone of contention. The importance, in the Editor's mind, of doing something to, if possible, take the edge off the criticism is thereby attested. But our friend could do no better with it than indulge in a fine display of terribly thin buffoonery, which was somewhat appropriate to the day of issue of his paper—April 1. In the whole of the balderdash on the subject which he thinks suitable for his readers, there is not a single denial of any one of the points that were made in our criticism, which the Editor, in the exercise of his intelligence, is of opinion "hardly merits a serious reply." But this statement is anything but in countenance with the devotion of his editorial pen and a column and more of his space to our comment. We asked the writer to inform us as to the names of those "several places" that have adopted the "fixed-price-per-light" system; we should like to hear from him as to the degree of success of the system in South London; perhaps he will tell us whether the Dundee Electrical Engineer's experience and recommendation are worthy of consideration; is there anything wrong with our criticism of the provision against misuse; whether the criticism of other electrical engineers (such as that published last week) has any value; has our friend any fault to find with our computations and conclusions? Not one of the points is dealt with or controverted by him. They "hardly," he submits, "merit a serious reply," though in them—whether or not the Council, the Electricity Committee, or the sapient Editor cares to accept our statements un-

corroborated—there is, we venture to think, sufficient to cause the Weymouth Council to pause before entering upon any speculative course, and to inquire as to their validity. It is easy to gibe at interestedness; it is not so easy to dispose of facts such as those in our criticism.

In the display of jocularity made by our contemporary, the writer had to descend to misrepresentation. There was no reference in our criticism to the "humorous fixed-price lamp;" it was the fixed-price-per-lamp "project" that was so described. And, again, there is a misstatement as to our criticism occupying one and four-fifth columns of the "Memoranda." But we will forgive our journalistic friend for these misrepresentations, as he was so hard pressed for points, and at a loss to give answers to our criticism. In view of the inaccuracies that were contained in the original article on the fixed price per lamp, it is interesting to learn that our contemporary's "attitude is, and has been, a perfectly impartial one," and that its "only interest in the new electricity scheme is a speculative one as to the result of its adoption." That was not the impression gathered from the original article. The "Southern Times," unlike its contemporary, takes a common-sense view of our criticism. While it does not expect to get an unbiassed judgment from the "JOURNAL," it says it would be imprudent to disregard the evidence which is presented of non-success in places in which the fixed-price-per-lamp principle has been tried. "As the fixed-light system comes to be closely examined, people are beginning to hope that the Committee charged with the management of the Weymouth electric light undertaking will make quite sure of their ground before they take the plunge which is to 'revolutionize' electric light consumption in the town. There seems to be a good deal of doubt about the commercial soundness of the project." We agree with our contemporary that the Electric Light Committee are to be commended on any sound scheme that may be adopted for popularizing the illuminant they sell; but it is only right that the Committee should "make assurance doubly sure, before they make a plunge which may possibly prejudice the future of this important municipal enterprise." The fixed-price-per-light project is as speculative as free wiring. The Electricity Committee have no power to compel a man to stay in his house after he has had it wired on the fixed-price plan, nor have they any check on the amount of electricity he will consume. In free-wiring the Beckenham Council have (as recently stated) sunk £22,613; and the rental last year only amounted to £935, and, after meeting interest and sinking fund, there was a deficit of £1708! It will be the best thing for Weymouth, and any other place that may be considering the fixed-price-per-lamp project, to look well before taking the leap. That is a more prudent policy than trying to meet criticism by cheap wit, instead of facing it fairly and squarely, and seriously.

In the "Electrical Review," there is a peculiar article on "Gas-Testing Standards." It is very superficial and very vague; and, as a matter of fact, it is difficult to determine in parts what the writer of the article means, and we are positively at sea as to where he obtained certain of his priming. There appears to be an extraordinary amount of interest just now on the part of the electrical industry in advocating that greater restrictions should be placed on the prime commodity of their competitors. In this article, it is stated that gas may be varied in its composition, and that its value as an illuminant does not necessarily correspond with its efficiency for heating and power purposes; and, this being so, users of gas and the safeguarding authorities should consider the need for closer and more scientific methods of checking the gas distributed than was found necessary when the flat-flame burner was exclusively used. This is delightful coming from an electrical source, in view of the little protection for consumers in the way of penalty testings that hangs over the electrical industry. But what would this self-constituted handicapper of the gas industry like in the way of closer and more scientific methods of checking gas? The only possible test in addition to tests now imposed would be a calorific power one; and the gas industry, after a proper decision on the point of the correct standard under local circumstances, would be quite prepared to accept such a standard in lieu of the illuminating power one. Surely, the gas industry's worst enemy would not wish it to work concurrently to two qualitative standards with penalties attached. The gas industry is most desirous of seeing the flat-flame burner dropped out of the reckoning altogether, so that calorific power alone is the only thing to trouble about in the matter of quality; and the cancelling of the illuminating power test would certainly hasten the eviction of the antiquated and wasteful burner. The writer in our electrical contemporary holds that, on the adoption of the "Metropolitan" No. 2 burner, there should be a reduction of price, or a calorific test should be imposed. Thanks are due to him for his disinterested recommendation. But the reasons why neither the one nor the other proposal should be adopted may be found by him in our recent series of articles on "The Case for the Standard Burner Bill." The suppliers of gas are fully aware of where their best interests lie; and they may be depended upon to defend those interests in a sane manner. The consumers, in the case of sliding-scale gas companies, are amply protected in regard to price. The electrical writer, however, asserts that, where the illuminating power standard is 16 candles, the adoption of the new burner would represent a loss of about 12½ per cent., but a rebate of 2d. on 2s. 6d. per 1000 cubic feet would only amount to 6½ per cent. Following up which gas suppliers are told something that, though the No. 2 burner has been extensively applied, they had

not learned until this writer voluntarily came forward to enlighten them. Our obligations, of course, are deep and sincere. Gas suppliers, read, mark, learn, and inwardly digest this: "The gain to the supplier is greater than the difference between these figures, owing to the general tendency to burn more gas, and the economy to be effected in fuel and treatment at the works." The writer has something to learn as to the possibilities of producing gas of much lower illuminating power without degrading calorific power. We should like the writer to also expatiate on these mysterious statements in order to remove the ambiguity: "With the exception only of sulphuretted hydrogen, the impurities cannot be checked, although they cause great destruction of property, and have a most injurious effect upon those who use gas lighting in unventilated places." It is some years since the "Metropolitan" No. 2 burner came into use; and nothing has been heard from the consumers as to any detrimental influences which entitle this writer to assume that they are unfortunate, and will be all the better for a little of his gratuitous sympathy.

It will be within the recollection of readers that the President of the Southern Association of Gas Engineers and Managers (Mr. C. Stafford Ellery), in his Inaugural Address, handled somewhat severely the vicious methods of the municipal traders in electricity supply, from which vicious methods he, as the responsible chief officer of the Bath Gas Company, has suffered in company with others similarly circumstanced. It is not surprising to find that the Company are unwilling to leave a stone unturned to get the business of the municipal electricity undertaking conducted in a fair manner. A gas company do not mind how spirited electrical competition is, so long as it is conducted on true and just commercial lines. The Electric Lighting Committee of the Corporation are now proposing that the latter should apply for a Provisional Order to extend the area of electricity supply; and the Gas Company are intending to oppose the application, solely for the purpose of obtaining the insertion of two clauses innocent of any object but fair dealing. The first clause is to provide that the charge made to the Corporation for public and other electric lighting shall not exceed the price to private consumers. The second provides that, in the event of the undertaking becoming a charge on the rates, the prices of electricity to private consumers should be periodically raised so as to cover losses necessitating such charges on the rates. The Council, it is stated, object to the insertion of both clauses. We wonder why. What is there in them to which any honest trader can object? They are both based upon true commercial and financial principles; and the latter clause is simply an abbreviated way of putting the terms of the Northumberland clause, which contains principles and regulations already approved by Parliament.

A representative of the "Electrician" has had an interview with Mr. A. Denman Jones, the Manager of the Jandus Flame Arc Lamp Company; and this gentleman has given the representative some "interesting information" on the subject of the competition of the flame-arc lamp with high-pressure gas-lighting. The "interesting information" has been duly chronicled as gospel. We learn that "there are numerous places where the Jandus lamp has displaced gas, simply and solely owing to the trouble of constantly renewing the mantles." Where are those places, we should much like to know? "With high-pressure gas, although the light given when the mantle is new is excellent, it falls off very rapidly; and the mantle life not infrequently is very short. The upkeep costs are therefore large; and an arc lamp which requires attention only once every four days, and then only 'cheap' attention, is being gradually found to possess certain distinct advantages." Purely by oversight, Mr. Jones forgot to mention that there are places where flame-arcs have quite recently been displaced by high-pressure gas lamps, simply and solely owing to the greater expense of the former, and the higher efficiency and constancy as illuminating agents of the latter. The "Electrician" ought to have known better than to have accepted as true the statement that with high-pressure gas the light falls off very rapidly. That is just what the light does not do with high-pressure gas, as the high-pressure lamps in Fleet Street amply bear witness. We suggest, too, that Mr. Jones should get a little more accurate information as to the average renewal of mantles, and compare it with the average renewal of arc lamp carbons, before he speaks again of the trouble of constantly renewing mantles.

We really admire the audacity of Mr. Denman Jones, in view of what is being done in the electricity-supply industry, in saying that gas-supply authorities have often taken on street lighting at a figure which only allows them to lose instead of make a profit. To this our contemporary appends the sage remark: "An arrangement which, in the long run, is likely, we should imagine, to lead to trouble for the shareholders." We should like Mr. Jones to point to a single piece of high-pressure street gas lighting in London that has been taken on at a price which causes a loss. One more quotation which shows that Mr. Jones has a grand imagination. Here it is: "High-pressure gas has, to a certain extent, also been tried for factory lighting; but the necessity for having a trained gas engineer on the premises to look after the pressure-raising installation, and the high cost of renewals, is causing a revulsion of feeling in favour of flame-arcs." There is something slighting in the words "to a certain extent" and "tried;" and the "trained gas engineer" for looking after pressure-raising plant is a happy piece of fiction. The fact of the matter is that the high-pressure gas system has become so popular for factory lighting, that those who supply high-pressure gas-lamps are doing

splendid business in this direction. Has our contemporary so soon forgotten the tribute paid by Colonel Bagnold and Colonel Sir H. Barlow to high-pressure gas-lamps for factory lighting as the result of their experiences at Woolwich Arsenal—see "JOURNAL," March 15, pp. 715, 731, and the statement of the latter that he would "no more think now of putting in arc lighting than think of flying"? Colonel Bagnold and Colonel Sir H. Barlow, we might mention, are not interested in the management of the Jandus Flame Arc Lamp Company. However, readers who desire to see what Jandus lamps will do should go and see the performance of the four erected at the Abbey end of Victoria Street, Westminster. The road is not uniformly lighted; and that end of the street at nightfall looks most dreary. The old double upright burnered gas-lamps in the next stretch of the street are doing better in regard to uniformity in illuminating the roadway and footpaths. Distinctly better than the flame arcs in effect are the succeeding electric metallic filament lamps; but best of all are the low-pressure inverted gas-lamps in the last part of the street.

PERSONAL.

Mr. W. B. MIMMACK, formerly of the Crays Gas Company (now absorbed by the Bromley Gas Company), has been appointed Manager of the Pembroke Docks and Town Gas Company, Limited, in succession to Mr. A. Horace Brookman.

Mr. J. DICKSON, who last week took over the duties of Manager of the Forfar Corporation Gas-Works, was (before he left Kely) presented with a timepiece, which had been subscribed for by the employees at Kely, as a mark of their esteem for him.

Mr. CARL BENNETT, who has served the Herne Bay Gas and Coke Company, Limited, as Assistant-Manager (under his father, Mr. C. V. Bennett), succeeds at Dartford his brother, Mr. W. H. Bennett, who, as announced last week, will shortly go to Redhill to take the position vacated by Mr. James Paterson.

On the afternoon of Saturday last, Mr. H. RULE, formerly the Assistant-Manager of the Falkirk Corporation Gas-Works—now Manager at Kely—was at Falkirk presented by the employees and friends with a gold watch and Albert, with sovereign case. The presentation was made in the gas-works by Mr. W. Wilson, the Engineer and Manager.

As will be noticed from the report of the proceedings of the Midland Junior Gas Engineering Association, the announcement was made during a visit on Saturday last that Mr. HAROLD E. TEMPLE, the Hon. Secretary, has secured the appointment of Assistant Engineer and Manager to the Christchurch Gas Company, New Zealand. Mr. Temple is at present engaged as Assistant Works Engineer at the Nechells Gas-Works of the Birmingham Corporation. He received his training under Mr. Charles Hunt at the Windsor Street Gas-Works; commencing here as assistant in the works laboratory in 1896, and being under Mr. P. C. Holmes Hunt (now of Melbourne) for some few years. He was subsequently promoted to the post of Analyst in 1902, and in 1905 was appointed by Mr. Henry Hack as Works Engineer's Assistant (under Mr. John Foster) at Windsor Street; being transferred to Nechells, a further promotion, in November, 1906. He succeeded Mr. James Hewett as Hon. Secretary of the Midland Junior Association, and is held in the highest esteem by his colleagues, who are all pleased to hear of his success. We understand he sails for New Zealand on the 23th inst.

OBITUARY.

Mr. DAVID WILLIAMSON, J.P., the Chairman of the Guildford Gas Company, died last week at the age of seventy-seven.

The death is announced as having taken place on the 16th ult., at the age of 79, of Dr. HANS LANDOLT, Professor of Physical Chemistry at Berlin. In 1856, Landolt made (in conjunction with Bunsen) the first exhaustive investigations on the Bunsen gas-burner. Later he collaborated with Börnstein in the compilation of the elaborate tables of physical and chemical constants which are now regarded everywhere as indispensable for scientific and technical calculations. His other work was of a more purely scientific character.

Yorkshire Junior Gas Association.—A meeting of the Association will be held next Saturday at the Municipal Technical College, Bradford, when Mr. J. Demain, of Garforth, will read a paper on "The Development of a Small Gas Undertaking," and Mr. W. Cranfield will give an address on "Modern Developments of Carbonization, with Special Reference to Vertical Retorts."

Gas Managers as Municipal Councillors.—At the suggestion of several friends, Mr. E. D. Sapey, the Manager and Secretary of the Horsham Gas Company, Limited, offered himself as a candidate for one of the vacancies on the Town Council, with the result that out of the eight candidates nominated, he was on Monday last week returned fourth on the list; those in front of him being three of the retiring members who had offered themselves for re-election. We congratulate Mr. Sapey on his success, and venture to predict that he will prove a useful guardian of the ratepayers' interests.

NOTES FROM WESTMINSTER.

PROCEEDINGS last week in the Committee rooms were peculiarly interesting, with a couple of days spent on the Standard Burner Bill and four days on the Glasgow Gas Bill. It will be the week of the session so far as actual gas fighting goes; but the current week for the gas industry in connection with the Standard Burner Bill and for Glasgow in connection with its own gas measure, will be the more momentous. The opposition to the Matlock Bath Bill has been withdrawn, so that this means there is to be no insistence upon the removal of the gas-works; for sparing them the expense in connection with which, the people more immediately concerned will be truly thankful. The Mallow Gas-Works and the Workop Water-Works. It will be seen later, are to change hands, and become the possessions of the respective towns, provided, of course, there is no hitch in the exercise of the powers. The Brighton Town Council, it is understood, are not satisfied with the Bill clipped by the House of Commons Committee from the standard price of the Gas Company in connection with the adoption of the "Metropolitan" No. 2 burner; and they have decided to contest the Bill in the House of Lords. This is unkind; but we venture to predict that the event will show that the Council are now taking an extremely fatuous course.

Standard Burner Contest.

On Thursday morning, Lord Ritchie's Committee commenced consideration of the Standard Burner Bills (Nos. 1, 2, and 3), commencing with No. 1. To the gas habitué of the Committee rooms, the scene in No. 3 was an unwonted one. One is accustomed to see, and to rub shoulders day after day with, the consulting gas engineers of Westminster, and the gas officials of the town immediately interested in a Bill. But the public part of the Committee room in which their Lordships sat on Thursday and Friday to consider these momentous Bills was practically packed by gas engineers from North, East, South, and West. The gas man, wherever he stood or sat, found professional friends to the right of him, friends to the left, friends in front, and friends behind. This is not to be wondered at, seeing there were 47 Gas Companies—21 maximum price, and 26 sliding-scale—jointly concerned in the promotion of the Standard Burner Bills, though there had been certain secessions by Companies who, under their existing testing powers and prescribed burners, did not think it worth while to incur the opposition of the local authorities for the small advantage, under their special circumstances, that the "Metropolitan" No. 2 burner would have conferred. Practically all the companies, however, must have been represented in the room by their technical officers. The opposition had followed the excellent example of the promoters, and had arranged for a joint case, with one set of counsel and witnesses. The Agents for the Bill (Messrs. R. W. Cooper and Sons), it was evident, had prepared themselves for a strong attack by having the case for the Bill thoroughly well grounded and submitted, and backed in a manner that would, from the very nature of the evidence and the manner of its presentation, commend itself to the Committee. Mr. J. D. Fitzgerald, K.C., Mr. Honoratus Lloyd, K.C., Mr. Hutchinson, and Mr. Paddon were Counsel for the promoters; and Mr. Ram, K.C., Mr. J. G. Talbot, K.C., and Mr. Courthope Munroe were for the opposition. This was a strong representation, and showed an intention on both sides to sustain a strong part, *pro et con*. The witnesses called in support of the Bill were, in order, the inventor of the "Metropolitan" No. 2 burner—Mr. Charles Carpenter—Mr. W. J. A. Butterfield, Mr. W. C. Young, Mr. J. W. Helps (the President of the Institution of Gas Engineers), Mr. Edward Allen, Mr. Corbet Woodall, and Mr. William Cash. As customary, the inseparable supporters of local authorities hostile (or, if not hostile, concession-desiring) to the adoption of the new burner—Mr. Isaac Carr and Mr. J. G. Newbigging—were at the back of the opposing Counsel, and Professors Percy Frankland and Teed were with them. The proceedings continued over the Thursday and Friday sittings, and then were adjourned to yesterday, when it was expected that the winding-up speeches of Counsel would be made, and the decision of the Committee would be delivered.

The Opening.

It was a cogent argumentative opening that Mr. Fitzgerald made on behalf of the Bill. The history of the test-burner question was detailed by him in a way that early put their Lordships into possession of the difficulties under which gas testing has been carried on, of the injustice to gas suppliers of the use of instruments in testing that do not give them the full illuminating value of the gas, and of the fact that the present promoters are only asking that they should have conferred upon them that to which they have a right under the fundamental parliamentary principle applying to the testing of gas, that the burner shall be the most suitable for developing the illuminating power of the gas. Further, that for the penal testing of the quality of any commodity there should be uniformity in instruments and procedure. He showed that, before the advent of the "Metropolitan" No. 2 burner as the result of the research and work of Mr. Charles Carpenter, gas testing was in a chaotic state; but in this burner, which has been conceded by Parliament and the Board of Trade (august bodies of whom Mr. Isaac Carr thinks slightly in respect of their knowledge of this subject)

to be the most suitable for the purpose, gas suppliers have an acceptable instrument for the testing of all the ordinary qualities of gas. Counsel made the point that both Parliament and the Board of Trade in the Private Gas Bills and Provisional Orders that have respectively come before them since 1905 have prescribed the use of the new burner, and have moreover specified it in the Model Clauses. The gas suppliers who have applied and obtained the new burner as their standard one, he pointed out, include not only companies, but local authorities; and the latter are not all averse to having the burner, though there are no means within human ken by which the consumers of the gas of those authorities can be protected in the definite manner proposed for gas companies by Messrs. Carr and Newbigging, both of whom are the officials of local authorities, one of whom (despite the protest of Mr. Newbigging) takes many thousands of pounds a year from the gas consumers for the rates. After the opening of learned Counsel, a question of principle was discussed; Mr. Ram, in his pious regard for the process of the House of Lords, looking upon the joint promotion of these Bills as not only a misuse but as an abuse of that process. The Sulphur Compounds Acts are precedents against him; and as Lord Ritchie and his noble colleagues, together with the authorities of the House, did not feel at all aggrieved over a number of Companies taking the sensible course of combining applications and case for one purpose, Mr. Ram's intervention in this matter did not avail him anything.

And Evidence.

There is hardly need to even glance at the evidence submitted for and against the Bill. Practically there was nothing new in it. All that can be said has been said before, and in numerous different ways. Mr. Carpenter made his evidence particularly interesting to the Committee. One point that has been made time and again in opposition to the "Metropolitan" No. 2 burner is that it does not comply with the principle that the test-burner must be practicable for use by the consumer. The barrier to the "practicable" state, it has always been submitted, is the cost of the burner; but Mr. Carpenter showed that, if the public demand "Metropolitan" No. 2 burners for lighting in the same way that they used to demand the old-time argands in pre-incandescent days, then the new burner could be made and sold at the prices that were paid for the argands of old, around which, in these times of incandescent lighting, clusters not utility but merely historical interest. It is all a question of demand. There was really no case to meet as to the suitability of the burner as a testing-instrument, or as to it doing better justice to the illuminating value of the gas. The ancient principle and right that the most suitable burner should always be used for the purpose of testing, which left open the way to improvements in the burner, and contemplated no stereotyping of it, Mr. Carr and Mr. Newbigging sought to amend by linking up with principle and right some distinct concession (something not provided for by Parliament at the beginning of history in statutory gas testing) for the consumers other than the advantages that would accrue to them through other statutory conditions and by the ordinary commercial routes. It is conceded by the promoters that, while under the altered circumstances of the time, gas consumers can utilize a lower grade gas to better advantage by modern means than the higher grade gas through the better intermixture of gas and air, there are also economies that can be effected, through the adoption of the new burner, in manufacture—by increasing the make per ton of coal, for instance—of which the consumers, through the statutory protection afforded them, will take the larger part, whether the suppliers be a maximum-priced company, or a sliding-scale company. Mr. Woodall, Mr. Carpenter, and others showed how these advantages inured to the consumer, without any parliamentary interference whatever, particularly in respect of the standard price on which investors have provided capital for the concerns. But Messrs. Carr and Newbigging see visions of possible mismanagement on the part of companies, and nothing will please them but to get them properly corded up in this matter. A great deal more evidence from the photometer room was advanced showing much theoretical suffering on the part of gas consumers, which suffering is not reflected in those practical things known as gas accounts. Liverpool particularly came in for intimate attention in this connection; that being a Company, with maximum price and high-grade gas, incorporated in the No. 1 Bill. There is a sympathetic regard on the part of the opposition for the flat-flame users of Liverpool, who have been wasting good gas and blackening their ceilings, instead of adopting incandescent burners. It will be an excellent thing for them if a lower-grade gas served as an inducement to the use of less gas, and in a more profitable manner, by means of incandescent burners. Nor is there any occasion to worry about the gas-engine user of Liverpool; seeing that higher authorities on gas-engines than the opposition technical witnesses—namely, Mr. Dugald Clerk and Dr. John Hopkinson—have affirmed that greater efficiency can be obtained from gas-engines by low-grade illuminating power gas than by one that is so rich in heavy hydrocarbons that proper admixture of air cannot be secured. A calorific power test received constant reference in the evidence; but the opposition did not seem to press the point much. The opinion was expressed by Mr. Butterfield that the Gaslight and Coke Company will have some difficulty in maintaining their calorific power standard, if they work down to their legal obligation in respect of illuminating power. Mr. Woodall, on the other hand, states that the acceptance of the test has not been accompanied by any special inconvenience; but he admits that it has been found, when working to a certain illumi-

nating power, that they are not able to maintain the calorific power specified in their Act. Among other *dicta* worth remembering is Mr. Butterfield's assertion that the change in illuminating power as indicated by the No. 2 burner involves a relatively small change in calorific power.

[Reference to yesterday's proceedings appears in our editorial columns.]

Glasgow Gas.

The outside districts within the gas supply territory of the Glasgow Corporation have taken, in the attempt to secure something to which they are not entitled, complete advantage of the application of the Corporation to Parliament to consolidate their Gas Acts and to have them revised. The Bill originally took the form of a Provisional Order; it was proposed to prosecute under the Scottish Procedure Act; but, probably in view of the vastness of the inquiry, the scene of investigation was transferred to the Committee rooms at Westminster. Mr. Balfour Browne, K.C., led for the promoters; and with him were Mr. Honoratus Lloyd, K.C., and Mr. Beveridge. The opposing Counsel presented a solid phalanx, portending a vigorous and protracted discussion. There was fulfilment. The discussion went on unceasingly day by day from Tuesday; and the opponents' case was still in full swing when the Committee rose on Friday. To a large extent, the matters under discussion purely refer to the regulation of the relations between Glasgow and the outer districts. But still in them questions of principle are involved. One submission by the outside districts was early disposed of; and that was that the time has arrived when there should be a Joint Gas Board. But this was going beyond the bounds of propriety. Mr. Balfour Browne rightly contended that such a matter should be raised on a Bill specially promoted for the purpose; and though at first the Chairman of the Committee appeared to think the proposal germane to a Bill contemplating new powers, on after-consideration the Committee were of opinion that it was not within their province to consider an alternative scheme on the present measure. No question was raised as to the reduction of the standard illuminating power of the gas to 14 candles; but there was strenuous contest on other matters as to which confirmation of existing powers is asked, and which to an extent bear upon the desire of the Corporation to have the area of supply divided into two districts, to be known as the city supply district and the supplementary supply district. Among the witnesses called in support of the Bill were Mr. W. W. Montgomery, the Convener of the Gas Committee, Mr. Alex. Wilson, Mr. Corbet Woodall, Mr. Charles Hunt, and Mr. W. R. Herring. Mr. E. H. Stevenson was looking after the interests of certain of the opponents.

Controversial Points.

The principal controversial questions referred to differential prices and the allocation of gas profits. The times for gas supply have changed; and conditions have so altered that business for different service cannot be conducted with that uniformity of prices that at one time prevailed, nor is it just that the districts beyond the confines of a city should expect to be supplied on an equality with the inner area. Glasgow, among municipal gas undertakings, occupies a leading place in the matter of generous treatment to their gas consumers; and the Corporation have only, we believe, once since the gas undertaking became a municipal concern, taken a few thousands from the profits in aid of the rates. The undertaking has been deliberately run on the politic lines of the best possible service for those who desire to take advantage of the service. The present price is 2s. for lighting, 1s. 8d. for power, and other prices for other purposes. The outer districts have enjoyed the liberal treatment of the municipal administration; they have enjoyed so much that they want to tie the hands of the Corporation in such a manner that there may be no preferential treatment of the city consumers or of the city public lighting. The Railway Companies, too, want to be placed in a preferential position. The power in the matter of differential rates at present possessed by the Corporation is a little obscure; and this obscurity the Corporation by the Bill seek to remove. What they propose is fair and reasonable, and not only so but is customary—perhaps, almost generally, in rather a less reasonable degree. What the outside districts desire is that the Corporation should not have the power to differentiate as between city and outer districts, though there is no particular objection regarding differentiation as between purpose and purpose. From the evidence however, especially of Mr. Wilson, it was apparent that there was no desire to make any difference except under special circumstances. It was evident throughout the proceedings that the outer districts were opening their mouths as widely as possible, while there was the opportunity. As to the proposal to continue the practically unexercised right to transfer profits in aid of the rates, it is, of course, natural that the Corporation should desire to retain the discretion. Their action in the past, and the present price of gas, are commendations for complying with this desire, though, as a matter of principle, there is an objection to complete liberty, and a definition of allowable appropriation is, from our way of thinking, highly requisite in all cases.

Mallow Purchase.

It was not thought unlikely that, when the two Mallow Gas Bills got before the Select Committee presided over by Mr. Armitage, the one promoted by the Council for purchase powers would be allowed to go through without much opposition by the Gas Company, provided the latter could obtain what they considered to be satisfactory conditions regarding the determination of the price to be paid by arbitration. The anticipation was realized. The

Company is a small one, making probably only between 5 and 6 million cubic feet a year; and, as is usually the case in small towns having to deal with few and little affairs, what were considered to be sins of the Company in conducting their operations have been magnified into the most heinous offences. The Company could not help the geographical position of Mallow (which caused their working expenses to be considerable), nor could they help the smallness of the population, both of which conditions assist to rule the price that has to be charged for gas. On the Company now approaching Parliament to place themselves under statutory obligations, and to be invested with statutory powers, learned Counsel (Mr. Freeman, K.C.) seriously assert that their only object was to improve their position, and to increase the price which they would get from the local authority on purchase. Mr. Freeman knows as well as anyone that, when powers are conferred on a non-statutory company, it is an easy thing to obtain a sterilization clause, which will, within a defined period for purchase, prevent any accretion of value in consequence of the new powers. But in this case, it was sought in the opening to make the Committee believe that it was not the good of the concern and of the consumers generally that the Company were seeking through Parliament, but that the Company had the one and sole motive in view of enhancing the selling value of their concern. However, while the Company objected to expropriation, their resistance was not very strong; but they did raise most serious objection to the purchase price being committed to the decision of an arbitrator appointed by the Board of Trade, instead of on the usual lines provided by the Lands Clauses Act. Such an appointment by the Board of Trade is not uncommon—a case in point being the Amman Valley purchase. However, the Committee on this matter were in favour of the Company, but against them on certain conditions that they wished to attach. But the main objection being removed, the course was easy to the Purchase Bill proceeding, and the Company's Bill being withdrawn.

Workshop Water Purchase.

In 1902, the Workshop Urban District Council promoted a Bill for the purpose of obtaining authorization to the purchase of the local Water Company; but the Local Government Board interposed with a report which pointed out that the loans of the town outstanding were equal to the assessable value of £52,000. The Board did not consider this at all a satisfactory position, nor the circumstances appropriate, for the purchase of the concern; and therefore the application for powers was then refused. A change has since come over Workshop; and its financial position has been considerably strengthened, with the result that not only do the Board now support purchase, but the Local Legislation Committee last week passed the preamble of the Bill conferring purchase powers on the Council. The purchase is to be by arbitration. The Company sought to have it specifically stated that the transfer was a compulsory one; but this the Committee declined. They, however, recognized the fairness of a request that notice of purchase should be given within six months. The Company also applied for the costs incurred in promoting their Bill last session, but this was not allowed, though a little *solatium* was given by the granting of costs, within limits, of appearance in connection with the present Bill. Compensation to officers was also allowed in three cases, providing their services were dispensed with within three years "without proper cause," which vague phrase is to be elucidated in the Act.

Visit of German Gas Managers to England.

The "Journal für Gasbeleuchtung" of the 9th inst. contains an official announcement by the Council of the German Association of Gas and Water Engineers in regard to the projected visit of members of the Association to England next month. It is stated that the original invitation of the Institution of Gas Engineers to their German colleagues proposed that they should also participate in the proceedings of the meeting of the Institution on the 14th to the 17th of June; but as the meeting of the German Association had been fixed for the 20th to the 27th of June, and at a place so far distant from England as Königsberg, it was decided that the visit, if arranged for this year, must be made quite independently of the meetings of the two bodies. The Institution of Gas Engineers were enabled to say that the German managers would be heartily welcomed if the trip were fixed for the middle of May; and this has now been provisionally settled. It is intended that the German gas engineers shall make a circular tour of about eight days' duration of the gas-works of England and Scotland, at which the more technically important and interesting novelties are to be seen. The German Association has already circularized its members in regard to the visit (which is intended only for managers of gas-works), and has received so many applications from intending participants that only a limited number of further applications can, it is said, now be entertained. The number of those taking part in the visit has had to be restricted in view of the organization of the tour and the visits of inspection.

Mr. H. J. Rydon, a Director of the Harrow and Stanmore Gas Company, left £126,107.

The Middleton Town Council have increased the salary of the Gas Engineer (Mr. C. F. Broadhead) by £50 per annum; and the Warrington Town Council have raised that of the Assistant Gas Secretary (Mr. W. S. Howard) by £20 per annum.

SUGGESTIONS FOR THE HOME.

VISITING on the opening day (last Friday) the "Daily Mail" Ideal Home Exhibition at Olympia, one could not but be struck by the welcome absence from it of that air of unreadiness which is so often present during the early days of such displays. Everything was in "full swing;" and not much more than a glance was needed to carry conviction to the mind that the promoters have arranged what is destined to be a highly popular show. The original and main object of the exhibition is officially stated to be "to promote the study of, and stimulate interest in, the making of the ideal home." A laudable object, truly. And if there are ideals and ideals—well, Olympia should be able to satisfy all. From pianolas to a new form of caster, is a far cry; but both are on view here—and all the intermediate stages of house furnishing as well; while in the gallery there is a section dealing with that indispensable feature of all ideal homes—the baby. But of all the many attractions, some of which will appeal to one portion of the visitors, and some to another, there is one which, it is safe to say, will prove an attraction to all, and that is the Tudor Village, which occupies the whole of the annexe. This is a really delightful creation. Here are old-world shops and houses, and old-world people. A veritable glimpse of the long past! Though not able to speak from actual experience, one would say that the village is complete. Certainly such historic features as the stocks and the whipping-post and the most primitive forms of fire-extinguishing appliances have been included; and there is on the village green "the ducking-stool for nagging wives and witches—a XV.-XVI. century punishment." With what different feelings may this last-named device be regarded by perhaps a few of the male visitors, and by assuredly the great majority of the ladies who pause to look at it!

However, it was not with a view to describing the various articles of beauty or utility that have so far been referred to that a representative of the "JOURNAL" visited the exhibition a few hours after it had been declared open by Her Royal Highness Princess Christian, but to see to what extent gas—that necessity to the modern household—was in evidence. Gas is represented, though perhaps not to the extent that might well have been the case, in view of the vast amount of comfort and convenience that can be secured by its aid in the home. The efforts of the seeker after any special items are assisted by the division of the exhibits into sections, though the manner in which the walks between the stalls are arranged might possibly lead a visitor with no leaning towards any particular branch to miss some of them. All paths, however, are so clearly shown on the map procurable on entering the exhibition, that it is not a matter of difficulty to find the way to any desired section. To begin in the middle (which, though apparently the wrong way of managing a tour, is, in view of the prominence of the exhibit, what ninety-nine out of a hundred people will probably do), there is an excellently furnished Central House, in the kitchen of which one is pleased to meet an up-to-date Davis cooker—an object that excited the obvious admiration of several ladies who were near the writer when he saw it—and an equally useful Wilson circulator; while in the upstairs rooms the Gaslight and Coke Company have fitted one or two attractive gas-fires. Some neat little inverted brackets have also been installed by Cash and Co., of Caxton House, Westminster.

Coming to the Lighting and Heating Section, the first stand is that of Messrs. Charles Toope and Son, of Stepney Square, E., who show gas and other heating apparatus for greenhouses, &c. Messrs. Tilley Bros., of Kingsland Road (with which firm is associated the Tilley High-Pressure Gas Syndicate, Limited), exhibit their "Hot-Ray" gas-fires, fitted with "Tree" fuel, and also gas-compressing plants. One of these compressors is water driven, and is primarily intended for use by gas consumers who have no motive power on their premises. By its means, it is stated, gas can be delivered at any uniform pressure up to 40 inches. The other type is suitable for larger installations, to raise gas pressure to 60 inches or more. It can, of course, be driven by an electric motor, a gas or air engine, or from existing shafting; and it is claimed that the compressor is simple and automatic in working. It bye-passes low-pressure gas to all the burners immediately the plant is stopped—thus ensuring a light under all conditions. The stall is brilliantly lighted by different kinds of lamps consuming gas compressed by these plants. The Birmingham Guild, Limited, of Newman Street, W., are well known for their artistic gas and other fittings, as is also Mr. Thomas Potterton, of Balham, for his cooking and water-heating apparatus, using gas and coal fuel. Messrs. Masters and Andren, of Great Tower Street, E.C., have on view their "Duck" ovens and breakfast cookers, under which a gas-ring or oil-stove is intended to be placed.

A number of the specialities of Mr. William Edgar, of Hammer-smith (including the Blenheim gas-fire), are to be seen, as well as the "Bosco" self-igniting incandescent gas mantle of Messrs. G. Limmer and Co., of the Strand. The Planet Foundry Company, Limited, and the Elbard Stove Company, of Guide Bridge, exhibit cooking and heating apparatus, and patent toasters; one appliance being a combined toasting and boiling stove, hot plate, and hot cupboard, fitted with three burners, and suitable for hotels and other large establishments. Messrs. James Stott and Co., of Queen Victoria Street, exhibit in action their well-known governors for lights, fires, and cookers; and also the "Elf-in-Cave" gas radiator—a very small portable appliance, weighing only about 1½ lbs. Geysers of all kinds are seen on the stand of

Fenlon and Son, of Tudor Street, E.C.; and Telephos, Limited, of Farringdon Avenue, demonstrate the action of their device for lighting and extinguishing gas, which can be applied in connection with any upright or inverted burner. The exhibit of the Standard Range and Foundry Company, Limited, of Watford, includes some gas and other fittings. Messrs. Bratt, Colbran, and Co., and the Heaped Fire Company, Limited, of Mortimer Street, W., display a selection of their patent grates for use with either coal or gas. These "Heaped" fires are made by the firm in many handsome patterns. There are no front bars; the fuel being merely heaped against the fire-brick back, and the gas supply run in underneath the grate.

The Parkinson Stove Company, Limited (now incorporating Maughan's Patent Geyser Company), of Birmingham, are showing various types of water-heaters in action. Three geysers are at work over a bath—viz., the "New Teba," fitted with the patent safety gas-valve which automatically cuts off the supply of gas should the water fail through any cause, the "Simplice," a cheaper type with interlocking gas and water cocks, and the "Holywell." Over a basin is the new pattern "Pearl" geyser—an effective, inexpensive article for instantly producing hot water in comparatively small quantities of about 3 quarts per minute. There is also the "Gacylote" automatic cylinder, which is an independent self-contained hot-water apparatus for supplying hot water to any point in the house; the gas being automatically controlled by a thermostatic valve. Special attention is drawn to their new pattern "Holborn" circulator, which is a well-made article, for which extreme efficiency in working is claimed. There is here an entire absence of cross tubes or extra chambers; the apparatus having only a single chamber, all joints of which are thoroughly seamed and riveted, and do not depend upon solder. The "Hydrotherm," a new pattern circulator, is also being exhibited for the first time. This is capable of standing a heavy pressure, and will work equally satisfactorily whether fed from a tank with a 10 feet head, or under heavy town water pressure. It likewise is said to be remarkably efficient. The outer casing can be readily removed, without disconnecting the gas or water connections. There is a small selection of gas-fires and cookers displayed at the stand.

Petrol air-gas plants are once more considerably in evidence; the plants noticed being those of Petrolite, Limited, of High Holborn, the British and Colonial Lighting Company, Limited, of Tottenham Court Road, Messrs. Strode and Co., of St. Paul's Churchyard, Messrs. Spencers, Limited, of South Molton Street, W., the Litz Safety Gas Company, of Great Malvern, Messrs. Tredegar and Co., of Victoria Street, S.W., the Eos Petrol Gas Plant, of Cromwell Road, Kensington, and the Praed Patent Safety Gaslight Company, Limited, of Sutton. The Allen Company, of Victoria Street, S.W., exhibit acetylene plants; and the British Petroleum Company, Limited, of Fenchurch Street, spirit for use in connection with air-gas plants.

The other sections, though, as has already been remarked, of great interest to the general visitor, do not contain anything that calls specially for notice in the "JOURNAL" columns.

SOME LABOUR STATISTICS.

EVEN a few months later than its immediate predecessor—belated as that was—is the Thirteenth Abstract of Labour Statistics of the United Kingdom, which deals generally with a period not later than the end of 1908, and has only recently been issued by the Labour Department of the Board of Trade. Of course, in the case of some of the figures given, this is not their first appearance, as they have already been published in sectional volumes, which have duly been noticed at the time of issue; but this remark does not by any means dispose of the whole of the information contained in the present volume.

One item that may first be noted, because it deals with a later date than most of the statistics, is the standard rates of wages and weekly hours of labour recognized last October. Passing over the building trades, we come to the engineering and shipbuilding branch, which is divided up into sections of pattern makers, ironfounders, engineers, boiler makers and iron and steel shipbuilders, brass moulders and finishers, and shipwrights. With regard to engineers, in the London district the rate of pay per week for turners, fitters, and smiths is given as 40s., of pattern makers 44s. and 45s., of ironfounders 41s. to 43s. In the marine shops at Cardiff, turners, fitters, and smiths get 41s. per week; whereas at Ipswich the wages for a 50 and 54 hour week are put down at 28s. In the majority of cases, the figures appear to be between 35s. and 38s.; and it is remarked at the head of the table that the rates given are those recognized for a full week's work, exclusive of overtime, by the principal Trade Unions concerned, according to the latest information in the possession of the Department.

With reference to profit-sharing schemes, there were 49 known to be in operation in the United Kingdom at June 30, 1908. Of these, one was in the building trade, one in the metal trade, five in engineering and shipbuilding, four in the textile trade, two in the clothing trade, one in agriculture, six in the printing and allied trades, three in the chemical, glass, pottery, and similar trades, five in food and tobacco, seven in gas-works and tar distilling, and fourteen in other businesses. The total number of schemes was two less than in the previous year; but a column setting forth the businesses "in which profit-sharing having been instituted no longer exists," totals no less than 146 cases, while

there are three more as to which particulars could not be obtained. The reasons for the cessation of these schemes are various. Going right back to the year 1829 (when one scheme was started), the total of 146 cessations has been caused as follows: Death of employer 2; job finished, 2; enterprise abandoned, 4; liquidation or dissolution, 21; changes in, or transfer of, business, 17; losses or want of success, 21; diminution of profits, 7; apathy of employees, 11; dissatisfaction of employees, and grant of increased wages, 3; disputes with employees, 3; dissatisfaction of employers with results, 38; grant of shorter hours, 2; substitution of fixed rate of interest, 1; special circumstances, 6; causes not known, 8. The ratio of the bonus allotted to wages varied from 1 to over 25 per cent.; but taking 36 cases in 1907, the average bonus was 7·1 per cent. on the wages of the participants. The number of persons working under the 49 schemes which were known to exist at June 30, 1908, was 63,403, as compared with 45,010 twelve months before.

Among the accidents reported under the Factory and Workshops Acts in 1908, there appear under "Gas" the following statistics: Fatal accidents caused by machinery moved by mechanical power, 3; non-fatal, 146. Hot liquid, molten metal, &c., in vat or pan, fatal, none; non-fatal, 76. Explosion, fatal, 3; non-fatal, 40. Escapes of gas, steam, or metal, fatal, 1; non-fatal, 85. Other causes, fatal, 10; non-fatal, 2. This made a total of 17 fatal, and 349 non-fatal accidents.

At the end of 1907, there were 1173 Trade Unions, with a total membership of 2,406,746, as compared with 1287 in 1898, with a membership roll of 1,688,531. The 100 principal Unions in 1907 had a membership of 1,457,856, and an income of £2,493,282, or 34s. 2½d. per member. The expenditure was £2,054,157, or 28s. 2½d. per member; and the total funds at the end of the year amounted to £5,637,661, or 77s. 4d. per member. The National Union of Gas Workers and General Labourers of Great Britain and Ireland had a membership of 43,474 in 1898; and this figure rose to 48,030 in the following year. Then a decline set in, which reached its climax in 1905, when there were only 28,120 members. Latterly there has been a substantial improvement in this respect; the membership in 1906 being 33,680, and in 1907, 39,805. Whereas, however, the income of the Union in 1898 was only £16,702, in 1907 it was £22,686—with fewer members. The expenditure in the latter year was £20,349; and at the end of that year the funds in hand totalled £6794.

In 1907, there were 2177 workmen's co-operative societies which made returns; the membership being 2,439,603, or 5½ per cent. of the population of the United Kingdom, as compared with 5·3 per cent. the year previous. The share capital was £31,948,150, and the loan capital £10,148,826; while the amount of sales and transfers is given as £123,350,464. The number of certified workmen's compensation schemes in operation in 1908 was 32; the workmen employed being 67,508, and the number contracting out of the Acts 65,277. The contributions by workmen amounted to £14,843, and those of the employers to £32,730. The payments to members and expenses totalled £43,722; and the funds at the end of the twelve months were £65,285. Among fourteen schemes in 1908, the estimated maximum amount payable under the Workmen's Compensation Acts for incapacity was £5438, while the amount actually paid under this head was £6244.

The federation of the towns in the Potteries, which has been a matter of keen discussion in the Midlands for many years past, took effect at the end of last month. On the 31st ult., the county borough of Hanley, the boroughs of Stoke-upon-Trent, Burslem, and Longton, the urban district of Tunstall, and part of the urban district of Fenton, all became fused in one great municipal area, to be known in future as the County Borough of Stoke-on-Trent. The borough is one of the twenty largest towns in the United Kingdom. It has a population of about 250,000, a rateable value of more than £790,000, and an area of nearly 10,000 acres.

It sometimes happens that the bottom of a lead-lined cistern becomes "pitted" after a period of use. When this is noticed, the corrosion may be checked by several methods. One is to treat the surface with a mixture of resin and tallow, the resin therein being somewhat in excess of the tallow, which otherwise might have a tendency to decompose and pollute the water. Bitumen applied hot is also good; but gas tar must not be mixed with it. A third suggested remedy is a coating of limewash, made from caustic lime, applied when warm, and allowed to dry before filling the cistern with water. This treatment, however, requires yearly renewal, or it may be done as often as the cistern is cleaned out.

The "Indian Daily News" (Calcutta) of the 17th ult. contained the following paragraph from a correspondent, Jogendra Nath Sinha: "I take the opportunity of thanking Mr. J. C. Watson, the Manager of the Gas Company and Chairman of the Maniktila Municipality, for rendering personal assistance in extinguishing the fire which broke out on Monday last at Belighata, the report of which has been published in your issue. No sooner had the flames drawn his attention, than Mr. Watson motored down to the spot, leaving his work. He rushed through the fire several times with a view to save the lives and property of those poor men who have now become homeless. In fact, Mr. Watson gave much help to the poor with his own labour. As this self-sacrificing act should not go unnoticed, I hope you will kindly give publicity to this incident."

SOME THEORIES OF COMBUSTION IN GASES.

Extracts from an Address to the Manchester Junior Gas Association by Professor Harold B. Dixon, M.A., F.R.S.

When members of the Manchester District Junior Gas Association were at the Victoria University of Manchester on the 12th ult., Professor HAROLD B. DIXON, M.A., F.R.S., delivered an address on "Some Theories of Combustion in Gases."

Dealing first with the union of hydrogen and oxygen in flame, Professor Dixon gave the results of his experiments at high temperatures, and with the aid of slides on the screen made this part of his address particularly interesting. He first studied the union of the two gases named as part of the investigation on the mode of burning carbon monoxide. When steam, either present to start with or formed in the flame, was found to be necessary for the propagation of a flame in carbon monoxide oxygen mixtures, he ventured on his first hypothesis—he thought a moderate one. If there was some constitutional disability preventing oxygen from direct combination with carbon monoxide, might not the latter take oxygen from steam, and the hydrogen so liberated re-form steam by direct union with oxygen? Many hypotheses had been advanced to account for the disability preventing the oxygen burning the monoxide directly—one that the oxygen, *per se*, was too stable, or that gases only reacted in equal volumes. He had shown, however, that neither the stability of the oxygen nor the "law of equal molecules" could be the cause, for carbon monoxide would not explode with ozone, with chlorine monoxide, or with nitrous oxide. On the other hand, the dried gases united readily without inflaming in the presence of red-hot platinum, and in the burning of dried cyanogen the carbon monoxide first formed would burn in excess of oxygen—either prolonging the flame, as in explosions, or burning with a separate flame, as in Smithell's flame-separator. Steam, therefore, was necessary for the burning of carbon monoxide only under certain conditions. How did it act? Carbon monoxide was found to take oxygen from steam and liberate the hydrogen when the two were heated together in a variety of ways.

In explosion of mixtures of carbon monoxide, oxygen, and steam, in which the oxygen was insufficient for complete combustion, the steam was found to give up its oxygen to burn the excess of monoxide. Moreover, the propagation of the flame through the mixture was found to increase in velocity the more steam was added up to 46 per cent. of the mixture. It was therefore possible for the carbon monoxide to take oxygen from steam in a flame; and if the liberated hydrogen united directly with oxygen, water would be re-formed, and the whole operation be completed by the repetition of some simple cycle. The next point was: Did hydrogen unite directly with oxygen in a flame, or did it only do so through the decomposition of, or by the intervention of, water?

The Professor went on to say that, in his experiments on the union of hydrogen and oxygen at high temperatures, he found that an electric spark which would fire a damp mixture of the two gases would also fire a similar mixture, however carefully dried. Many different electrodes were tried, and they were submitted to every process he could devise to prevent the possibility of steam being formed in or on the surface of the electrodes. The spark always determined explosion. Dr. Brereton Baker, a careful and patient experimenter, had come to the same conclusion. But it might be objected that "some steam molecule may exist in the path of the spark and start the reaction; and once started, the water formed serves to spread the flame." They could not, of course, prove that no steam molecules existed in the dried gas—indeed, he should say it was very probable that there were some. But they had some evidence as to the progress of the reaction in the explosion of hydrogen and oxygen; and this evidence they could use to test the point whether the flame, once started, was propagated by direct union of hydrogen and oxygen molecules, or whether the union only took place through the intervention of a steam molecule. Both Moritz Traube and Professor Armstrong had put forward the view, on different grounds, that for the formation of steam there must be a simultaneous reaction between three molecules—



Now, the explosion-wave was a true physico-chemical constant. According to Berthelot, the "wave" was propagated from layer to layer by successive shocks between the molecules, resulting in chemical action, so that the explosion-wave differed from the sound-wave in that the former varied, not only with the physical, but with the chemical, nature of the gaseous mixture.

Berthelot said that the maximum velocity of the explosion-wave could be predicted by calculating the mean velocity of the gaseous products before they had lost by conduction or radiation any of the heat of the chemical change. His (Professor Dixon's) own work on the explosion-wave began in an attempt to confirm or disprove his hypothesis that steam was the "carrier" of oxygen in the explosion of carbon monoxide and oxygen. The results obtained led him to use the explosion-wave as a means of tracing the course of other changes in gases. For example, it was found most useful in showing that the carbon in gaseous compounds of carbon was not burnt directly to carbon dioxide in explosions, but, in every instance that could be traced, the carbon dioxide, appearing as an end-product, had been produced by a secondary and not a primary reaction in the wave-front. After numerous

experiments on the diluting effect of various gases on the propagation of the explosion-wave, he was led to advance a working hypothesis somewhat different from that of Berthelot. In his hypothesis, the gases were not burnt "cold," but the unburnt molecules were heated in the wave-front by "shock," and so were burnt "hot;" and, consequently, the product was raised to a higher temperature. A formula based on this hypothesis was successful in predicting the velocities of the explosion-wave in a number of different gases:—

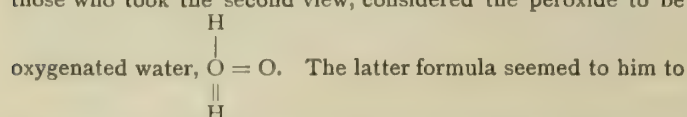
| Gas Mixture. | Velocity of Explosion Wave. | |
|------------------------|-----------------------------|--------|
| | Calculated. | Found. |
| $8H_2 + O_2$ | 3554 | 3535 |
| $H_2 + 3O_2$ | 1740 | 1712 |
| $2H + C_2$ | 1832 | 1849 |
| $C_2N_2 + O_2$ | 2725 | 2728 |
| $C_2N_2 + O_2 + 2N_2$ | 2166 | 2163 |
| $C_2H_4 + 2O_2 + 8N_2$ | 1727 | 1734 |

He (Professor Dixon) found it very hard to believe that these extremely close approximations could be mere coincidences. There were probably many cases where the reactions were not so simple as the above. He found that the explosion-wave in a mixture of equal volumes of ethane and oxygen did not give the same products as were obtained in the explosion of ethylene, or of acetylene, with its own volume of oxygen. The ethane was not burnt wholly to carbon monoxide and hydrogen, but appeared to form—as Professor Bone had shown at lower temperatures—acetaldehyde and steam; the acetaldehyde yielding methane and carbon monoxide. For other gaseous mixtures, especially those in which steam was formed at a very high temperature, the formula gave a higher value than the rate found. For instance, the found velocity of the explosion-wave in electrolytic gas was a long way below that given by the formula. He explained this by the further supposition that the dissociation of steam was appreciable in the explosion-wave of electrolytic gas. In support of this view, the Professor showed by experiments that about 1 per cent. of unburnt gas remained behind after the explosion-wave had gone by, and proved that this could not be attributed to the cooling effect of the walls. He added that he did not believe to-day in the truth of his working hypothesis of the explosion-wave. It embodied a number of assumptions, some of which he had himself shown to be erroneous. Still, he thought it sufficiently parallel to the truth to be useful. He made no higher claim for it.

Summing up this part of his address, Professor Dixon said he believed the reaction between hydrogen and oxygen in an explosion was a direct one, and did not take place through the intervention of steam; and for these three reasons: (1) That well-dried mixtures of electrolytic gas always explode with a spark; (2) that the velocity of explosion in a well-dried mixture is greater than when steam is added; and (3), that the explosion-wave is propagated as a pressure-wave through the gas. Whether steam or water facilitated the slow combustion of hydrogen and oxygen below the inflammation temperature was another question. The most careful experiments made to decide this question were those of Mr. Brereton Baker. In the year 1902, Mr. Baker demonstrated that when the greatest care had been taken to purify the gases, the moist gases exploded when the tube containing them was heated in a flame, while the dried gases did not. In some of the tubes which did not explode, a small quantity of steam had been formed and in one tube, which had been dried for two days only, water was visibly produced by slow combustion. In another experiment, Mr. Baker heated a fine silver coil in the dried gases, and succeeded in melting it without exploding the mixture. Although he (Professor Dixon) agreed with Mr. Baker that steam (or water) intervened in the initial action of hydrogen on oxygen at moderate temperatures, he did not think it necessary for the propagation of a flame once started in the mixture. There were many similar differences in gaseous reactions. Light would not explode dried hydrogen and chlorine—it did so in the presence of water; but once start a flame in mixed hydrogen and chlorine, and it was propagated as an explosion-wave through the dried gases. A platinum wire heated to whiteness would not fire a mixture of cyanogen and oxygen—flameless combination taking place round the wire. But a spark immediately set up the explosion-wave in the same mixture.

The latter portion of the address was directed to the question "What is the first product of the union of hydrogen and oxygen in flame?" Did hydrogen and oxygen directly form steam, or did they form hydrogen peroxide in a flame? If they accepted the view of Mendeléeff that all primary reactions between different substances were bimolecular—a view enforced by Sir J. Larmor for gaseous reactions—they must suppose that a collision between a hydrogen and an oxygen molecule could only result in the primary formation of hydrogen peroxide, or in the formation of steam and a free oxygen atom. The following reasons had, among others, been brought forward for the view that hydrogen peroxide was the first product in flame: (1) That hydrogen peroxide is found in the water rapidly condensed from a hydrogen flame; (2) that the mixture of equal volumes is more sensitive to a spark; (3) that the mixture in equal volumes has a lower ignition point than any other mixture. Moritz Traube first showed, he thought, that a jet of burning hydrogen playing on to the surface produced peroxide in the water. Some years ago, when he repeated Traube's experiment, he thought that the mere heating of the water would produce some peroxide; but he found afterwards this was incorrect. It required some burning to take place near the surface of the water. But the presence of the peroxide

in the condensed water might be explained either by its direct formation from hydrogen and oxygen, or by the union of the liberated oxygen atom with a molecule of water. Those who favoured the first view considered the peroxide to be $H-O-O-H$; those who took the second view, considered the peroxide to be



be supported by the remarkable researches of Carl Harries on the decomposition of ozonides by water, in which he showed that the loosely joined oxygen atoms attached themselves to water molecules to produce hydrogen peroxides quantitatively.

Engler's experiment of burning a hydrogen jet so as to bore a hole into ice, showed plenty of peroxide in the condensed water in the hole. He (Professor Dixon) had repeated this experiment, both with ice and with a lump of solid carbon dioxide. When a large jet of hydrogen was used, burnt with an outside blast of air, and a very small jet of nitrous oxide was introduced into the centre of the hydrogen flame, a piece of ice might be introduced so that it was surrounded by hydrogen, and a hole might be bored in it by the small central jet of nitrous oxide burning in hydrogen. The central jet might then be fed by oxygen, and the samples of condensed water compared. While the oxygen produced plenty of peroxide, only a trace was found in the water condensed from the nitrous oxide flame. This, of course, only showed that in the burning of hydrogen and nitrous oxide, steam was formed directly without the splitting off of an oxygen atom. In the explosion-wave, the greatest velocity of propagation was not given by electrolytic gas. The addition of hydrogen increased the velocity of the wave so long as it was set up in the mixture. This, of course, was due to the mobility of the hydrogen. But the fact that the addition of equal volumes of oxygen and nitrogen to electrolytic gas retarded the wave exactly in proportion to their density, was an argument that hydrogen peroxide was not the primary product of the change; for the two gases appeared to be equally inert to the mixture $2H_2 + O_2 = 1$. Let them consider the explosion wave traversing the mixture $H_2 + O_2$. If hydrogen peroxide were directly formed, the immensely high temperature of the flame and the very rapid cooling behind the flame should be precisely the conditions most favourable for a high yield of the endothermic peroxide. He had examined the product of combustion of the explosion-wave in such mixture, and could detect no peroxide. On the other hand, when the explosion-wave traversed electrolytic gas, about 1 per cent. of unburnt gas was left behind, showing how rapid was the cooling.

The experiments of Emich on the sensibility to explosion by small sparks of different mixtures of hydrogen and oxygen led him in 1897 to suggest that hydrogen peroxide was the first product of the reaction, on the ground that the mixture in equal volumes was most sensitive to the spark. In a later paper (1900) Emich withdrew this conclusion, although his work was still quoted as an argument in favour of the direct formation of peroxide. Whether or not a local heating of a small mass of gas by a spark would set up general inflammation must depend *inter alia* on the rate at which heat was conveyed away from the heated region; a gas richer in the rapidly moving hydrogen molecules would convey heat away more quickly than one poorer in hydrogen. Dr. Coward had recently found that the mixture in equal volumes was not the most sensitive to a spark. The addition of oxygen still further increased the sensibility. But a stronger argument had been drawn by K. G. Falk from his experiments on the ignition point of gaseous mixtures, heated by adiabatic compression. Acting on the very ingenious suggestion of Professor Nernst, he had compressed different mixtures of hydrogen and oxygen in a steel cylinder by means of a weight falling on a piston, and had determined the volume of the compressed gas by measuring the lowest point reached by the piston. Falk thought the mass of the gas was heated equally throughout until it reached the ignition point, and then that the whole detonated practically instantaneously, and the explosion stopped the descent of the piston. Assuming that the piston has no time to move downwards appreciably after the ignition point was reached, Falk calculated the temperatures of ignition of different mixtures:—

| Mixture. | Ignition Point. |
|------------------------|-----------------|
| $4H_2 + O_2$ | 603° |
| $2H_2 + O_2$ | 540° |
| $H_2 + O_2$ | 514° |
| $H_2 + 2O_2$ | 530° |
| $H_2 + 4O_2$ | 571° |

Falk said: "The fact that the maximum affinity is shown by the mixture $H_2 + O_2$ proves that H_2O_2 must be the first product of the reaction between hydrogen and oxygen." His reason for assuming that the gas detonated instantaneously throughout its whole mass, once the ignition temperature was reached, was the fact that the explosions were of great violence, and that the compression is very nearly the same in the case of electrolytic gas whether the weight fell from a lower or a higher altitude. What he found to be nearly true of the rapidly firing mixtures $2H_2 + O_2$ and $H_2 + O_2$, he had assumed to be also true of the less-rapidly firing mixtures with excess of oxygen, and the mixtures of hydrogen and air. When he (Professor Dixon) first read Falk's paper, it occurred to him that the descending piston must send in front its sound waves, which would be reflected from the bottom of the

cylinder and back to the piston front, and so on, producing by their collisions *loci* of higher temperature, at one of which the flame would eventually start.

Falk stated in his second paper that Professor Jouguet had made the same criticism. By photographing the explosion produced by the adiabatic compression on a rapidly-moving film, he (Professor Dixon) had been able to show that the flame did start from a point; and in the more slowly burning mixtures, the spread of the flame throughout the gas took an appreciable time. Moreover, the point of ignition could be made to vary by altering the velocity of the piston. With electrolytic gas, the photographs showed that the explosion-wave was very quickly set up; but the flame always started from the one point. The mass of the gas was not fired instantaneously, although the time required in this case for the flame to reach the piston was negligible. With such a mixture as $H_2 + 2O_2$, the time required to set up the explosion-wave was not negligible. To determine the temperature of ignition of mixtures of hydrogen and oxygen, it was necessary to stop the descent of the piston artificially the moment the gases were brought to the self-heating temperature. This was effected by leaving on the end of the piston a steel head, which was caught by a steel collar at a certain point in its descent. By varying the thickness of the collar, the piston could be stopped at any point. By a series of trials a compression was found which fired the mixture, and a slightly less compression which did not. The mean between the two was taken as the ignition point. By repeating each experiment, nearly concordant ignition points were obtained. His ignition point for electrolytic gas agreed closely with that found by Falk—an agreement which showed that this mixture must have a very short period of flameless combustion, and that the spread of the flame must be very rapid. He found that the mixture in equal volumes had a lower ignition point than electrolytic gas; but it was not the mixture of "maximum affinity." The further addition of oxygen lowered the ignition point. He submitted therefore that the ignition point of hydrogen and oxygen mixtures did not support the argument that hydrogen peroxide was the first product of the reaction.

Daylight Efficiency of Artificial Illuminants.

The "Electrician" recently published an abstract of an article by Mr. Herbert E. Ives, upon the "Daylight Efficiency of Artificial Illuminants." In this (to use our contemporary's summary of the contents of the article) the author describes two methods of obtaining "a measure of the approach in colour to daylight of any illuminant. Two expressions are obtained for stating the colour efficiency—one by consideration of the white light available by the use of absorbing screens; the second, by consideration of the amount of white light which, with a spectrum colour, would match the light in question. The first is termed white light efficiency; the second white sensation efficiency." The author himself in his opening paragraph points out that among students of illumination, it is generally agreed that the best light for human use is daylight. This being so, it is interesting to see from the following figures that, by the methods adopted in the investigation, Mr. Ives finds that the incandescent gas mantle is, among the ordinary illuminants, at the top of the tree in both white sensation efficiency and white light efficiency, taking average daylight as 100.

| | White Sensation. Per Cent. | White Sensation Efficiency. | White Light Efficiency |
|---|----------------------------|-----------------------------|------------------------|
| Glow lamp (4.85 watts per candle power) | 13.7 | 31.0 | 19.3 |
| Glow lamp (3.75 watts per candle power) | 14.5 | 33.4 | 21.2 |
| Glow lamp metallized (3.1 watts per candle power) | 15.3 | 35.8 | 24.6 |
| Tantalum lamp (2.6 watts per candle power) | 15.9 | 37.3 | 26.3 |
| Tungsten lamp (1.56 watts per candle power) | 18.0 | 48.5 | 33.2 |
| Acetylene | 20.7 | 51.7 | 42.0 |
| Welsbach mantle ($\frac{2}{3}$ per cent. cerium) | 24.5 | 66.5 | 50.5 |
| Mercury arc | 18.0 | 78.8 | 0 |
| Average daylight. | 33.3 | 100 | 100 |

It is pointed out that the white light efficiency furnishes information, in the consideration of artificial illuminants, in respect of the merits of a source for the purpose of illuminating coloured objects. Of course, the larger the amount of available white, the better suited is the light to colour discrimination. Thus the incandescent gas-light is the most suitable, *plus* a lower whip-lash efficiency, of which so much was heard at the February meeting of the Illuminating Engineering Society.

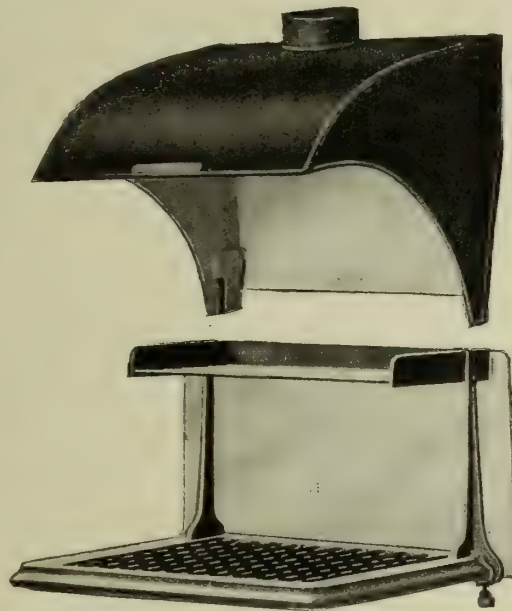
Butterworths' Workmen's Compensation Cases.—We have received from Messrs. Butterworth and Co. Part I. (1910) of their Quarterly Advance Sheets of cases under the Workmen's Compensation Act, edited by Mr. Douglas Knockner. It is the first section of a series of reports dealing with every case entered in the lists of the House of Lords and the Court of Appeal; and further parts will be issued as soon as possible after the Court has finished the hearing of each term's list. At the end of the year, the cases will be published in volume form, together with the Scotch and Irish decisions, as Vol. III. of "Butterworth's Workmen's Compensation Cases," edited by His Honour Judge Ruegg, K.C., and Mr. Knockner.

NOVELTY AND UTILITY IN COOKERS.

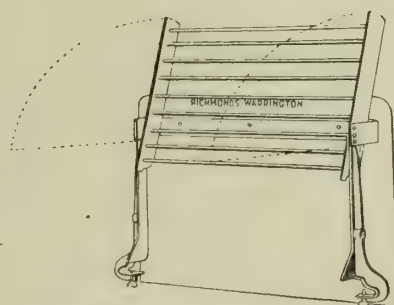
In these days there is an all too common tendency to cut to a low point the price paid for gas-cookers; but there is much that is fallacious from the economic point of view about too close an adherence to this policy. The desire to purchase what is called "cheap" has a peculiar way of growing on one when once encouraged; and, with the growth, one becomes gradually blind to the virtues of a higher grade and somewhat more costly class of goods. This applies to gas-cookers as to other manufactured articles. Looking at the matter from the financial point of view, capital saving does not form the sum-total of consideration; for no one will contest the point that a good cooker gives the best value in the matter of wear and tear, maintenance, and renewal costs. Where compensation for present outlay is obtained from future savings, there one has real economy. And there is the further consideration that a really good article, or rather (in this instance) a really good cooker, is bound to give the user greater satisfaction than one that, pleasing in appearance it may be, is inferior both in respect of constructional and serviceable details. The point is worth thinking over on the part of those whose aim has of late years been to obtain as many cookers as possible for a given expenditure, regardless of a high standard of merit.

These prefatory thoughts arise in considering some new and useful features that have been added to the attractions of the "Crusader" type of cooker of the Richmond Gas Stove and Meter Company, Limited. The Company, it is evident, have had in view, for

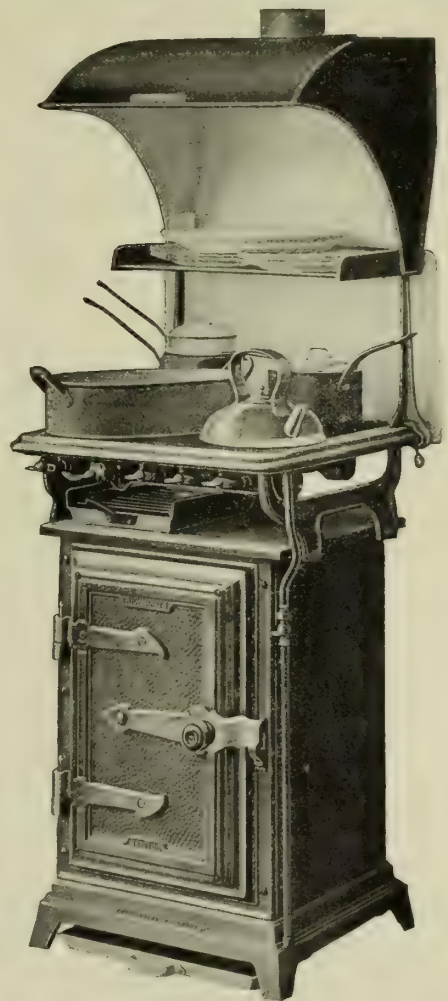
nowadays is to provide kitchens of extremely, and uncomfortable, limited area; and it somewhat frequently now occurs that there is not in such kitchens room for gas-cookers with the taps at the side. To meet the difficulty, there has had to be a special ordering of cookers with the tap-rail in front. This has meant, where stock patterns have not been suitable, some delay in securing what is required. It occurred to the Richmond Company that, if a cooker could be made that, without special ordering, could be readily adapted for any position, it would be a distinct advance in the matter of convenience, and helpful in the economizing of the time and expenses of the gas-distribution department. The idea was materialized in an ingenious and practical way. Simply by the removal of the union at the side connection, and the loosening of four screws which secure the hot-plate to the bridges, the whole of the top can be turned round by the gas-fitter himself, so as to convert the cooker from side tap to front tap. The change can be effected within five minutes. A desideratum is here satisfied. The hot-plate is made square; so that, with the taps either at the side or in front, the hot-plate has the same depth and width. The top burners when the taps are at the side run from right to left; when the taps are at the front, the burners run from back to front. But their arrangement is excellent in both these cases, so that there is no disadvantage whatever in the position of the burners. In one of the illustrations, the fitter is portrayed turning the hot-plate to meet the requirements of the situation; and in the largest of the illustrations, the cooker is seen with the tap-rail in



The Removable Hood.



Movable Plate-Rack, when out of use.



Cooker, Showing Plate-Rack and Hood Complete.

Turning the Hot-Plate to Bring the Tap-Rail to the Front Tap.

the cooker season now being entered upon, a dual object in effecting the improvements. In the first place, they have endeavoured, and the endeavour has been rewarded with success, to bring the cooker up to a high state of efficiency to meet the requirements of the suppliers of gas; and, in the second place, they have made a serious attempt, and again with success, to incorporate adjuncts contributing to the pleasure and the advantages of cooking by gas as compared with coal.

Considering first the features of the improved "Crusader" cooker from the gas suppliers' point of view. When this type of cooker was introduced now several years ago, it led the way in having no screws on the enamelled surface, either inside the oven or on the crown-plate; so that wherever grease fell there was no accommodation provided for its lodgment, and there were no screws to prevent a clean "rub-down" after using the oven. All the advantages then introduced have been retained in the cooker; and the chief improvement now effected, which will be pronounced as both a convenience and a saving to gas suppliers, has reference to the hot-plate. The vogue of the builder of houses

front. In addition, a new type of door has been provided for this class of cooker. In design, as the illustration shows, it is both massive and artistic. When one considers these improvements and the prior ones, it must be conceded that it is difficult to put the finger upon any point where further advances can be made so as to produce any additional reduction of fixing and maintenance costs.

Such improvements are advantageous not only to the gas supplier, but to the user of the cooker. In addition, the Richmond Company are this season introducing a combination plate-rack, removable back, and hood, which combination can be fixed to the cookers of any maker complete, or the plate-rack alone without the hood. Cheap though the combination is (we do not generally mention prices in these notices, but the cost is so reasonable that an exception is made by saying that it runs, according to size, from £1 net), it adds so considerably to the appearance of the cooker—making it much more imposing—that one feels inclined to put upon it a much greater value than is represented by the extra cost; and from the points of view of utility, cleanliness, and

appearance, it is bound to commend itself to the housewife. Plate-racks and hoods to cookers are not new. This particular combination (for which a patent has been applied for) is new in respect of its means for fixing, universal applicability to old and new stoves, and the design that gives it universality, movability, and portability. But to a few details. The plate-rack has two side supports, the bases of which are made to clip on to the cornices of the crown-plate of the cooker, and with a thumb-screw underneath are held rigidly in position. The rack (which is made of wrought steel) is a movable one; and when in position is held firmly by two projections on the side bars of the frame engaging with the back bar. When not in use, or, when from any cause, the rack (in the down position) would be in the way, it can be lifted and swung back so as not to be an inconvenience. The usefulness of the rack for plate warming, or for the accommodation of dishes when "dishing-up"—in fact, for several purposes while cooking is in progress—is apparent. The second feature in the combination is a loose enamelled back for the protection of the wall, and to prevent splashings from cooking on the hot-plate. A couple of studs on the back bar of the rack, and corresponding keyholes in the plate, enable the latter to be hung in position, and readily removed for cleaning.

The rack and back plate can be had separate from the hood; but the hood gives an air of completeness to the arrangement and is an extremely useful addition, particularly in the modern kitchens of limited cubical capacity. One difficulty in providing a fixed hood hitherto has been that the sides have been brought down to the cooker top; and this has been somewhat of an impediment. With this removable hood forming part of the combination, the difficulty has been overcome by making the hood to fix on to the plate-rack, and this gives complete freedom at the sides. Grooves are provided in the plate-rack into which the supports for the hood slide; and thus the hood is held rigidly in position. Provision is made for ventilation at the top of the hood. The whole combination and arrangement generally are as ingenious as they are attractive. We are of opinion that there is a good business to be done in this combination.

The Richmond Company have also added to the conveniences of their grillers. Grillers, though an extensive trade is done in them, have had little consideration paid them in the matter of location. They have found accommodation where they could; and in this respect they have generally been at the mercy of the whims and fancies of fitters and housewives. Their convenience claims for them more considerate treatment. The firm are now making substantial iron stands, with a barred under shelf between the four legs, and an enamelled top, which gives it a clean and good appearance. In addition, the new plate-rack and enamelled protecting back are now made for fitting to the grillers. The rack is convenient as a rest in using a griller, and a couple of plates can be warmed nicely on it.

The firm have in times past been successful in introducing structural and efficiency improvements in gas cookers and fires in many ways; and among them those noticed in this article, it will be conceded, are of considerable value in their recommending characteristics.

SCOTTISH JUNIOR GAS ASSOCIATION.

Visit to Falkirk Corporation Gas-Works.

A joint visit to the Falkirk Corporation Gas-Works was made by the Eastern and Western Divisions of the Scottish Junior Gas Association on Saturday afternoon; nearly forty members of the latter and about twenty of the former being present. The visitors were received by Provost Christie, Bailie Bogle (Convener of the Gas Committee), and Mr. W. Wilson (Engineer and Manager).

Attention was centred in the working of the charging and discharging machines of Messrs. R. Dempster and Sons, Limited, of Elland, which were shown in operation, and were explained by Mr. Wilson. A retort was charged in the short space of 30 seconds; and the discharge occupied about the same time. It was noted that the coke was of a beautifully clear appearance, and very even in size. Originally it was taken from the retort-bench by a hot-coke conveyor; but this plant has been superseded by a method of Mr. Wilson's designing. On the front of the bench, in the lower floor, hangs a pocket into which the coke falls when drawn. It is there quenched, and when cold the bottom of the pocket—a movable saucer worked by a lever—is withdrawn, and the coke falls into a truck. This is run out upon rails into the yard, and is elevated by an electrically worked hoist to a high-level platform, from which the contents are either tipped into the bin or into the screening plant. No other change has been made in the works since they were described in the "JOURNAL," at the opening in 1904; but their equipment has been completed by the erection of a very handsome suite of offices, which contain, on the ground floor, apartments for the Manager and his Assistant, a spacious public office, a photometer-room, a drawing office, and a gas-stove room. On the flat above are the residences of the foreman and the timekeeper. In another block recently erected near the gate are a weigh-house, an engineering shop, a meter and stove repairing shop, and stores.

Having completed the inspection of the works, the visitors were entertained at tea in the exhaustor and station-meter house—Provost CHRISTIE presiding.]

At the conclusion of the repast,

Bailie BOGLE, in the name of the Corporation, extended a very hearty welcome to the Association. They were aware, he said, that Mr. Rule, the President of the Eastern District, was lately in their service; and he was sure the Corporation were pleased to know that he had obtained a very good appointment. They wished him success in his new situation, and trusted he would ultimately get a position more worthy of his merits. The Corporation were quite willing to show their gas-works to any public body, as they believed they would see one of the most up-to-date works, not only in Scotland but in the United Kingdom. The Corporation had spared no expense in their erection. They put in the newest machinery, and, with one exception, it had worked very successfully during the whole six years the works had been open. He had the honour of presiding at the opening meeting, and he remembered saying that the time would come—possibly in the near future—when they would be able to supply gas almost for nothing. Even now, after the lapse of six years, he did not go back upon that statement. He was perfectly certain that if they adopted the methods they ought to adopt for dealing with residuals, and other matters which they had looked at without having taken advantage of—for instance, in dispensing with the use of lime for purification—they would effect so large a saving that they would be able to supply gas, not exactly for nothing, but very nearly so. He found that in the old gas-works labour, from coal-waggon to coke heap, including 9d. for carting, cost them 3s. 3d. per ton of coal. In the new works it cost them only 1s. 1d. per ton. The undertaking was saddled with a very heavy capital, amounting to £205,500, which was a tremendous handicap to them. Considering the distance they were from the coalfield, it was wonderful that they had been able to do what they had done. They were selling gas at 3s. per 1000 cubic feet; but there was a time when it was 4s. 9d. During the past three or four years, the town had not been progressing as it used to do, and the output of gas had gone back. It was about 200 million cubic feet last year; but if they had progressed as they were doing some years ago, it should have been 300 millions. Their works were capable of almost doubling the present output without any further plant being put down. The ground upon which they were built was an ancient morass; and shortly after their erection the retort-bench unfortunately sank for a considerable time. In doing this the bench was cracked in places; and their coke-conveyor did not work as it should have done. Ultimately, after a great deal of trouble, and a loss, he was sure, of £4000 or £5000, and an immense amount of extra labour, they dispensed with the conveyor, and reverted to the old-fashioned method of removing the coke by hand, combined with the electric hoist the visitors had seen. They now did the work considerably cheaper than with the conveyor. There was nothing wrong with the machine; the trouble arose from the sinking of the bench. This was the only important episode they had had since the works were started. He was certain they would now be carried on successfully.

Mr. D. CURRIE (Stirling), the President of the Western District, conveyed the thanks of the Association to the Corporation for their kindness in allowing the members to visit the works. Those of the Western District wished also to offer their congratulations to Mr. Rule upon his success, and express their hope that his appointment was only a stepping-stone to something better. The Corporation of Falkirk were to be congratulated on having such excellent gas-works, and so able an Engineer and Manager in charge of them.

Mr. H. RULE (Kelty) expressed the thanks of the Eastern District to the Corporation for allowing the visit, and also his own for the all too kind things which had been said of him during the afternoon.

Mr. T. WILSON (Coatbridge) pointed out that if they were in the same position in Falkirk as they were in Coatbridge, they would be selling gas for nearly nothing. The charge for interest alone in Falkirk was about 1s. per 1000 cubic feet more than in Coatbridge. But then there was a saving of 1s. 4d. per ton in the handling of coal there, as compared with Coatbridge; and this, on 22,000 tons a year, meant something considerable. He had instructions from his Board to recommend them some coke-handling plant. He had been all over England, and had not seen any to equal that which he had seen that day; and he was prepared to recommend the adoption of something like it. He proposed a vote of thanks to Provost Christie and Bailie Bogle for their kindness in receiving the visitors.

Provost CHRISTIE expressed the very great pleasure the Corporation had in knowing that the Association thought it worth their while to visit Falkirk. They were thoroughly satisfied with their works and their Manager.

Mr. CURRIE proposed a vote of thanks to the Engineer and Manager for the very kindly manner in which he had shown the members over the works.

Mr. WILSON, in acknowledging the vote, said that as one of the Past-Presidents of the Western District he had a very personal pleasure in welcoming the members. He was possibly the youngest gas engineer occupying a senior position in the gas world at the present time; and he thought this fact was largely attributable to the interest he took in the Junior Gas Association, which was the schooling ground for coming gas engineers. He thought this was borne out by the fact that almost all the gentlemen who had been Presidents of the Western District were now occupying senior positions.

The gathering then dispersed.

INFORMAL MEETING OF SCOTTISH GAS MANAGERS.

Annual Meeting in Glasgow.

The Twenty-Seventh Annual "Informal Meeting" of Scottish Gas Managers was held in the Windsor Hotel, St. Vincent Street, Glasgow, last Wednesday. In the notice convening the meeting, Mr. W. B. McLusky, of Perth, intimated that the meeting would be open to all gas managers, assistants, or members of junior gas associations; and that gas managers might introduce visitors to the meeting, on application to the Convener—visitors to include persons engaged in the administration of gas undertakings, and principals or managers of engineering or other concerns connected with the gas industry. These conditions are in conformity with the rules and regulations of the North British Association of Gas Managers, which were adopted at Stirling last July. Owing to the failure to take the chair of Mr. J. Ballantyne, of Hamilton, who was nominated at last year's meeting, Mr. D. Vass, of Airdrie, again presided. When the chair was taken, shortly after 2 o'clock, there was a very good attendance; the gathering being almost entirely composed of gas managers.

The Convener said he was sure it was a disappointment to them that Mr. Ballantyne did not see his way to take the chair. In the circumstances, he had no alternative but to ask Mr. Vass to continue in office; and he hoped they would approve of this course. It would have been unreasonable to have asked Mr. Vass to deliver an address, after the one which he gave last year; but he very kindly agreed to take part in the proceedings. They would see, from the programme, that Mr. Wilson, of Glasgow, Mr. Herring, of Edinburgh, and Mr. Yuill, of Dundee, had come forward, at very short notice, to help to interest the members in some of the more important matters engaging the attention of gas managers.

THE WILLIAM YOUNG MEMORIAL.

The President said they had intimations from Mr. Wilson and Mr. Herring that they had been both called away in connection with the Glasgow Corporation Gas Bill, and this had, to some extent, depleted their audience. But they had very able substitutes in Councillor W. B. Smith, who would take up the subject Mr. Wilson was to have dealt with, and in Mr. A. Masterton, who was to fill Mr. Herring's place. Councillor Smith was Convener of the Glasgow Committee on Purer Air. They had all, as members of the North British Association, been approached recently in connection with a matter which was of great interest to the North British Association, and to all of them as individuals—the William Young Memorial. Circulars had been issued calling on the members to subscribe to the memorial. Most of them knew of the steps which had been taken with a view to doing something, in the shape of the publication of Mr. Young's works, as a memorial which would stand for all time. But they were aware that the financial question was the stumbling-block in this movement. They had now something before them which, he ventured to think, would exceed even the other proposal in usefulness. This was that every two years there should be a lecture by one well qualified to deal with his subject, before the meeting of the North British Association. It was in order to get up a fund sufficient to warrant them in carrying out this arrangement that an appeal was being made. He was sure they in the Informal Meeting, having so recently celebrated one prominent member of the profession, all so heartily in sympathy with the movement which had been brought forward on this occasion.

Mr. J. W. NAPIER (Alloa) remarked that, as most of them were aware, the Committee entrusted with the duty of raising a sufficient fund for this memorial had gone a certain length with their labours, and were at such a stage as would determine the ultimate success of the proposal. The memorial was one which must appeal to all gas managers. They had heard of the honour just conferred in England upon the memory of Sir George Livesey. They knew what gas companies and corporations and gas managers in England had been able to do to perpetuate the memory of that great man. Now, while in England they were able to speak of their hero, in Sir George Livesey, he thought that they, as Scotsmen, ought to make the utmost endeavour possible to perpetuate the memory of their hero—William Young. The memorial, as they were all aware, was fortunately to be neither of brass nor of marble, but was to be something of more living and real interest, and one which ought to appeal to all technical men. One of the objects in the conception of the Lectureship was that of creating a better status, as it were, for the North British Association—that they might look upon the proceedings of the Association as more valuable in the future than they had been. No doubt in the past the proceedings had been, in every respect, exceedingly valuable; but they hoped that the Lectureship would provide matter in their "Transactions" which would reflect the very best, in any capacity, existing among the prominent men in the profession. He would therefore appeal to every gas manager to do his utmost to forward the interest of the fund. It was at one time hoped it might be brought into practical shape at their meeting next July; and while this was some-

what improbable at the present moment, still he did not see why it should be impracticable.

The President said the remarks of Mr. Napier would be open for discussion. He purposed to take up each of the papers in turn; and then they would go into a discussion upon the whole of them together.

SMOKELESS FUEL.

Mr. W. B. SMITH (a Town Councillor of Glasgow) read a paper on this subject.

He said: I much regret that Mr. Wilson could not attend this meeting; but I am glad to take his place, and to have this opportunity of opening a discussion on the subject that Mr. Wilson had chosen, if you will permit me, as one not versed in the technicalities of your work, to put before you some ideas that have come to me as a member of the Glasgow Gas Committee.

In the whole history of the gas-making industry, there never was a time when its prospects of usefulness to the community were so great as they are to-day. Gas, originally intended for lighting only, has become a necessity for cooking and heating in the house, and for many manufacturing processes in the workshop; and now that public feeling is so strongly roused to the necessity for a purer atmosphere as essential to the better health and longer life of the community, the scope of gas using is greatly enlarged. The pressing need for smokeless fuel demands that your energies be specially directed to two objects, which fortunately are not antagonistic to each other. In the first place, we shall want much larger quantities of gas at greatly reduced prices; and, secondly, we require, for many purposes, a better bye-product than the present form of coke—something that can be burned in ordinary grates. The increased price the public would be willing to pay for better coke should materially contribute to a reduced price for gas.

To enable the general public to realize the possibilities of gas, I hold that it is the duty of all gas undertakings, whether municipal or private, to help to popularize the use of gas by keeping themselves up-to-date, and by educating their consumers in the most modern ways of using gas. This conclusion has been forced on me by my experience in a West of Scotland town where I have been spending the winter. I find that there are very few gas-cookers in use there; and in no shop in the town did I see any display of them. Many of the houses built lately have no gas supply whatever; the lighting being electric. When I learnt on inquiry that they are still supplying gas of 24-candle power, costing 3s. 4d. per 1000 cubic feet, I did not wonder at it. It seems to me that they are afraid of offending the consumers, who, because they know no better, still use the old flat-flame burner. As you know, 24-candle power is far too high for incandescent burners. I examined the nozzles of two inverted incandescent burners that had been in use for only a few months; and I found them thickly coated with carbon, which had even deposited round the top edge of the mantles, and partly destroyed them. This occurred on burners where the gas was not turned on full, but was always carefully adjusted. Under such conditions, can one wonder at gas being supplanted by electricity?

Any gas undertaking that does not come into line with modern requirements by lowering the candle power to a point more suitable for use in cooking and heating appliances and incandescent lighting, is not fulfilling its duties to the public. Parliament recognizes the changed conditions; for the Model Clause for Gas Acts says 14-candle power, and something near that quality will best meet the demand for a smokeless fuel, and still be best for lighting. I have heard people who use incandescent gas lighting complain about "bad gas" or "poor gas;" and I have always found the trouble to arise from too good gas—gas so rich that it took more air to burn it than could practically be mixed with it, and so gave a flame that deposited soot on the mantle.

That gas is an ideal fuel in many respects has been very fully demonstrated by the results of the most exhaustive series of experiments made by our Corporation Chemical Department, and reported on to the Corporation by Mr. F. W. Harris, Chief Chemist, Mr. Peter Fyfe, Chief Sanitary Inspector, and Mr. Alex. Wilson, Gas Manager.* No doubt you have all read this report. The Corporation were so satisfied with it, and so recognized its importance, that we gave instructions to have it re-cast in popular and non-technical language, that the public may easily understand it. It proves conclusively that a gas-fire, of proper construction, properly fitted in, is quite as healthy as a coal-fire; that a gas-fire does not "dry the air" of a room quite so much as a coal-fire; that the temperature of the room can be kept at the same point, without fluctuation, for any length of time, making it almost invaluable in cases of sickness; that no fumes are given off into the air of the room; that the ventilation of the room is quite ample, and not so liable to cause draughts as with a coal-fire; that for cooking, and for heating rooms for a few hours at a time, gas is cheaper than coal, while for prolonged heating it is only about 25 per cent. dearer, without allowing anything for saving of labour; and that the products carried up the chimney and thrown into the air are not only smokeless, but innocuous.

* See "JOURNAL," Vol. CIX., p. 39.

Unfortunately, there are gas-fires on the market that are not properly constructed; and they do not give all these good results. It is clearly our duty to condemn them, as they bring discredit on gas heating. That a user may be informed of the state of matters in his own house, I got a motion carried to instruct the Gas Committee to report on the advisability of appointing a staff to inspect gas fires and cookers in consumers' houses, when desired, and to certify if they fulfil the conditions necessary to health and efficiency. This has not come up for discussion yet; but I think the scheme is feasible. The Water Department test all fittings; and the Electricity Department will not connect to an installation until they have tested the insulation. The Gas Department might be authorized to make certain tests, not perhaps compulsorily, but where desired.

Many people to-day judge gas-fires by their experience of something tried—perhaps many years ago—that was unsatisfactory; and they condemn the whole system of heating by gas, when the fault was really with the particular appliance they used. But we must not continue to suffer for the faults of ignorant makers or fitters; and some scheme of inspection seems to me a way to counteract wrong impressions, and inspire confidence.

While advocating gas and coke as smokeless fuels, let me impress on you that your methods of production must be smokeless. Many gas-works are themselves smoke producers; and this must be stopped. Acts of Parliament for the prevention of smoke included gas-works among those liable for prosecution; and it will not do for us, as a health authority, to fine ourselves as a gas department for emitting smoke. As smoke is not only a danger to the health of the community, but a loss of money to the producer, you must find some way to stop it.

VALUATION AND INCOME-TAX.

This subject was introduced by Mr. A. YUILL (Dundee). He said: As to valuation and the mode of computing the same, it is better understood than formerly, though it will require a considerable amount of reasoning to convince one that it is computed on the basis of equity, when either the amount of capital or profits is considered, in comparison with other industrial concerns. The subject of income-tax assessment is of more importance to us at the present time; and I purpose confining myself principally to the consideration of this.

The latter part of last year, most of the members of the gas profession felt some degree of surprise on receiving a circular from the Income-Tax Commissioners, intimating a new form of computation to the following effect:—

DEPRECIATION OF GAS AND WATER UNDERTAKINGS.

1.—This scheme has received the approval of the Board and the assent of the various Institutions which represent the corporations and the companies concerned.

2.—No depreciation should be allowed in any circumstances in respect of any portion of these undertakings.

3.—All expenditure on repairs and renewals, but excluding extensions and improvements, is to be charged and allowed as working expenses, as and when incurred.

4.—Provided that, whenever any exceptional expenditure on *bonâ-fide* renewals is incurred, and full effect cannot be given to its deduction in that year, owing to the profits or gains chargeable with income-tax in that year being less than the amount so expended, the balance of the expenditure which has not been allowed may be carried forward and allowed the following year or years, as is provided in the case of unallowed wear and tear by section 26 (3) of the Finance Act, 1907.

5.—These proposals are to take effect for the year 1909-1910, and for years preceding in cases where claims of depreciation are at the present time awaiting settlement.

6.—Where in any case allowances for depreciation have been made which are now to be discontinued, and they have not been exhausted by renewals already effected, the amount of such unexhausted allowances should be determined by agreement between the Surveyor and the corporation or company, and deducted from the expenditure on future renewals as and when they are effected.

The first item, by way of introduction, mentions that it has received the approval of the Board, and the assent of the various Institutions which represent the corporations and the companies concerned. On making investigations on this point, I find that this, along with other matters, was considered some time ago by a self-elected body, terming themselves the "Municipal Accountants' Association," who no doubt may have read about the historical "Three Tailors of Tooley Street," and were influenced accordingly. I am somewhat surprised that the gas profession has not taken up this matter in a more serious spirit before now, and brought it to a satisfactory conclusion, the same as the Municipal Tramways Association have done. This would have saved to a great extent the trouble of tackling the subject with the local assessors individually.

With reference to the second item, we are confronted with the kernel of the situation. I have no desire to go into the question of procedure—why the assessable values are computed under Schedule D, instead of Schedule A. This was fully gone into and explained by Mr. W. A. Schultz, of No. 50, Cannon Street, London, acting under instructions of the Parliamentary Committee of the Gas Institution, who clearly pointed out that, under Schedule D—

The allowance of depreciation is made obligatory in the Customs and Inland Revenue Act, 1878 (39 & 40 Vic., cap. 16), Part 2, Taxes, Section 12, which provides:

Notwithstanding any provision to the contrary in any Act relating to

income-tax, (a) the Commissioners for general or special purposes shall, in assessing the profits or gain of any trade, manufacture, adventure, or concern in the nature of trade, chargeable under Schedule D, (b) or the profits of any concern chargeable by reference to the rules of that schedule, (c) allow such deductions as they may think just and reasonable as representing the diminished value, by reason of wear and tear during the year, of any machinery or plant used for the purpose of the concern, and belonging to the person or company by whom the concern is carried on, &c.

The Finance Act of 1907 (7 Ed. VII., cap. 13), section 26, provides—

For the purpose of enabling deductions for wear and tear to be allowed by the additional Commissioners, claims in respect of those deductions shall be included in the annual statement required to be delivered under the Income-Tax Acts of the profits or gains of the concern for the purpose of which the machinery or plant is used, and the additional Commissioners, in assessing those profits and gains, shall make such allowances in respect of those claims as they think just and reasonable.

The two Acts above noted are those which govern the depreciation to be allowed, and which may be considered correlative to each other; and they clearly set forth that allowance must be made for diminished value during the year by reason of wear and tear.

We have another pronouncement on this point from the Chancellor of the Exchequer in May, 1907, in reply to a communication from the Association of the Chambers of Commerce of the United Kingdom, which is as under—

The Chancellor of the Exchequer has had under his consideration the memorial of the Association of Chambers of Commerce of the United Kingdom, which you sent him at the beginning of April. The chief points in the memorial are as follows:

1.—That the allowance in respect of repairs and depreciation of machinery is insufficient, and the methods of calculating such depreciation are unsatisfactory.

2.—That no allowance is made for the cost of replacing machinery which has become obsolete.

As to the first point, I am to say that, as the law now stands, deductions are allowed both in respect of expenditure incurred in repairs or alterations of machinery, according to an average of the three years preceding the year of assessment, and also in respect of the diminished value of machinery by reason of wear and tear during the year. The allowance of these deductions is in the hands of the District or Special Commissioners, as the case may be; and they have to decide in each case, as it arises, the adequacy of the deductions allowed, &c.

From the above, it will be noted that both expenditure on repairs and depreciation for wear and tear are allowed.

In considering the behest of the Commissioners that no depreciation will be allowed in any circumstance, one is confronted with the question, Wherein do gas and water undertakings differ from any other concern, as both gas and water works are owned by companies, and are carried on as a source of profit on the same lines as a mill or any other industrial undertaking? Suppose we take the case of tramway undertakings. I find that, in a case before me, they are allowed depreciation on the permanent way equal to 41·75 per cent. on the adjusted assessable value, 7 per cent. on the written-down value of cars and other rolling stock, and 5 per cent. on machinery, plant, workshop tools, and miscellaneous equipment. The net total deduction for depreciation for wear and tear equals 58·49 per cent., and the net assessable value 41·51 per cent. of the adjusted assessable value before deduction of depreciation. Compare this with the orders of the Income-Tax Commissioners, that they will not allow any depreciation in any circumstances for gas and water undertakings. I am at a loss to determine why these two departments are singled out and dealt with in such an arbitrary manner.

With reference to item 3, this states: "All expenditure on repairs and renewals, but excluding extensions and improvements, is to be charged and allowed as working expenses, as and when incurred." I am sure several of the members will be conscious of the fact that occasions may arise where machinery or plant in gas-works may be discarded through obsolescence. In accordance with this clause, that is not allowed.

Suppose we take a case to illustrate our meaning. A gas-works may have occasion to discard the method they have in use in the manipulation of their retorts, which necessitates the installing of new machinery, differing in every detail from that formerly in use. New capital has to be raised to meet the improvements, which, together with the sinking fund on same, will add to the net assessable value. But as this is in the nature of an improvement, no allowance will be made for depreciation or obsolescence of the old plant. This, in my opinion, is not in accordance with the Finance Acts, nor in accordance with the opinion expressed by the Chancellor of the Exchequer, as previously noted. A great many cases could be given of a similar nature in connection with gas-works, all proving the arbitrary nature of the clause.

Clause 4 of the circular is inoperative to some extent, so far as it affects gas companies or corporations. As I do not remember a case where exceptional expenditure on *bonâ-fide* renewals is incurred in any year in excess of the income, the balance of such loss may be carried to the debit of next year.

With reference to clause 6, when this is taken in conjunction with clauses 2 and 3 it has a certain amount of mystification about it—more especially when you consider clause 2, which states that no depreciation will be allowed, and clause 3, which enacts that such expense will only be allowed as working expense.

As this question is of importance to all gas companies and

Corporations throughout the United Kingdom, I am of opinion that the Council of the Gas Institution ought to take up the matter with the Income-Tax Commissioners at Somerset House. The question is too momentous to be dealt with individually.

VERTICAL RETORT CARBONIZATION.

Mr. A. MASTERTON (Assistant-Manager at Edinburgh) read the paper on this subject prepared by Mr. W. R. HERRING, and given on pp. 109-11 of this issue of the "JOURNAL."

Mr. MASTERTON, at the close of the paper, said that in the current issue of the "JOURNAL OF GAS LIGHTING" there was a full description, with diagrams, of the setting which had been erected at Granton. They had not been able yet to charge the retorts, but expected to do so in a few days; and he had no doubt that the technical results would, in a short time, turn out very interesting indeed.

SURPLUS GAS REVENUE FOR THE RELIEF OF RATES, &c.

The PRESIDENT's contribution consisted of a paper on the "Appropriation of Surplus Revenue of Gas Undertakings to the Relief of Rates and Other Purposes."

Many of the municipal gas undertakings in Scotland have been acquired by the local authority under the Burghs Gas Supply (Scotland) Act, 1876. Under section 41, the Act clearly sets forth the manner in which the revenue can be applied—*i.e.* (1) To meet the expenses incident to the manufacture and distribution, (2) for interest on borrowed money, (3) to provide a sinking fund, and (4) to provide a depreciation or renewal fund sufficient to maintain the works in perpetuity. Any balance, after meeting these charges, shall be carried to the debit or credit of the succeeding year.

Corporations who are in a position to carry out the terms of the Act as it stands are enabled to reduce the price of gas to the lowest possible figure; and when, from increase of sales or from any other cause, an excess of revenue is obtained in any year, the gas consumers will benefit to that extent in the following year. But should the corporation working under the Burghs Gas Supply (Scotland) Act be also owners of the electric light undertaking, the gas undertaking will be liable for any deficiency in revenue of the electricity department by the standard clause, which says: "Any deficiency of income in any year not answered out of the reserve fund shall be charged upon, and payable out of, the local rate;" and by the Electric Lighting (Scotland) Act, 1890, the local rate in this case is "the gas-rate leviable and gas-rents and other revenues receivable under the General or Local Act." Admitting that under the same standard clause the net surplus from the electric lighting undertaking in any one year could be carried to the credit of the local rate—*i.e.*, to the gas undertaking—the corporation have also the option of applying "such surplus, or part thereof, to the improvement of the district for which they are the local authority, or in reduction of the capital moneys borrowed for electricity purposes." So I think that you will agree with me that the chance of any surplus revenue from the electricity department coming in the direction of the gas department is very remote.

This obligation on the part of gas undertakings is not confined to paper, like the gas contingent guarantee rate, but in a large number of instances is a very real claim on the revenues of the gas department; and, consequently, a charge is made on the gas department in order to cover the deficiencies, year after year, on the municipal electricity department—*i.e.*, the gas consumer is required to pay more than the cost of the gas, so that the user of electricity may get his supply below cost price. Is this a course of action which can be defended on any reasonable grounds? Is the user of electricity requiring financial support? Generally speaking, the users of electricity are those who prefer it for reasons in which finance is of small consideration, and are prepared to pay the full cost. Then, why burden the gas consumer for another person's luxury or convenience?

It will be admitted that it is necessary, in order to facilitate the borrowing of the capital necessary for carrying on the electricity department, that some guarantee should be offered to lenders in addition to the electricity rates, in the same manner as the gas department has the support of the gas contingent guarantee rate; and so the gas rates have been pledged in security. But I consider that it is a breach of privilege to make repeated claims on the guarantor. The electricity department should be held to the same rule as the gas department, that in fixing their rates they shall be such "as will be as nearly as possible sufficient to meet the costs and charges of, and incident to, the manufacture," &c. What would be thought of the gas department who persistently fixed their price at such a rate as to render an annual call on the ratepayers through the gas contingent guarantee rate an absolute necessity? True, there is one case in which the guarantee rate has been enforced; but that is an exceptional one, and the total revenue from gas in that district barely reaches £2000 per annum.

The levying of an electricity contingent guarantee rate direct on all the ratepayers of any burgh would raise such a storm of opposition that I venture to think the first levy would be the last, and that the full cost of the commodity would thereafter be

charged against the users. Yet, in practice, such a levy is actually taking place wherever a call is made on the revenue of the gas department to meet a deficiency on the electrical department; and the levy is made on those parties who are not benefiting from the outlay (*i.e.*, the consumers of gas), while those benefiting (*i.e.*, the consumers of electricity) bear no portion of this indirectly levied rate. Is this fair? Whatever may have been the justification for burdening the gas department with the debts of its rival in 1890, one would like to hear of the man who would justify such action to-day; and if there were no other remedy, it would be our duty to urge at least that the Act be amended so that the deficiency be answered by an electricity contingent guarantee rate. There is, however, a remedy, and a very simple one, already in the hands of every municipal electricity committee—*i.e.*, to make their income sufficient for their outlays by fixing the charges for electricity accordingly.

But there are also a few municipal gas undertakings working under Local Acts; and with most of these the power of dealing with surplus revenue is much wider. In the case of one or two of our larger towns, full advantage has been taken of this, and revenue derived from the sale of gas has been appropriated to such purposes as improving existing streets, opening new streets, erecting, improving, and maintaining municipal and other public buildings, baths, and washing-houses, making sewers, and otherwise improving the respective towns, or else carried to the general purposes account for the relief of the burgh general assessment, or to a similar account.

It has been held that the undertaking is the property of the ratepayers. Is this according to fact? When a gas undertaking is acquired, do the ratepayers, as such, invest any money therein? Is it not the case that it is only nominally their property; for no sooner is it acquired in their name than it is immediately bonded up to the hilt—to use a common expression? And are the repayments of the bond (by sinking fund or otherwise) made by the ratepayers? Nay, verily, but by the gas consumers only, and that through the gas rates. Thus only those ratepayers who are also gas consumers are entitled to claim consideration and benefit as owners of the undertaking; and such limited and justifiable benefit can best be granted by making the gas rates as low as possible, so that there shall be no surplus revenue to apply to purposes in which there are others interested, and benefiting therefrom, who are not contributing to the gas revenue.

It has been held, however, by some that the power to apply the gas contingent guarantee rate entitles the ratepayer to benefit from the surplus revenue of the gas department. Why should it do so? Does not the name of the rate clearly indicate its purpose? By this clause, the ratepayers become guarantors; but it is not in accordance with practice that guarantors, as such, should benefit from the financial success of the undertaking for which they have given a guarantee. The most they have a right to expect is that, in the event of the guarantee being called up, it should be repaid at a subsequent period if, and when, the undertaking is in a position to do so.

I hope I have made it clear that the appropriation of any surplus revenue of a gas undertaking, for purposes other than those of the undertaking, is a system of levying rates under partiality and under a false name; and it is to be hoped that gas consuming ratepayers who have been victimized in the past will see through the folly of such indirect rating, and insist on the remedy being applied.

Discussion on All the Papers.

Mr. A. WADDELL (Dunfermline) thanked the President for the excellent matter put before them. All the papers were of great interest to the gas profession. Those of the President and Mr. Yuill showed the need of such meetings, and of combination on their part to secure fair rating. It would be difficult for even an authority to explain why they were so heavily taxed, as compared with other industries. In the town in which he was resident, there was a mill which turned over in a year seventeen or eighteen times as much money as the gas undertaking did, and yet the mill was taxed at less than the gas-works. He believed this existed generally. It had been brought home that they were living under an injustice. The paper by Mr. Herring was an exceedingly interesting one—perhaps of paramount interest for the time being, in connection with gas undertakings. A great deal of very useful matter had been put forward, which would be helpful to all of them in considering the subject of increasing their gas output. Among other features of the vertical retorts, it was certainly a most desirable thing that they applied equally to small as well as to large works. An effect of this would be that the use of gas would be made still more general in country districts as well as in towns. With regard to Mr. Herring's position upon the question of continuous-intermittent charges, he, in the first place, gave his opinion in favour of continuous charging. This was a difficult question, and depended a great deal upon circumstances. If his own case, for instance, were taken into account, he already handled his coal and coke in trucks containing what would make a nice charge in a vertical retort; and therefore intermittent charging would altogether commend itself. Again, in smaller gas-works, at the present time at least, he could not think of a mode whereby a continuous process could be made easy. Mr. Herring, further on in his paper, pointed out how well the retorts acted which he saw in Glasgow. Thus he apparently, while expressing one opinion, had also favoured another. There were very few of them who were not looking forward to getting much more

important working results from vertical retorts than they did from the charging of their present horizontal retorts full.

Mr. W. BLAIR (Helensburgh) said the papers by Mr. Yuill and the President showed that electricity, their principal opponent, had been treated as a favoured child, at the expense of others, who had had to bear their burden. He did not see why this should be. Each tub should stand on its own bottom; and the gas-using public should get gas at the cheapest rate. He had been trying to get these things equalized. The subject was one which their parent Associations—the North British Association and the Gas Institution—should take up. They should see that electricity should bear its just burden. As to Mr. Herring's paper, for years he (the speaker) had been giving very serious consideration to the question of carbonization. They required to extend their carbonizing plant; and as each system had come forward, he had been very keen to try to find out which plant would be best suited for them. They had under consideration now the adoption of a continuous system of carbonization, which was the latest and best to-day, and was quite suitable for a works of their size, having a make of about 60 million feet a year. At present, it cost them about 2s. 4½d. per ton of coal carbonized, taking the coal from the store, and the coke to the coke-bing. Under the system they were thinking of adopting, all this came out at a minimum rate of about 3d. per ton; and, of course, they were not large enough to be able to fully take up the work of one man, at their maximum make in mid-winter of from 320,000 to 330,000 cubic feet per day. The whole of the labour of exhauster, pumps, and the like, could easily be accounted for by one man; and they could not get down to a lower rate than this. The cost would be about £170 per ton of coal used, and the return on the outlay would be 12 to 13 per cent. They would also be avoiding the making of smoke, because all steam, smoke, and laborious manual labour would be entirely dispensed with. No doubt with the Dessau system they were getting excellent results; but the old laborious work of stoking was still in existence. He would refer to how much they were indebted to the late Mr. William Young and others, for the state in which they found themselves. It was the Glover-West system he recommended his people to adopt; and he did so for the simple reason that there was less mechanism and less likelihood of getting out of order with it, while the maximum results were likely to be obtained in actual use.

Mr. A. MILNE (Aberdeen) thought it was advisable to have a number of subjects to discuss, rather than one address. The paper by Councillor Smith was extremely interesting, and went to show that they ought to have more command over gas-fires than many of them had. True, they had absolute control of fires which were on hire. They should be authorized at least to create a department for looking after purchased fires, as well as those which were hired. No doubt such a proposal would meet with much opposition on the part of the trade; but they had only themselves to blame. He supposed the gas consumers in Aberdeen were no better, and perhaps no worse, than those in other towns; but many instances had been under his observation of consumers coming to them in desperation. They had employed a plumber or gas-fitter again and again, with no satisfactory results. The fact was that gas-fitters had not acquainted themselves with the principles of gaseous firing. He could recall numerous instances of this. A case was brought before him by a doctor in Aberdeen, who had purchased a gas-fire, at a cost of £5, for his waiting-room; and it was very unsatisfactory to find that he had to call in the fitter very often—and he employed one of the best fitters in Aberdeen. When the doctor came to him, he took away the gas-fire, and had it thoroughly cleaned. He found that it was a quite suitable fire, and put it back. It had been replaced only about a fortnight when the doctor called again, and said the fire was very unsatisfactory. A man was sent up, who inquired as to the position of the stopcock, and found that it was placed from 3 to 4 feet from the fire. He naturally assumed then that the trouble was due to the stopcock being so far away. It was found that the maid, for fear of explosion, turned on the gas very slowly, with the result that the fire struck-back every time. The remedy was to place the stopcock close up to the fire. Since this had been done—seven or eight months ago—there had been no trouble with the fire. With regard to the question raised by Mr. Yuill, they had all had the subject before them of late; and he thought they could not do better than each insist upon following out valuations upon the old line of receiving allowance for depreciation. His people in Aberdeen were quite of opinion that the question ought to be looked into. He was particularly interested in the paper by Mr. Herring; and he was sure they all looked forward with interest and anticipation for the results which would emanate from the Granton Gas-Works.

Mr. G. R. HISLOP (Paisley) said he had been specially interested in the President's paper on the application of surplus profits, as he presumed he had Paisley in his mind, because there they had very large parliamentary powers for doing things with surplus profits. Of course, they had to put the price on to the gas, in order to do this. They were not entitled to relieve the rates; but they could apply surplus profits for public improvements, such as parks and improving streets. He thought that they would admit that all the members of the community derived some benefit from these; and therefore he drew the line between this and giving away the money for the relief of rates, which was not in accordance with true methods of doing business. Altogether, he considered this system was much better than handing over the money for subsidizing the revenues of electric light undertaking,

which they had to do. Where electricity works were saddled upon corporations, it was the invariable practice of the Legislature to link them on to the gas undertaking. It was a hardship that the gas consumer, after paying for his own light, should have to pay for that of others who chose a more luxurious illuminant. No doubt some of the processes that were being brought forward for making gas were sought for the production of coalite and the like; but he doubted whether they would stand an analytical examination. First of all, they found that for every ton of coal treated they required more than twice the coal carbonized; and this, in many cases, would mean new gas-works, where the space was already fully occupied for retort purposes. He could see considerable difficulty in getting people educated to buy and burn the material, at a very much higher price; and they would have got a more costly fire. The consumption of the rich gas with an incandescent mantle would be a great trouble indeed; but he could fancy those who supported the coalite system saying that this could be overcome by the introduction of so much blue water gas as a diluent, in order to get the quality they now had. There, again, they would have to go into this subject with a strong prejudice, as well as sentiment. He maintained that this thing had come at an inappropriate era. If it had come some years ago, it would have had a better chance of getting a hearing; but he feared that, under the difficulties they had, there was little hope of much being made of it, at least for a long time.

Mr. J. NAPIER MYERS (Saltcoats) sympathized with the President in having been called upon a second time to preside at these meetings; but the arrangement had been fruitful in introducing to them a new style of things, which could not be characterized as other than an improvement. He supposed they were heartily in agreement with the view that consumers of gas should not be called upon to pay for electricity through a higher price being charged for gas. There were some towns owning gas-works which were entitled to make an extra profit, to be used for other purposes than for the benefit of the gas consumers. The townspeople had been the original guarantors—the adventurers—and surely they were entitled to a little consideration. An inquiry was being held in Ayrshire into a tramway and electric lighting scheme for three coterminous towns. The Provost of one of the towns said that their best consumers of gas were the Railway Companies who were serving the town, and that if the Companies went in for electricity, a guarantee rate would have to be enforced at once. It was not often that they heard of such a thing being done; but if there was a liability for the ratepayers to pay such a rate, he considered it only fair that if they had the opportunity of making a little money, they should have the power to devote it to some such purposes as those which Mr. Hislop had indicated. With regard to the matter so ably introduced by Mr. Smith, it would be possible to speak at great length about smoky chimneys. In the domestic consumption of coal, they had not made improvement at all commensurate with the advance which had been made in its consumption in steam-boilers. Not far from where they were meeting, an eminent engineer said that steam-engines would be of little use for carrying ships across to America, because it would take three tons of coal to carry one ton of produce. But improvement had been so great and so vast, that the figures might now be reversed; and a ton of coal could bring home 3 tons of produce. While there was this great advance in the science of consuming coal in boilers, they saw no such similar advance in the consumption of coal in domestic grates. If anything, the progress had been backward. This, to his mind, was largely due to the character of the fire-places which were in common use in tenement houses. These were largely the product of Falkirk; and they had been made altogether too cold fires. They had abandoned the use of fire-clay, which was a good non-conductor of heat, and had introduced too much cast iron, and thereby made the fire more cold. The fire-boxes were also smaller, and required frequent stoking. The proper combustion of coal was a very good subject for the Corporation of Glasgow to embark upon. The true line of progress should be in the direction of gas-fires—that the coal should all go to the gas-works, and there be broken up into its constituent products; the part which should be sent to the consumers being pure, and the deleterious matter going into the tar-well. He read the specification of Herring's vertical retorts in the "JOURNAL OF GAS LIGHTING" that morning, and no one could do so without complimenting the inventor upon his gift of clear expression. He had specified exactly what he wanted to do, and how he meant to do it. The specification made the impression upon his mind that it was far too complicated for business. It introduced a series of pipes at the head of the vertical retorts, which one would be disposed to think would be liable to become cavities for the collection of gas, and liable to explosion. Whether this would be so, remained to be seen. He had said that if those engaged in their metropolitan engineering works, who were interesting themselves in the carbonization of coal in bulk—and that had only an academic interest to those who were living in villages—would go to blast-furnaces, they would see that a blast-furnaceman could put in 4 to 5 tons of stuff, with less waste of gas than his neighbour in the gas-works could put in 4 to 5 cwt. of coal. They would get a lesson as to how the work ought to be done. He had a neighbour who consumed and used about 150 tons of coal per day; and he did this with far less noise, smoke, and fuss than they who used one-fifth part of this, in their busiest time, in winter.

Mr. J. W. NAPIER (Alloa) thought the remarks which had been made were perhaps sufficient; but they ought to congratulate

the Convener upon the arrangement of the subjects, in so far as each subject might be said to have been treated by an expert. Arising out of the papers read by the President and Mr. Yuill, he considered that, as an Association of technical men, they ought to exert their influence in attempting to bring about legislation affecting their own interest. They had the case of the fact of the Electric Lighting Act of 1890 putting a burden upon gas undertakings municipally owned; and, again, they had the effect of the uncreated tax by Somerset House officials, as regarded not allowing depreciation. The time had come when Associations of Gas Managers ought to take a step forward; and in this respect they had had the example, in past years, of the Gas Institution. So far as legislation for gas matters in Scotland was concerned, the Committee of the North British Association might do well to exert themselves in this direction. The trouble the President might have had in knowing what conception was in the minds of the men who carried the Electric Lighting Act of 1890, was not difficult of apprehension, because at the initial stage of the electric light everyone was content that deficits were bound to arise; and no doubt a broad view of the matter was taken—that, in so far as municipalities were suppliers of light and power, the Government of the time considered that any deficit arising, from whatever source the light and power emanated, should bear the loss upon electricity. He was one of the sufferers in this respect. During the past seven years, a sum of about £4000 had been paid by gas consumers to meet the deficits on the Electricity Department. Regarding Councillor Smith's sayings, two very pertinent points arose. What was wanted was more gas consumed, about which there could be no difficulty; and cheaper gas. Now, while they might follow out the policy of fitting up gas-fires free; while they might pursue the policy of hiring-out gas-fires at reasonable rates; and some might venture to go so far as to supply gas-fires free—he had no hesitation in saying this was only a half-way house towards attaining their object. The electrical people sold current at 3d. or 4d. per unit; and they went down so far as $\frac{3}{4}$ d. per unit. There, undoubtedly, they had the factor of consumption affecting the peak-load. At the same time, he did think that gas companies would do well to look into their accounts, and find out precisely what was the cost of their gas into the holder. He found that in Glasgow it was 1s. 1 $\frac{1}{2}$ d. per 1000 cubic feet. He ventured to say that unless gas people were prepared to supply fuel cheap, it was almost impossible to expect the use of gas for heating purposes, because they must recollect that while they gave certain advantages in fixing free or supplying at low rentals, they were still putting on consumers the burden of a dear fuel. As to what means should be devised whereby they could get a cheaper gas supply, of course, they were aware that advance had been made in the carbonization of coal; and no doubt other economies would be effected. But he was inclined to think that if gas departments would only take a bold step forward, and sell gas at a very cheap rate, they would find that the relative yield from consumption would rise so enormously as to provide a very satisfactory return indeed. Regarding Mr. Herring's contribution, the author seemed to be quite convinced that continuous was much better than intermittent charging; and, from what he learned at St. Helens, and also at Sunderland, he was quite satisfied that the continuous system was the best. Mr. Herring stated, as one reason for the increased production of gas in vertical retorts, that this, in small measure, arose from the presence of moisture in the coal. He, however, did not agree with this, because the coal would be denuded of the small amount of moisture it contained when put in at the top, long before it reached the zone of high temperature. But what particularly was troubling gas managers at the present moment was not whether the charging of vertical retorts should be continuous or intermittent, but rather what they were going to do in order to obtain the best results from horizontal retorts. They must recognize that they could not scrap their horizontal retort-benches. And, as far as he had been able to gather, the system of filling the retorts full, giving heavier charges, and the use of a pusher, was going to produce results, so far as the production of gas and residuals was concerned, equal to those obtained with vertical retorts. The only question in the matter was one of labour; and undoubtedly the advantage lay with the verticals. At the same time, he would venture to say that those who were unable to get the full advantage of carbonizing coal in bulk might consider the chamber retort. After all, what they were attempting to get at was the carbonization of coal in bulk; and if this could be attained in horizontal retort-settings, whether in chambers or not, those tied to horizontal retort-benches had the same interest in following the advantages obtained by those who were inclined to introduce vertical retorts.

Councillor SMITH expressed his pleasure, as a member of the Gas Committee, in attending the meeting and hearing many details gone into which, as a Committee, they had not time to learn. He was very much obliged for the way in which his paper had been listened to, and for all the remarks made. He purposely refrained from mentioning any particular form of coke. This he left to the meeting. All that was wanted was a coke suitable for consumption, and this he had no doubt would be obtained. As the Sub-Convener of the Electricity Committee, perhaps they would allow him to assure them that in Glasgow they did not take a penny from the Gas Department towards the Electricity Department. Current was sold to the public at cost price—the same as gas was sold; so that in their case it would be admitted that they were doing right.

Mr. G. KEILLOR (Broughty Ferry) did not understand that the President meant to say that it was necessary for a gas department to provide depreciation. This was a question which the Scottish Office took up with their department at Broughty Ferry two or three years ago; and they were successful in beating off the officials, because they considered that, as they were repaying their capital in from twenty to thirty years, and were maintaining the works, they were not called upon to provide for depreciation. This year, however, the Scottish Office came to them again, and wanted them to create a reserve fund. This was a provision for which he considered there was no need, because if they created a reserve fund, and at the same time maintained the works from current revenue, they were also paying income-tax upon that, and, of course, local rating at the same time. He had in his mind a town which had to give the imposition of a gas contingent guarantee rate very serious consideration. Their legal advisers told them that this was not a rate which could be lightly dealt with. In their opinion, it was simply there to be used in the event of something very exceptional happening—he presumed the stopping of the gas-works or something like that. They advised them very strongly not to put a contingent guarantee rate into operation, because it had been suggested that it might be the means for companies or gas departments creating a deficiency in order to have such a rate imposed so as to help some other department. What the particular town did was to increase the price of gas very considerably; and they got the consent of the Scottish Office to raise the rate over a series of years, which was done. He quite agreed as to the iniquitous custom of taking money from the gas department to meet current deficiencies in the electric light accounts. In his town, the Gas Department had had to pay £1100 or £1200 for accumulated deficiencies; and he did not consider this was just. However, the Electric Lighting Acts said this had to be done; and they could not avoid paying. His Committee approached the Electric Lighting Committee when the money was handed over, and asked that it should be repaid. They were simply laughed at, and told that this was impossible; there was no power or provision in the Electric Lighting Acts to compel the Electricity Department to refund the money. It had been paid by the Gas Department to wipe out their deficiency. They admitted that there was a moral obligation on their part to repay, but that was all; they could not bind their successors in office. The consequence was the gas consumers had to pay to enable the richer inhabitants to obtain a light at a figure below that which they ought to have been paying. He supposed that the reason the Gas Department were made to pay was that it was generally conceded that it was only after two or three years that an electric light undertaking became self-supporting. Their Electricity Department was now on a self-supporting basis. It had a profit last year, and would have a fair profit this year. Turning to Mr. Yuill's paper, they all knew the author to be a past-master in the laws relating to valuation, as well as in the computation of the basis for income-tax. Mr. Yuill had been a little too modest; he ought to have told them that through his instrumentality they, at all events in the north-eastern districts of Scotland, were able pretty successfully to defy the local assessors. They agreed, after some research, that the adoption of the regulation by the Somerset House authorities was optional—that it was not an Act of Parliament. Mr. Yuill told them this at the time—and it was the case—that the Income-Tax Authorities had no right whatever to issue the regulation; and he believed they had been told it pretty plainly by some of the Judges who had tried cases recently. But he considered that the Institution of Gas Engineers, for instance, ought to have exerted themselves more upon this question than they did. He recently had put into his hands a copy of a paper prepared for the Institution by Mr. Schultz, which was merely a collection of historical data; there was nothing in it to guide such as themselves in arriving at a satisfactory basis of valuation. Why could not the Gas Institution go to the authorities at Somerset House, just as the Municipal Electrical Association and the Tramways and Light Railways Association had done. They went; and they had been very successful in their appeals. Unless they in the gas industry did this, they would never get anything at all.

Mr. W. BLAIR pointed out that the matter was under consideration by the Council of the Gas Institution.

Mr. KEILLOR said he was very glad to hear it.

Mr. A. MASTERTON assured the speakers that he was very pleased indeed that they agreed with the opinions expressed in Mr. Herring's paper, because it was a very difficult and delicate matter to be responsible for the opinions of another. He (Mr. Masterton) thought the best policy, seeing that this system of carbonization was, comparatively speaking, in its infancy, was to wait and see, and carefully note the experiments which were being made, and which would eventually be made.

THE PRESIDENT would have liked very well if Mr. Yuill had seen his way to have gone a little further, and have dealt with local assessments, because he found there were differences in the way of arriving at what was the actual value of an undertaking for local assessment. This was a subject which, he thought, should be narrowed down, so that there should be a universal system or basis for valuation; or, at any rate, that there should be one system for municipal authorities and one for companies, instead of two or three different methods. Companies were much more settled, because there had been cases before the High Courts, in which there were decisions; but when it came to a question of assessing municipal undertakings, they found that there were very

few cases to which they could refer to find a leading. The case of the Edinburgh and Leith gas undertaking was about the only one in which they had a decision as regarded the rating of municipalities for local assessment.

Mr. YUILL (after expressing his regret that Mr. Smith had had to go away, because he had taken notes of the remarks he put before them, and it might appear invidious on his part now to go into the matter he dealt with) said he thought that in Glasgow they could do very much more than they did, considering the great desire they had shown to lessen smoke pollution. What had they done, more than any other corporation, other than preparing a report? They had really not gone so far as other corporations. The desirability had been mentioned of giving a differential rate—the same as electric undertakings did—for power purposes. They could do this in more than one way. They could give it off the price of gas, or they could lessen the price in another way, by giving cookers free. He thought that Glasgow (from its position geographically, and from its position financially) stood in a better position than almost any other corporation for giving facilities to consumers; and from the experience he had had in giving cookers free, he thought it was one of the best things they ever did. It had contributed to their success in more ways than one. They all realized what a difference it made to them if they were able to increase the consumption 25 per cent. It meant the lessening of the fixed charges, not only fixed charges for interest and sinking fund, but also charges for labour; and they had also the consciousness of conferring a benefit upon their consumers. The works belonged to their consumers, practically; and it was all the same how they gave facilities to their consumers. Seeing that in Glasgow they were so desirous of encouraging the use of gas, or smokeless fuel, why did not they do the same as other municipalities who had done something in that way? With reference to Mr. Herring's paper, it was educative certainly. So far as he (Mr. Yuill) could see, the points in it were the differences between the continuous and the intermittent methods of charging. Suppose they came back to the question, as between horizontals and verticals. In his own case, he could not face the question of the introduction of vertical retorts; but he was in the position of being able to wait, and by the time he could entertain the subject, possibly great revolutions would have taken place, and he would then be able to benefit by those revolutions. Coming to the criticism of his own paper, he was pleased to find that the objections had been very mild. They were all at one in considering the great injustice which had been done to them. When they took the common-sense view of the matter, into what did it resolve itself? Of all the industries in the United Kingdom on which the Income-Tax Commissioners made an annual charge, they said only to gas and water works—"We will not allow you any depreciation, under any circumstances whatever." Why did they do this? Why were gas-works and water-works singled out in this particular way? Possibly it might be imagined that they were so yielding, with a consciousness of their power to do or say anything they liked, and that they would submit. He mentioned in his paper that he thought this was a fit subject for the Gas Institution to take up. He hoped that Mr. Blair, who was on the Council of the Institution, would do all he could to bring the matter up, and insist upon its being put forward, in the way that other bodies had done, and have it fought out with the authorities at Somerset House. He knew of no better body than the Institution to take the matter up, and fight it out.

The PRESIDENT said he had dealt a little, in passing, with the other papers, so that he had only to make one or two remarks upon his own paper. With reference to Mr. Hislop's remarks, he had not Paisley specially in his mind's eye. There were several places just like Paisley, that drew attention to the position and suggested the line of argument which he took up. Even admitting that public parks, and suchlike, were enjoyed by the general community, still they had an unequal rating if it were only placed on gas consumers. Why not levy one on the electric consumer as well, to provide public parks and other improvements? This was the line of his argument. Mr. Keillor referred to the question of depreciation, whether it was compulsory or not. It was not compulsory. Surplus revenue might be applied for the purpose of making a depreciation fund; but it was not compulsory. This was a subject he would like to see fairly well dealt with. He held pretty strongly that when the present generation were providing for all possible repairs, and also providing for a sinking fund, they were doing their fair share; and that the question of providing for depreciation, while renewing the plant from time to time, was one which should be left to a future generation. He would like to see this matter more fully referred to in a paper, and at no distant date.

ADMINISTRATION.

Mr. M'LUSKY said he had been asked to inform those present that the Committee of the North British Association proposed in future to annex the Informal Meeting. He had learned of this since he came into the room that afternoon. He considered it a very excellent proposal, and one with which he thoroughly agreed; but he asked whether they could go into the question that day. It was a large meeting; still it was not a fair representation of the gas managers of Scotland. If they were to hand over the management of these meetings to the North British Association, he thought they ought to insist upon the informal character being maintained. It was proposed to make it the spring meeting of the North British Association and to have no

July meeting of the Association, but to have their regular meeting in September.

Mr. WADDELL said it was felt that July was not a very suitable time for the North British meeting; and that if this proposal were carried, it would give some reason for putting off the North British meeting till later in the season.

Mr. YUILL considered the question a very momentous one. The present was the 27th annual meeting. Could anyone say that these informal meetings had not played their part well, and played a noble part? The informal nature of the meeting was one of its safeguards. Speaking from experience as a Past-President of the North British Association, and knowing the difficulty there was to get papers for the meetings of that body, he would not care to undertake the duty of getting papers for two meetings.

Mr. J. W. CARMICHAEL (Barrhead) thought that the question had been sprung upon them. Of the two meetings, he preferred the informal one. They had in April just got over their winter's work, and they met and had conversations together. No reasons had been given for the proposed change. The North British Committee were quite right in putting forward their ideas; but those present ought to have time to consider the matter.

Mr. WADDELL said the Committee would rather that the present meeting should put forward reasons against annexation. They were quite willing to give as long time for consideration as might be wished.

Mr. D. ROBERTSON (Dunoon) thought they should be very cautious in departing from their usual procedure.

Mr. BLAIR said there was no desire to interfere with the informal nature of the meeting. There would be nothing definitely decided that day, as the North British Committee could do nothing until the general meeting of the Association.

Mr. T. WILSON (Coatbridge) did not think annexation would serve any good purpose. He did not see any benefit to be gained. He thought they should refuse the proposal immediately.

The PRESIDENT said he brought forward such a motion four years ago; but it was very much sat upon. They could not decide whether the informal meeting was to be dissolved without reasonable notice being given.

Mr. YUILL moved, and Mr. J. W. NAPIER seconded, that the proposal be not entertained; and this was agreed to without a counter-motion.

Mr. M'LUSKY moved that Mr. J. B. Scott, of Cowdenbeath, be nominated as President for next year. Mr. Scott, he said, originated the North-Eastern Commercial Section, which had been a great success.

The PRESIDENT seconded, and the motion was agreed to.

Mr. SCOTT accepted office, and was invested with the Memorial Chain. He then returned thanks for the nomination.

Mr. YUILL moved that Mr. M'Lusky be reappointed Chairman, which was agreed to.

A company of about eighty gentlemen, at the close of the meeting, sat down to "High Tea," instead of the dinner usual at previous gatherings—Mr. Scott in the chair. After tea, the company dispersed, at the early hour of six o'clock.

The Stone Gas-Works Managership.—In answer to the advertisement which appeared in the "JOURNAL" on the 29th ult., 132 applications have been received for the position of Engineer, Manager, and Secretary of the Stone Gas Company. These have been duly considered; and six of the candidates have been invited to attend a meeting of the Directors on the 15th inst.

Modern Gas-Engines and Gas-Producers.—We have received from the Publishers (Messrs. John Wiley and Sons, of New York) "The Modern Gas-Engine and the Gas-Producer," by Mr. A. M. Levin, M.E., of Chicago. The contents of the book were originally notes arranged with the idea of having for personal use some of the many questions pertaining to the gas-engine which, in practice, often come up and require immediate answers. In order to present this matter properly in a book designed to be of use to others, the notes have been extended and supplemented by other particulars, so as to make them readable. A fuller notice of the book will appear in an early issue. The English publishers are Messrs. Chapman and Hall; and the price is 17s. net.

"Transactions" of the Association of Water Engineers.—We have received Vol. XIV. of these "Transactions," containing the reports of the proceedings at the summer and winter meetings held last year under the presidency of Mr. Robert Askwith, M.Inst.C.E., the Engineer of the Weardale and Consett Water Company. The papers read on the two occasions referred to, and the discussions upon them, were dealt with in the "JOURNAL" at the time; but they, of course, appear in a more amplified form, and with numerous illustrative plates, in the volume under notice. The book contains much interesting matter in addition to the record of last year's proceedings. As in the preceding volume, there is a collection of abstracts of legal cases, all of which, with one exception, were issued to the members as separate pamphlets during the year; and there are useful indexes to the subject-matter in all the volumes. The library catalogue, lists of Council officers, and Past-Presidents, and a statement of the year's accounts, complete the contents, to which a very effective portrait of the President forms a frontispiece. The volume, which will rank for interest with its predecessors, has been produced under the editorship of Mr. Percy Griffith, M.Inst.C.E., F.G.S., the Secretary of the Association.

VERTICAL RETORTS FOR THE MANUFACTURE OF ILLUMINATING GAS.

By Mr. W. R. HERRING, M.Inst.C.E., of Edinburgh.

[A Paper prepared for the Informal Meeting of Gas Managers at Glasgow, April 6.]

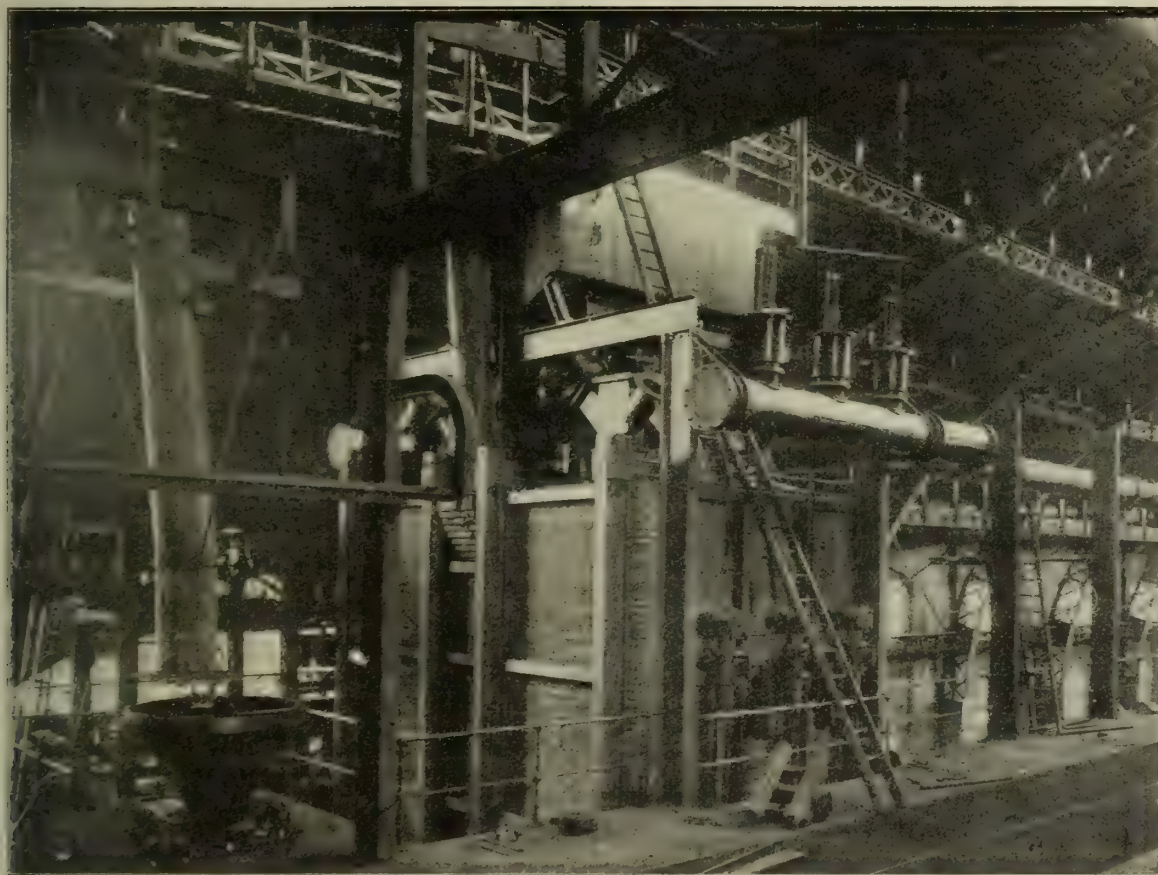
It is now more than four years since I first took occasion to call the attention of gas engineers to the subject of vertical retorts for coal gas manufacture. The impulse that caused me to do so had its origin in comments by the "JOURNAL OF GAS LIGHTING" (in their issue of Nov. 4, 1905), on a report of the Imperial Continental Gas Association, referring to the fact that the Directors of the Company had, after trial of the vertical system, decided to extend the inclined retort system at their Mariendorf works. A paragraph in my first article reads: "British gas engineers will not necessarily be deterred from giving the matter that close attention which such a system, on the face of it, appears to deserve." These facts suggested to me that the time had arrived when steps should be taken to show to what extent vertical retorts were used for a similar purpose in Scotland.

It is true the oil-works practice is slow distillation with a view to obtaining the maximum quantity of products that can be easily reduced to the liquid state. Coal distillation, however, was not

unknown in conjunction with the same process, as the coal used for fuel in connection with the oil retorts was in some systems carbonized in similar retorts forming part of the oil-retort installation; the illuminating gases being taken off and mixed with the oil vapours and the producer gases used to heat the settings.

Our much revered friend, the late Mr. William Young, has on different occasions dealt with this; and I should think it will be admitted that the production of coal gas in vertical retorts is not as novel as some people unacquainted with Scotland seem to imagine.

If we reflect, I think it will be admitted that the factor which has permitted the use of vertical retorts for the production of illuminating gas is the changed conditions under which we are now working. The standard of illumination has been brought down to a degree that is found to be more suitable than a gas of high luminous value, such as was generally supplied a few years ago; and the gas which is now manufactured is much more easily brought to a point of perfect combustion than was the case before.



View of the Upper Part of the Setting. The Stage Level is the Charging Stage of the Inclined Retort-House.

The reduction of the luminous value of gas has, therefore, enabled processes to be successfully prosecuted which formerly dare not be risked when the former high standard prevailed; and many things are now possible in the carbonization of coal which it was hopeless to attempt four or five years ago.

The articles to which I have already referred resulted in an interesting series of interviews with the late Mr. William Young. It appears that the publication of my articles at the time rather trespassed upon the ground that was being covered by Mr. Young and Mr. Glover in the prosecution of their patents for the particular type of plant they were introducing, and which had not then been made public.

During their issue Mr. Young visited me, and we had a long conference on the subject. It was at this interview that I suggested to Mr. Young that the industry would be forever indebted to him if he would relate his ideas as to how the subject should be tackled. I ventured to suggest to him that his opinions of what takes place in the inside of a gas-retort were accorded the gravest attention by anybody connected with the industry, and that personally I believed he could disclose a very large amount of information which would be of inestimable value to those of us who were engaged in carrying on the work. I take some credit, therefore, for having been the means of persuading Mr. Young to contribute the articles which subsequently followed my own in February, March, and April, 1906, contributed to the "JOURNAL OF GAS LIGHTING."

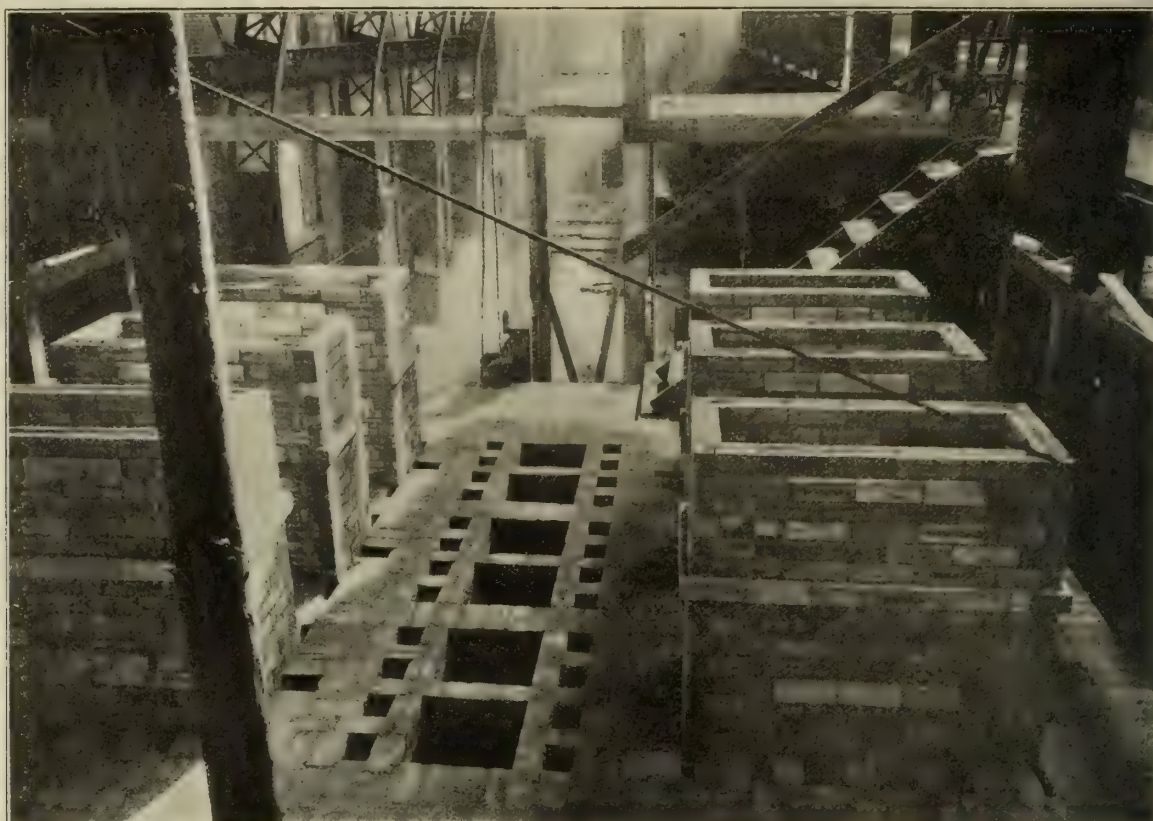
This intercourse with Mr. Young led to still further interviews, and many interesting conversations; and I think that I am not

disclosing any confidential information when I say that only a short time before his death Mr. Young, along with Mr. Glover, expressed a wish that I should collaborate with them in the development of the Young and Glover patented system of vertical retorts. For reasons which it is not necessary now to relate, I refrained from accepting the very kind offer which Mr. Young made; but at the same time I took care to express my high appreciation of his generous proposal. Since that date two distinct types of vertical retort systems for the production of illuminating gas have been developed—viz., the intermittent, represented by the Dessau or German type, and the continuous, represented by the Woodall-Duckham, Young-Glover, and others.

For my own part, I am inclined to favour the system that will permit of the continuous carbonization of coal, and the continuous withdrawal of coke, and thus render gas-making as nearly automatic as possible. The intermittent system differs little from the present retort-house operations of charging and drawing retorts; but, it must be admitted, it is giving very satisfactory results, both as regards labour costs and gas production.

In dealing with the question of results, it is necessary to take a broad view; and the following factors must be taken into consideration: 1. Structural cost. 2. Yielding capacity on a given area. 3. Yielding capacity per ton of coal carbonized. 4. Fuel consumption. 5. Repairs and maintenance and upkeep of the plant and its accessories. 6. Labour costs.

On the face of it, it does not appear that the intermittent system will offer the same advantages under the heading of labour as the continuous system will do.



The Edinburgh Vertical Settings of Brick Retorts, Showing the Projecting Ledges for the Stay-Bricks to Rest upon.

The operation of charging retorts from the upper end cannot differ much from the operation of charging other types; and the operatives will be subjected to more discomfort than in either a machine charged house or an inclined retort-house. The rate of wages will, therefore, be the same as we understand a stoker's rate of wage to be to-day.

The drawing of the charge necessitates the physical operation of mechanical parts, and the quenching of the coke in the conveyor. I am afraid our present-day operatives would demand the same rate of wage for this work as at present holds good for horizontal or inclined charging or drawing. The saving in labour is, therefore, represented by the extra tonnage handled per man; and this, it must be admitted, will be considerable.

The continuous system, on the other hand, differs very much in this respect. The operations are entirely mechanical and continuous. The work of the operatives is that of lookers on; their occupation being merely the watching of the free running and lubrication of the mechanical parts. The rate of pay for such work should not be on a higher scale than is at present paid for the coal and coke handling plant, which, roughly speaking, may be said to be 33 per cent. lower than the stokers' wage.

1. *Structural Cost.*—The structural cost may be taken at from £175 to £185 per ton of carbonizing capacity per 24 hours for verticals, as compared with £100 to £110 for the inclined type complete equipment, including coal and coke handling plants in both cases.

2. *Yield of Gas on a Given Area.*—The yield of gas on a given area does not differ materially with either of the vertical types or with inclined retorts.

3. *Yield of Gas per Ton of Coal.*—On first consideration, the yield of gas per ton of coal appears to be from 10 to 15 per cent. superior to the former working on the same works; and from published figures the make per ton may be said to range from 12,000 to 12,500 cubic feet. If, however, we look among the published statistics of the industry, we find many moderate-sized works producing this quantity of gas from ordinary horizontal settings. We must, therefore, be careful to determine whether the increased make of gas is due to the vertical type of retort or to the more efficient and intelligent supervision and direction of operations which are generally devoted to a new type or experimental working. Personally, I am inclined to attribute the higher yield per ton to the absence of the hydraulic main, more regular pull or suction on the retorts, and other incidentals—such as most of us know go a long way towards improving the yield from any type of coal-gas carbonizing plant. Then, again, any moisture that gets access to the base of the retort and most of what is in the coal itself in the Dessau plant is converted into water gas—a combustible gas which will add to the bulk produced.

4. *Fuel Consumption.*—The fuel consumption per ton of coal carbonized will not be greater in verticals than in present types. If anything, it should be a little less.

5. *Repairs and Maintenance.*—Repairs and maintenance should also be less.

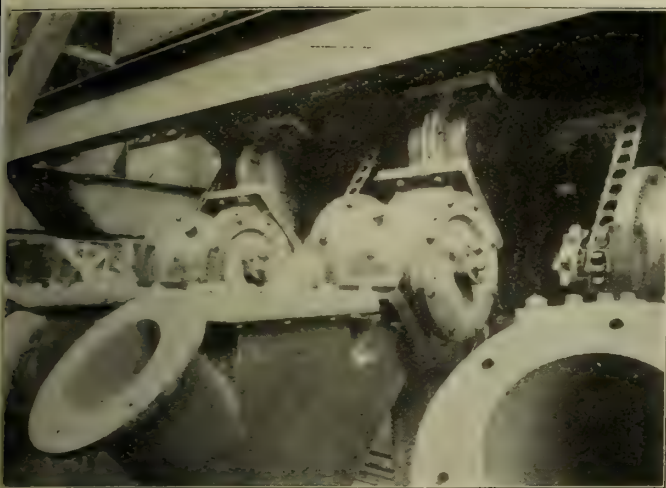
6. *Labour.*—There only, therefore, remains to be considered the question of labour. Abundance of statistics have appeared the Technical Press relative to the working costs of the verticals—partially estimated and partially actual.

The Dessau-Sunderland plant is stated to cost 3d. per ton of coal and the Woodall-Duckham or Glover-West system is estimated to amount to the same sum. Mr. Glover appears to base his wages on the rating for ordinary stokers, which is a factor that should be considered, as it differs from my opinion as to the ratings that should prevail for such work.

Comparing these costs, however (of 3d. per ton), with my own inclined system, they may be said to be only one-third of the inclined installation at Edinburgh, costing 9d. per ton. There would, therefore, appear to be a saving of 6d. per ton; but in



Quenching Hoppers, and Rotating Discharge Valve into the Conveyor (not shown).



The Charging Arrangements by Means of the Rotating Valve. The Gas Take-offs are in the Foreground, and Clear Access to the Retort is Gained by the Central Cover.

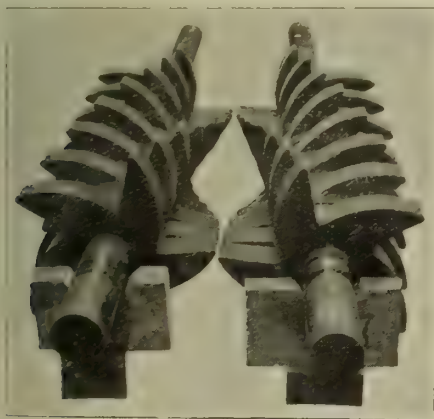
connection with this, we must take into account the capital expenditure involved.

Taking the capital sums already given, and allowing for the installation to be working at its full capacity for 200 days per annum, interest at the rate of 5 per cent. per annum amounts to 6d. per ton on the inclined retort installation and 10½d. per ton on the vertical retort installation.

Adding capital costs to labour, we have 1s. 3d. per ton for labour and capital costs on the inclined retort system, and 1s. 1½d. —a difference of 1½d. per ton—for labour and capital costs on the vertical installation. The vertical system, therefore, does not appear to offer the advantages which at first sight might appear—particularly as my comparison is with inclines worked on 7 cwt. charges, whereas it would be less if compared with inclines worked on full charges. But I have preferred to take the results of a complete year rather than sectional results of our recent working, which has been on the principle of full charges.

Comparing it with other types of plant, however, the vertical retort would show up much better; and having these figures, it will be possible for you to arrive at the difference between your present costs and the vertical costs on your own works.

There is another very great advantage which I think the vertical system will possess; and it is that a comparatively small installation of verticals can be worked at the minimum cost, whereas the small-sized works cannot hope to reach the economy that a large installation of inclined retorts offers.



Details of the Supporting Base for a Positive Discharge and for Breaking the Coke to Commercial or Domestic Dimensions.

It is, therefore, of the utmost importance that the closest possible watch should be given to developments of the vertical type of plant; and I would strongly advise any who are contemplating either an extension or reconstruction of their carbonizing plant to pause as long as possible with a view to giving the closest consideration to the newest type.

Since compiling the preceding notes, I have had an opportunity of inspecting Mr. Wilson's system of verticals at Glasgow, where he has erected a full-scale plant of three 20 feet retorts. The bench was at work at the time of my inspection, and appeared to be doing exceedingly well. Mr. Wilson defines his system as "continuous intermittent"—that is to say, at regular periods of 4 cwt. to 5 cwt. of coke are withdrawn and an equivalent bulk of coal charged. I witnessed the operation; and the discharging was most satisfactory. The bottom hopper is sealed by a pivoted water cup actuated by a hydraulic cylinder. Mr. Wilson's object has been to test his setting under all conditions; and on the occasion of my visit he had for some days been using what is probably the strongest coking coal in Scotland. As explained,

the discharging was perfect, and the method of charging is novel and appeared to be in every way effective. His results, as far as ascertained, appeared to be fully equal to any of the other systems previously referred to; and I have no doubt we shall hear more of this type in the future.

In conclusion, I may say that we in Edinburgh are nearly approaching the stage when we shall also have working results to guide us. A setting of six verticals is now under fire, and I need not say more than that it is capable of being worked on either the continuous or intermittent system.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to the Sutherland Meter Company's Works.

On the invitation of the Directors of the Sutherland Meter Company, between sixty and seventy members of the Midland Junior Gas Engineering Association visited the new works of the Company at Witton, near Birmingham, last Saturday afternoon, and were afforded an excellent opportunity of inspecting the up-to-date arrangements and equipments for manufacturing wet and dry meters, test holders, automatic lighting devices, governors, &c. No effort had been spared by the Company to make the visit as enjoyable and instructive as possible. Men were kept at work until the completion of the tour; and members were therefore able to follow more clearly each stage in the production of the modern meter. The visitors (among whom were included Mr. Vincent Hughes, of Smethwick, and Mr. J. V. Stevens—a former member of the Birmingham Gas Committee) were met at the works and guided round by the Chairman of the Company, Mr. A. Cecil Wright, who was assisted by the General Manager (Mr. A. C. Frost), the Secretary (Mr. Madeley), the Works Manager (Mr. Hansford), and Messrs. L. Hughes, Munnings, M'Kay, and Tipper, all of whom were assiduous in their endeavours to reply thoroughly to innumerable requests for information. A description of the works was published on their completion some twelve months ago (see "JOURNAL" for March 16, 1909, pp. 777, 778). It is therefore unnecessary to describe them again in detail.

Commencing at the dry-meter shop at the top of the building, the various processes were carefully explained to the members. All the different parts of a three-light prepayment dry meter were displayed on a bench near by; and it was interesting to note that in the construction of this comparatively small meter no fewer than 255 different parts were required. An object of interest was a very old three-light dry meter undergoing repair at the time of the visit; the badge affixed to the case denoting that the meter was originally made in 1849 by the old Gas Meter Company. Many of the members were surprised to find that dry meters had been made so long ago. The testing shop, wet-meter shop, casting shop, and other portions of the premises were visited.

Meter making alone, however, does not cover the operations of the Company. The manufacture of street-lamps is now quite an important part of their work; and they are also the patentees of many clever devices which were exhibited, some for the first time, including a special pipe-coupling for hydraulic, gas, or steam pipes, which enables joints to be made without the use of soldering irons or the nuisance of "wiping." There were also automatic street lighters of the well-known clockwork type, and one controlled by diaphragm and pilot-light; small secondary meters for gas-fires; high-pressure dry meters; and a small diaphragm governor for high-pressure gas. This governor is fitted with a new combined adjustment for capacity and pressure. In answer to inquiries, it was stated that it was impossible for the pressure to "build up" with this governor.

At the conclusion of the tour, the visitors adjourned to the offices, where high tea had been provided by the Directors.

Mr. A. CECIL WRIGHT, who on rising was greeted with acclamation, expressed his pleasure at meeting the members there. The whole of the officers and staff of the Company had done all in their power to make the visit instructive and pleasant. Having expressed his gratification at the opportunity of meeting the members, he added his best wishes to them individually and as an Association. One heard so much nowadays of the time devoted by young men to sport, that it was almost startling to find an Association such as theirs the members of which were willing to spend Saturday afternoon in inspecting works and processes, and striving to increase their knowledge and experience. He was quite sure such efforts would meet in the future with great success; and he wished all of them success in the future—which they were fitting themselves for, and which they so much deserved.

Mr. R. S. RAMSDEN (Burton-on-Trent), the Senior Vice-President of the Association, in the unavoidable absence of the President (Mr. A. O. Jones, of West Bromwich), asked the members to accord a very hearty vote of thanks to Mr. Cecil Wright and the other Directors of the Company and their staff, for the very enjoyable and instructive afternoon they had given them, and the generous hospitality extended. There was no doubt that, with the higher distribution pressures they had now, compared with (say) 10 or 15 years ago, with the necessity for registering a small consumption of gas by bye-passes of incandescent burners in the daytime, it was absolutely essential for them to have meters which would stand high pressures with perfect soundness, and

which would be found capable of registering minute consumptions with accuracy, or else their unaccounted-for gas would increase. From what they had seen that afternoon of the class of goods turned out by the Company, he was sure they could congratulate them on the articles they manufactured. The Company had a fine site, a magnificent building, and splendid equipment inside. They had been reading a good deal lately of the testing of meters under the Sales of Gas Act; and if, before they separated, Mr. Frost could give them his views as a practical meter maker on this subject, he was sure they would be interesting to them.

Mr. R. J. ROGERS (Birmingham), in seconding the vote of thanks, remarked that this was the first works of the kind the members of the Association had had the privilege of visiting. Everything seemed to be done to facilitate the manufacture of meters in the most efficient manner, and to ensure that accuracy which was so necessary. The other portions of the business apart from meter manufacturing—he referred to the self-lighting arrangements for street-lamps, and the governors, &c.—had been a great source of interest to the members. Here again modern requirements were calling for governors that would govern-down pressures accurately both for lighting and heating purposes in manufacturing processes; and it was interesting to see how these articles were being made.

Mr. VINCENT HUGHES (Smethwick), President of the Midland Association of Gas Managers, cordially supported the motion, and remarked that this was the first opportunity he had had of meeting the Junior Association. He had so thoroughly enjoyed himself that afternoon that he had been thinking seriously of resigning from the parent Association, and joining the Juniors. (Laughter and applause.) He had come to the conclusion that they had a very much better time than the seniors. The works they had visited were certainly very well equipped, and very much up to date. Mr. Wright had expressed surprise that the members of the Association should be willing to give up their Saturday afternoons to study of the kind; but a greater marvel was that Mr. Wright and his Managers had contrived to keep their workmen there during the afternoon, in spite of the attractions of a local football match. Visits to works of this class must be of extreme benefit to the members of the Association, and it was to the Junior Association that they had to look for the men who in years to come would take up the heat and burden of the day, when the seniors had to lay it aside.

Mr. W. S. SMART (Saltley) also cordially supported the vote of thanks.

Mr. G. C. PEARSON (Birmingham), who at the last meeting was appointed Hon. Secretary of the Association for next session, took the opportunity of announcing to the members that Mr. H. E. Temple, his predecessor in the office, had obtained the appointment of Assistant Engineer and Manager at Christchurch Gas-Works, New Zealand—a statement which was received with loud applause. Mr. Temple, he said, was leaving the country very shortly, and consequently his attendance with them that afternoon had been rendered impossible.

Mr. FROST stated, in reply to Mr. Ramsden's remarks, that there was severe competition in the meter market; and the old style of manufacturing meters by rule-of-thumb was no good whatever. They had now standardized every part of their meter, thereby benefiting the workmen in making the meters, and enabling them also to put a far better article on the market. They had also developed a department for research work in connection with high-pressure and water gases. This had been of great benefit to them. He expressed his best wishes for the prosperity of the members of the Association.

Mr. J. V. STEVENS, who is the local Secretary of the Tinplate Workers' Association, and a former member of the City Council, proposed a vote of thanks to Mr. Wright personally for his kindness and courtesy to them. Gas engineers of to-day were certainly on their mettle, and they had need to be in consequence of the rapid advance of electricity. Incandescent lighting had given a new lease of life to the gas industry; and there was plenty of room for development in the future. There was a great fallacy current that incandescent gas lighting was injurious to pictures and decorations; but some few years ago Professor Frankland, of the Birmingham University, made a series of experiments in the Birmingham Art Gallery, and stated that it was a far better preservative of good pictures than electricity. It was to a great extent to manufacturers like the Sutherland Meter Company that the gas industry owed the rapid developments made in recent years; for new machinery, processes, and inventions were usually brought about outside the gas-works and the gas engineers themselves, though the engineers were the persons who had to judge the worth of the articles. They were indebted, therefore, to manufacturers who were not satisfied to work on the old stereotyped ideas, but constantly invented some new thing. What they had seen that afternoon would set them all thinking. They were indebted to Mr. Wright for his hospitality, and the opportunity afforded them of inspecting the works; and they wished the Company every success in their business. There was plenty of room in the Midlands—usually the home of enterprise—for gas-meter making; and it should be of great advantage and convenience to the gas companies of the district to have such works close at hand.

Mr. WRIGHT suitably responded; expressing the hope that it would not be the last visit the Association would pay them, and that in the meantime many of the members would occupy a high position in the gas profession.

LONDON JUNIOR GAS ASSOCIATION.

Visit to Beckton.

Last Saturday, the London and Southern District Junior Gas Association duly carried out another item in the programme for the current session, by paying a morning visit to the Beckton works of the Gaslight and Coke Company—which they were able to do by permission of Mr. D. Milne Watson, the Company's General Manager. The muster was a large one, as the importance of the occasion warranted; and it is gratifying to note that so many assistants were granted the leave of absence from duty which was necessary to enable them to take part in the proceedings. The main party on arrival must have numbered over sixty; and there was probably an addition of more than twenty to this number made up by subsequent arrivals. Upwards of two hours were spent in inspecting various portions of the huge works; cars drawn by locomotives being requisitioned to convey the members from one spot to another. At each halt (as well as while in the cars) the many points of interest were fully explained by the energetic guides—Messrs. A. H. Solomon, W. H. Warren, S. Thorman, J. Methven, and R. W. Hunter—who were in charge of the parties. Many members, of course, had visited Beckton before (some as lately as last July, with the Midland Junior Gas Association, in connection with which fixture some particulars of the plant and its capacity were given in the "JOURNAL" on July 6, p. 34); but many more who had not done so were naturally much struck with the magnitude of the works and of the operations that are carried on there. Some 263 acres of the 1000 acres or so of land which the Company own at Beckton, represent, it may be mentioned, the area of the works themselves; while the productive power is about 75 million cubic feet of gas a day—13 millions of carburetted water gas.

The visit being timed to take place early on Saturday, the members arrived before the men in the repair and renewal shops ceased work; and a move was at once made to this department, so that the various machine tools, &c., could be seen in operation. The shops are on a large scale, and constitute a department of which the Company are justly proud. The railway cars were then boarded, and a run was taken to No. 2 pier. This is reached by means of a viaduct under which coal is stored. Waggon with bottom discharge doors convey the coal from this pier, and also when necessary from No. 1 pier, and then deposit it where required. On No. 2 pier there are hydraulic cranes, with one-ton Hone grabs. The cranes on No. 1 pier carry skips loaded by hand; and coal is seldom unloaded at this pier, which, however, is used largely for receiving other materials, and for loading coke and chemical bye-products. A pause was made at the hydraulic pumping-house supplying power for the two piers, in which there are five compound hydraulic pumping-engines. The steam pressure in each case is 130 lbs., and the water pressure 750 lbs.

The coal-testing plant, which is a complete installation that would be sufficient in size to meet the requirements of many small country towns, was examined with interest; and afterwards a move was made to No. 3 retort-house (in which at present six and eight hour charges are being worked), containing thirty settings of ten retorts, or 600 mouthpieces. The capacity of this house is about 420 tons of coal a day; and the make of gas 7500 cubic feet per mouthpiece, or a total of $4\frac{1}{2}$ million cubic feet. West's compressed air machinery is in use. The coal-breakers and elevators to the hoppers are driven by a gas-engine. The retorts are set in five tiers, and heated by regenerator furnaces. Some time was spent in the water-gas house, where the twelve sets of carburetted water-gas plant were seen; and then the last building to be inspected was reached—namely, one of the houses containing engines for pumping the gas from Beckton to London (for storage and distribution) through two 48-inch high-pressure mains. There are two of these pumping-houses; and their total capacity is over 4 million cubic feet per hour. Of the many interesting features at Beckton, not the least is the works railway system, consisting of over 40 miles of rails, for use on which there are some thirty locomotives. There are high-level roads to take the coal into the retort-houses, and low-level ones for bringing the coke out. Most of the roads are under control from signal-boxes, being worked on the block system; but the coke roads into the retort-houses are worked by hand signalling.

Before the party left the works, the President (Mr. W. J. Liberty) proposed a hearty vote of thanks to Mr. Milne Watson and Mr. Reeson and his staff. It was, he remarked, a great privilege to inspect such works; and under the care of their guides, the visit had been a most interesting and instructive one. Mr. Reeson had said how sorry he was that an engagement had made it impossible for him personally to be with the members; and he had also been kind enough to tell him (the President) that he would like to become a patron of the Association. It was impossible to say how it was that Mr. Reeson's name had been missed; but anyhow this error had now been rectified, and from that day they would have him as one of their patrons. The Senior Vice-President (Mr. L. F. Tooth) seconded the vote, which was cordially passed, and responded to by Mr. Solomon.

Sir William Ramsay, K.C.B., F.R.S., has been nominated President of the British Association for the meeting to be held at Portsmouth next year.

REINFORCED CONCRETE FOR COKE-BUNKERS.

A Dunfermline Plant.

DURING the past few years, our columns have furnished evidence of the growing use of reinforced concrete in connection with gas-works; and the establishment of a monthly publication devoted mainly to this class of construction is a proof of the extended interest now attaching to it. The current number of the publication referred to—"Concrete and Constructional Engineering"—contains an illustrated description of a large reinforced concrete coke-bunker which has been erected at the Dunfermline Gas-Works, in accordance with instructions by Mr. Alexander Waddell, the Gas Engineer to the Corporation. Some of our readers may remember that reference was made to this coke-receiver in the course of the report of the visit of the members of the Eastern District Division of the Scottish Junior Gas Association to the Dunfermline Gas-Works which appeared in the "JOURNAL" for the 16th of November last (p. 474); and it is hoped the additional particulars and illustrations which, by the courtesy of the conductors of the publication already referred to, we are now able to give, and which were supplied by the Consulting Engineers (Messrs. F. A. Macdonald and Partners, of Glasgow), may be of interest to a larger number of readers than those who were afforded by Mr. Waddell an opportunity of seeing the bunker during its erection.

The original intention of the Gas Commissioners was to use steel columns and longitudinal girders; but, on the suggestion of the Consulting Engineers, this idea was abandoned, and a monolithic reinforced concrete structure was adopted. As will be seen from the photograph, the bunker has been constructed over two lines of railway sidings—the one passing directly beneath it being used for discharging into a receiving bunker below the ground level, as well as for loading into railway trucks from the large bunker above; and the other, passing below the outer reinforced concrete cantilevers, being used for ordinary siding purposes, and also for loading.

At the top of the bunker, and supported by large reinforced stay-beams, there has been constructed a receiving hopper, and also a reinforced concrete bottom for another storage hopper for breeze. The total weight of contained material on which calculations for the design of the structure were based was 350 tons of coke in the large bunker and 40 tons of breeze in the hopper receiving it—making in all 390 tons more than the self-weight of the structure. In addition to these loads, reinforced concrete brackets have been constructed, monolithic with the main bunker walls, to carry those arising from the roof principals and the roof girders of the adjoining buildings.

The coke is fed into the bunker by means of a revolving screen, erected on a platform adjoining the main bunker at summit level. This platform partly obtains support on the reinforced concrete structure. To enable the coke to be dropped from the screen into the main bunker without being broken, and to form a support

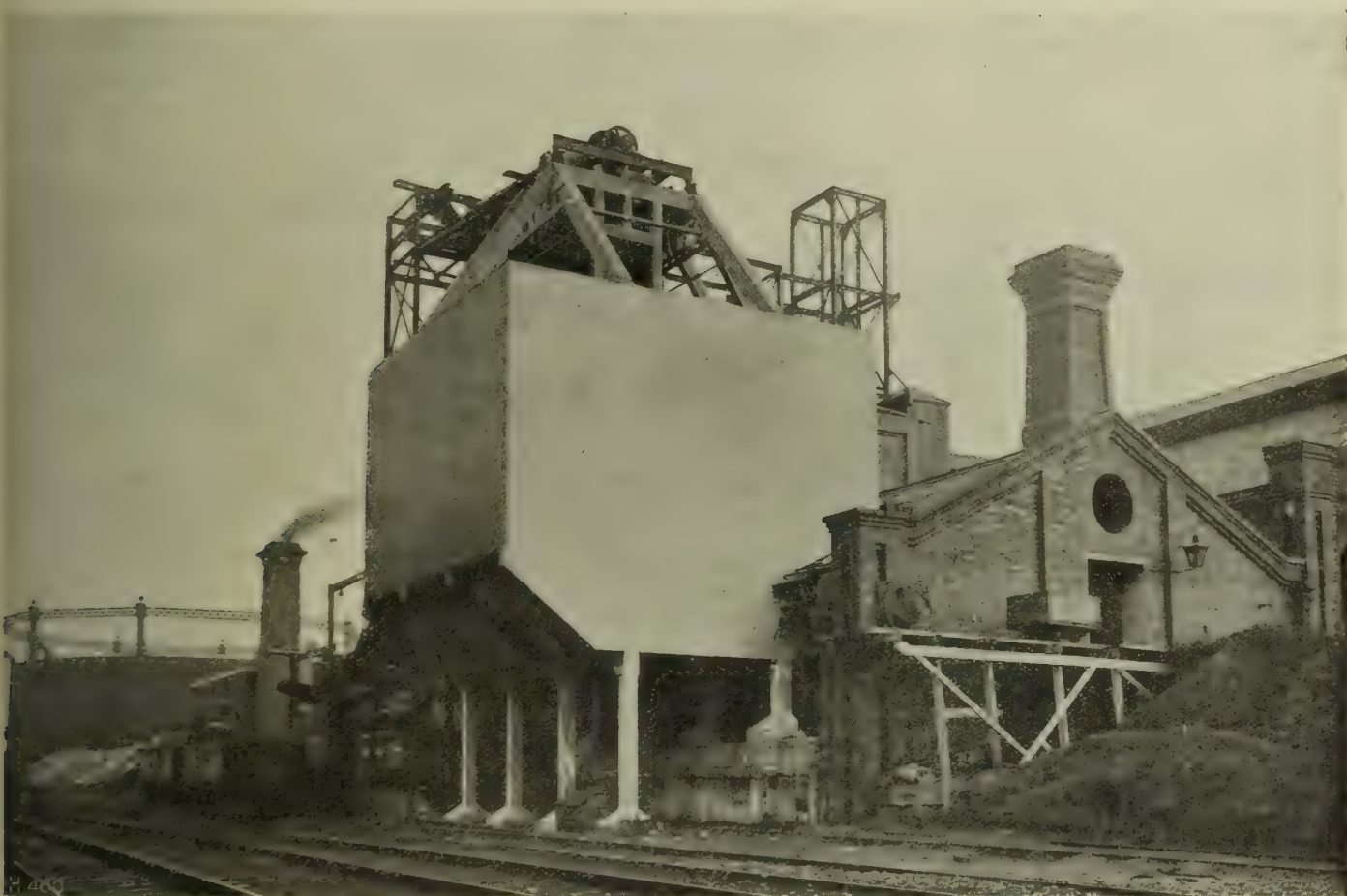


Fig. 1.—Reinforced Concrete Coke-Bunker at Dunfermline.

for the end of the coke-screen, a reinforced concrete structure has been put up within the main bunker, comprising four columns, braced together with diagonals, and supporting a series of inclined and graduated slabs, each so formed as to be slightly concave on its upper surface, and down which the coke will flow, eventually heaping-up within the storage bunker at its natural angle of repose. At the summit of the main structure, as already mentioned, there has been constructed a receiving hopper, having four openings, fitted with hinged steel plates, which will be kept closed until the coke in the main bunker reaches the level of the sliding doors, when these will be released—thus enabling the bunker to become completely filled.

Inclined reinforced concrete beams have been introduced in the design, for the purpose of staying the summit of the structure. The space between two of the large arched stay-beams has been filled in on one side with a reinforced concrete slab—thus forming the bottom of the breeze hopper. The whole arrangement is one of particular efficiency and ingenuity. The position of the main columns in the transverse direction is limited by the presence of the railway sidings, which existed prior to the construction of the bunker; and this necessitated the cantilevering out of two sides of the bunker beyond the columns as shown, and complicating the problem of design. The reinforced concrete columns on the

one side are 12 in. by 12 in. section, and are supported on reinforced concrete bases, the loads from which are again spread by means of a special beam along the length of an existing masonry wall, constructed as a retaining wall, and having a minimum breadth at the top of 2 ft. 6 in. On the other side, the breadth of the supporting columns was necessarily limited on account of the Board of Trade regulations for the clearance of railway traffic; and the section adopted was 12 in. by 9 in. On this side also the loads from the columns are received on reinforced concrete bases, and the loads again spread by means of a special beam.

The ground under this line of columns was found to be of the nature of "forced" material for a considerable depth. This difficulty was dealt with by excavating a broad trench down to the hard—the trench being timbered in the usual manner. After the excavation was complete, the trench was filled up solid with lime concrete—thus practically forming a continuous wall. Above the wall the special beam already mentioned was constructed, and after completing this foundation beam the making of the column bases and columns was proceeded with.

The diagrams (figs. 2 and 3, p. 114) show the method of reinforcing the bottom of the bunker, which is 9 inches thick, and supported on the main reinforced concrete cantilever beams running transversely, and on the reinforced concrete T beams Br

running longitudinally. The method adopted by the Consulting Engineers, of reinforcing the bottom of the bunker, which has an enormous load to carry per square foot of area, is exceedingly interesting. The main reinforced concrete girders are braced top and bottom by reinforced concrete beams at right angles thereto—at the bottom by beams—which, in addition to being calculated and designed as beams, are also further reinforced as struts and ties, and at the top by struts designed and reinforced as struts and ties. Certain of the reinforcing bars of some of the beams are hooked round the buttresses of the end walls; their section being calculated so as to enable them to act as ties as well as struts.

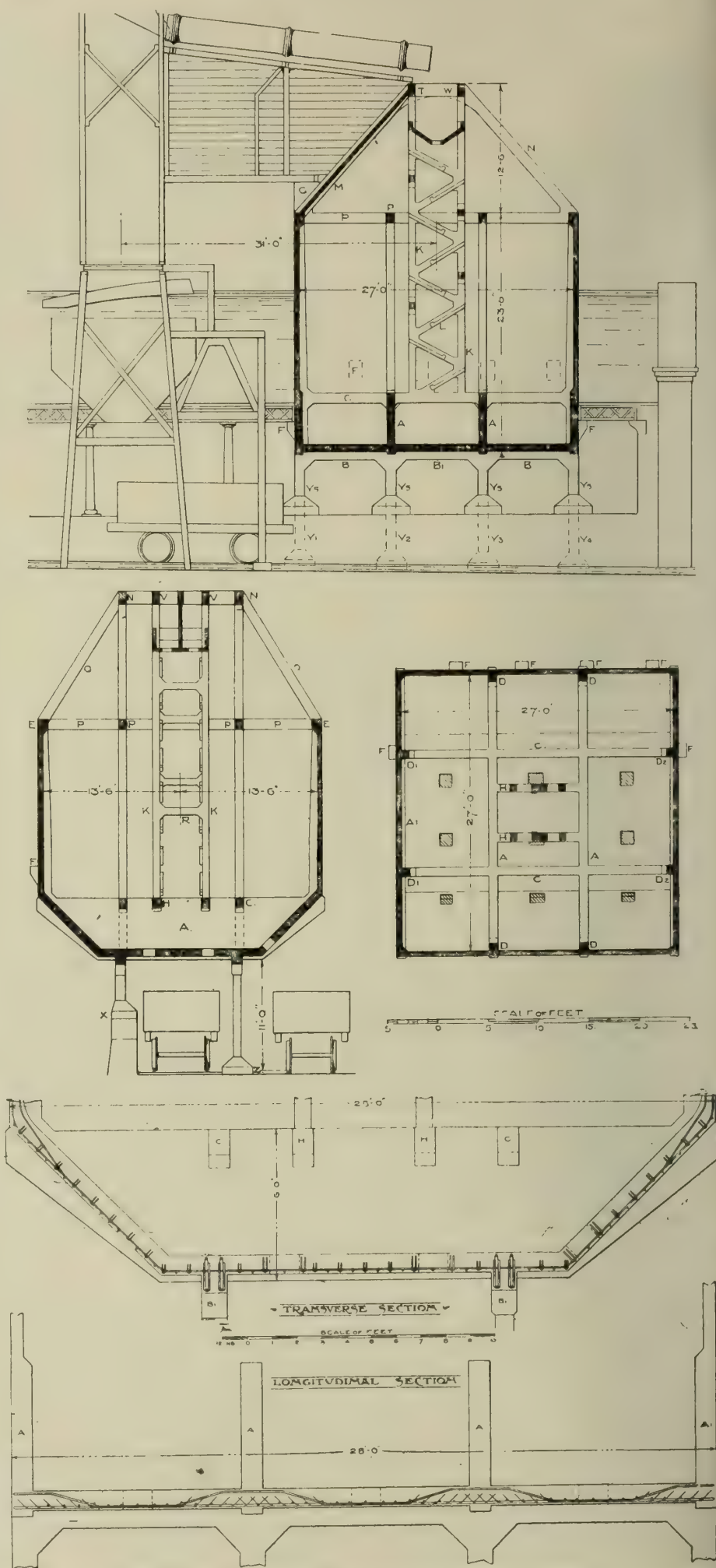
The outer walls of the bunker, resisting the thrust of the contained coke, are 6 inches thick; and their span in the horizontal direction is lessened by the introduction of buttresses or vertical beams, which are held at the bottom by tie-beams, and at the top are received into other beams.

The internal structure for ensuring the downward gradual flow of the coke into the bunker is of itself an exceedingly interesting and somewhat intricate construction, and the general formation of it is shown in fig. 2. It will be noticed that the whole of it is carried on the subsidiary independent beams H, which are again supported by the main cantilever girders A. For greater rigidity, reinforcement of the internal columns K has been carried up, in continuous lengths, from the beams H to the summit of the arched stays N. These columns are strongly braced together by means of the diagonal bracings L and the horizontal struts R, and are also held at the summit by the tie-beams T, V, and W, which support the receiving hopper. The diagonal bracings also serve to receive the inclined slabs; and for this purpose they are constructed with a projecting fillet for part of their length. The coke, as already mentioned, flows down the series of inclined slabs so that it is not broken in its descent, and finally spreads out to its natural angle of repose in the main storage bunker.

A CONCRETE STAND-PIPE.

A reinforced concrete stand-pipe, 90 feet high and 30 feet diameter, located at Empalme, Mexico, and supplying water to the town and to the shops of the Cananea, Yaqui River, and Pacific Railroad, has been described in "Engineering Record." The pipe was filled with water in January last year, after it had been allowed to cure for four months after placing the last concrete. During the first two or three weeks, the entire surface was wet, as if sweating. This slight leakage stopped after three weeks; leaving blotches of efflorescence having the appearance of salt. The stand-pipe is now perfectly dry except one very small spot near the base which remains damp—indicating probably a less dense concrete at this point than in the rest of the pipe. There are indications, however, that this hole, like a number of similar ones, now closed, is gradually being filled with sediment.

It was noticed that the first dampness appeared on the outside of the pipe in horizontal rings at the junction of the old and new concrete where the forms were raised; and whatever efflorescence is still evident streaks down the pipe from these horizontal lines. Since the work was carried up continuously, or as fast as the forms could be raised and the bond of the concrete was made as perfect as possible, the engineer in charge of the structure believes that the weakness at these points indicates that the concrete there was inferior, despite the fact that precautions were taken to secure a good bond by carefully cleaning the old concrete and brushing it with neat cement before depositing the fresh



Figs. 2 and 3.—Sections of Reinforcement of Bottom of Bunker.

concrete. The pipe is located in the centre of the city piazza; and it is the intention to start vines at its base, so that the entire surface will eventually be covered. The structure was waterproofed by using 6 lbs. of Medusa waterproofing compound to each barrel of cement, and painting the inside with one coat of Werco waterproofing cement.

ASSOCIATION OF ENGINEERS-IN-CHARGE.

The Decay of Apprenticeship.

The annual dinner of the Association took place on Saturday, in the King's Hall at the Holborn Restaurant, when a party of considerably over three hundred (including the Lord Mayor, Sir John Knill, Bart.) sat down, under the chairmanship of Mr. Henry Adams, M.Inst.C.E., M.Inst.M.E., the President; the Vice-Chairman being Mr. A. E. Penn. A musical programme was rendered while the dinner was in progress; and the toast list which followed was interspersed with songs.

The Loyal Toasts having been duly honoured, that of "The Association" was proposed in felicitous terms by Mr. Henry W. Hancock, Assoc.M.Inst.C.E., M.Inst.E.E., who coupled with it the name of the President, and highly praised the work performed by the various officers. In the course of his reply, the President expressed his thanks to the Lord Mayor for the great personal honour he had conferred upon the Association by his presence there that evening. They knew that Sir John Knill took great interest in many questions; and one was a matter which affected the Association very closely—that of apprenticeship. He thought that almost all the members had served their apprenticeship, and so were aware of the advantages that ensued from such a course. Their title was the Association of Engineers-in-Charge; but he noticed that nothing was said as to what they were in charge of. In some cases, he feared, they might be in charge of the failures of other engineers.

Sir Alexander B. W. Kennedy, LL.D., F.R.S., submitted "The Lord Mayor, the Sheriffs, and the Corporation of the City of London;" remarking that probably one of the reasons for which they were honoured with the presence of Sir John Knill was that they were an Association nearly all the members of which had passed through an apprenticeship. At any rate, he (the speaker) served five years in Millwall. Of course, among engineers, it had no doubt been easier to keep up the serving of some kind of apprenticeship than in other trades. There had come an odd sort of revulsion—perhaps more in America and Germany than here—and people had gone the length of saying that no practical training at all was necessary. All one needed to do was to go into a polytechnic or college of some kind, from which a youth would be turned out ready to earn his living. Only a few years ago, a really representative Committee was appointed to go into the matter; and the almost unanimous conclusion of the members was that, though it was necessary for a man to get a theoretical training, it was also in all circumstances absolutely essential that he should have a practical training, and that even civil engineers should spend part of their time in ordinary mechanical workshops. The Institution of Civil Engineers, in particular, had shown clearly the great importance they attached to apprenticeship, by making it much easier for a man who had gone "through the mill" to enter any of the grades than one who had not. As he had said, with engineers it had been comparatively easy to keep up an apprenticeship system, and alter it as the years went on to conform to the needs of modern times; and he quite recognized that in other businesses where anything like continuous training had disappeared, the question was a much more difficult one. The members of the Association hoped that some means would be found of overcoming these difficulties, and believed that, when they were overcome, the benefit to the country would be as great in every respect as would be the honour that would belong to the man who overcame them. He himself felt very strongly that it was time the great Trade Unions, who controlled so many men, recognized this matter. It was all very well to devote attention to getting more wages for everybody concerned. He had no fault to find with this. But presently there would come some Trade Union leader who would be more broad-minded than some of the men now were; and he, it was to be hoped, would take for his ideal not simply and solely the man who worked the fewest hours for the largest number of shillings a week (which was really a mean ideal of itself), but would strive to produce the best workmen he possibly could, and would insist that steps should be taken to this end by masters as well as by men. Then he trusted, and believed, they would have the best body of workmen in the world.

The Lord Mayor, in responding, expressed his pleasure at being the guest of the Association, and his regret that the Sheriffs had been unable also to be present. With regard to the Association, he understood that, before joining, all members had practically to be apprenticed. With reference to the apprenticeship system and his scheme—which he hoped would bear fruit—what he really wanted, at the commencement, was to revive the old system of apprenticeship. Plenty of cold water had already been thrown upon him; and he was ready to confess that there were many difficulties in the way. But what thing that was not difficult was worth taking up? Only the other day he was told that a man objected very strongly indeed to his son being apprenticed to a trade; and on being asked the reason, he said: "If my son learns a trade in that way, he will most likely do his work better than I can; and I shall probably have to join the ranks of the unemployed." It seemed he could not realize that, if his son did not study, that son would ultimately join the unemployed.

Owing to the absence through illness of Mr. James Swinburne, F.R.S., the toast of "Our Guests and Friends" was entrusted to

Mr. W. H. Patchell, M.Inst.C.E.; and this was replied to by Judge Rentoul, K.C., and Sir David Gill, K.C.B., President of the Institute of Marine Engineers. "Our President" was submitted by Mr. A. E. Penn, who referred to the good work that Mr. Adams had done for the Association. The President's reply brought this portion of the proceedings to a close.

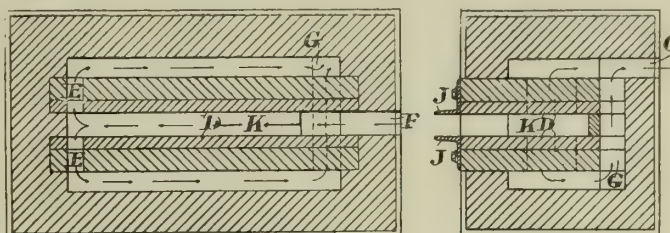
REGISTER OF PATENTS.

Gas-Fired Furnace.

FLETCHER, RUSSELL, AND CO., LIMITED, NEIL, A., and FLETCHER, T. W., of Warrington.

No. 6910; March 23, 1909.

This invention relates to a gas-fired furnace for heating bars, plates, and the like requiring to be hardened, tempered, or otherwise treated; the object being to enable the furnace to be easily and quickly repaired, and to utilize the heat to the fullest extent.



Fletcher, Russell, and Co.'s Gas-Heating Furnace.

The furnace is constructed with a metallic casing or shell lined with fire-bricks; while ledges or supports secure fire-clay slabs D superposed and extending to within a short distance of each end. A narrow space E is formed in the slabs at the inner end of the furnace; and gas-burners are fitted at the end of the casing at F in such positions that the flames pass between the slabs, return partly under the bottom slab and partly over the top slab, and pass thence to the flue G, which is closed to the passage K by a partition. By these means, when repairs are required it is only necessary to remove the bars J and withdraw the defective slabs from the front of the furnace.

Pyrophoric Masses.

BLOXAM, A. G.; a communication from Treibacher Chemische Werke G.m.b.H., of Treibach, Austria.

No. 8163; April 5, 1909.

In this specification, the patentees remark: Pure cerium when exposed to the air becomes coated with a thin layer of what appears to be suboxide, but generally contains a small proportion of nitride; and this layer (in contradistinction to the unattacked metal) has pyrophoric properties. Alloys of the metals of the rare earths which are rich in cerium behave like pure cerium. Now it is a noteworthy fact that this layer is formed more quickly on the most powerfully pyrophoric alloys consisting of rare-earth metals and heavy metals (such as iron, nickel, cobalt, or manganese) than upon alloys which are less pyrophoric. It may be deduced from this fact that, in all probability, the pyrophoric behaviour of all alloys of the rare-earth metals is essentially dependent on the speed with which the suboxide layer is formed. It may be taken as generally true, therefore, that, with the formation of suboxide layers, the pyrophoric power of all rare-earth metal alloys is found to be much increased.

Since the substance constituting the "layer" (termed "suboxide" whatever its true nature) is tolerably stable in air, attempts to manufacture pyrophoric masses of rare-earth alloys having suboxide admixtures in the mass suggested themselves; and the present invention consists in the manufacture of such pyrophoric masses; the preferred procedure being as follows.

The alloy is first reduced to a fine powder or fine chips by abrasion or scraping; air being excluded if necessary. The powder or chips are then compressed by strong pressure in suitable moulds; and the compact mass obtained has a metallic appearance, but is not considerably more pyrophoric than the original substance. The compressed mass is now heated with a suitable oxidizing agent—air is most convenient, in which case the heating is conducted with a volume of air about equal to that of the compressed mass, in a metal casing having thin walls and adapted to be closed. The heating is at first gentle and gradual, but rapid at the conclusion; finally attaining a temperature corresponding with incipient red-heat. A lively reaction ensues; and the mass glows and frites together. The fritted mass exhibits a clear metallic lustre on a freshly filed surface. The embedded suboxide is not visible to the naked eye.

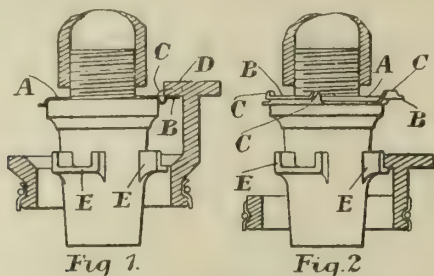
The mass is stable in air like the original alloy, but possesses a higher degree of pyrophoric power than the original alloy—that is to say, the particles separated by means of any tool are more easily inflammable in the air, and smaller mechanical power suffices to produce sheaves of sparks, than with the original alloy. If the proportion of air enclosed is too great, the heating may result in the fusion of the alloy. Such fusion renders the alloy homogeneous again, and the pyrophoric power of the mass is not appreciably greater than that possessed by the original material. If a strongly pyrophoric alloy of cerium and iron is subjected to the treatment described, a mass is obtained, the pyrophoric power of which is so increased that "by lightly drawing a knife blade across it an actual sheet of flame is produced."

Mantle Carriers for Inverted Gas Lamps.

COWAN, T. W., of Rotherham.

No. 9889; April 26, 1909.

This invention has for its object to provide a device whereby nozzles made for supporting one size of mantle-carrying ring can be utilized to support rings of larger diameter.



Cowan's Inverted Mantle Carrier.

The illustration shows a nozzle attached to a gas-supply pipe with a device in accordance with this invention in position. Fig. 1 shows the device supporting a mantle-carrying ring of large size; fig. 2, a mantle-carrying ring of small size carried by the nozzle in the usual way—the device which is provided in accordance with the invention being, in this figure, shown in edge view in place but not in use. The device A is provided with projections B, having their end edges at C turned up to form rests for securely supporting the mantle when the projections D on the ring which carries the mantle have been passed up between the usual projections E on the nozzle and between the projections B of the device, and the mantle and its supporting ring have been turned so that the projections D are brought over and allowed to rest on the projections B. The device is shown as being supported upon the shoulder of the burner nozzle; the opening in the middle of the device enabling it to be slipped over the screw end of the nozzle when it is removed from the gas-supply pipe.

Burners of Incandescent Gas-Lights, Gas-Stoves, Soldering Irons, &c.

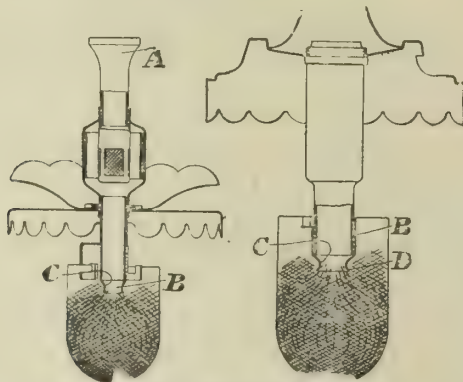
PROSSER, H. R., of King's Heath, Worcester.

No. 10,518; May 4, 1909.

This invention relates to gas-burners of the class having a jet surrounded by a mixing-chamber which is connected to the nozzle by a mixing-tube—such burners being used for heating the mantles of incandescent lights, gas-stoves, soldering irons, bunsen burners, &c., to all of which the present improvements are applicable.

In this class of burners, the mixing-tube connecting the jet with the nozzle is generally of relatively small diameter throughout its length—“probably with the object of preventing firing-back,” the patentee remarks; but this method of construction is open to the objection that considerable frictional resistance is set up to the flow of the gas, while a further disadvantage exists in the shape of the flame obtained, consisting as it does of a long, pointed jet, which is inefficient for heating an incandescent mantle for example.

According to this invention, the mixing-tube is of increased diameter, to reduce the surface-friction and allow the gas to flow unimpeded through it, and to prevent the firing-back which would otherwise occur by reason of the attenuated condition or low velocity of the issuing gas consequent upon the increased area. The mixing-tube is constricted near its outlet so as (in conjunction with the configuration of the outlet described later) to spread the flame into a ball shape, and satisfactorily effect the heating of the mantle or other article.



Prosser's Heating Burner.

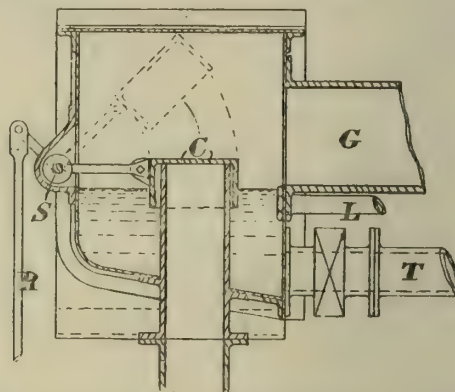
In the form of the invention shown as applied to a small incandescent lamp, and to a larger one, the usual mixing-chamber, air-regulator, and jet are provided; the mixing-chamber A being advantageously extended without any diminution in diameter down to the nozzle B, from which the gas issues. The nozzle is arranged with an internal rib C of semi-circular section, the outermost portion gradually opening out to a bell or trumpet shaped mouth D—a configuration said to be particularly effective in spreading the flame, or causing it to assume a ball shape. In some cases the nozzle B may be a separate fitting (as in the larger form shown) for attachment to the mixing-tube or to existing fittings. “By maintaining the mixing-tube as a spacious chamber to substantially the point of combustion, and by restricting the nozzle from which the gas issues into the mantle, a maximum pressure is ensured at the nozzle; the gas being consolidated or compressed, and thereby expressed from the nozzle in such a manner as to produce a particularly satisfactory flame.”

Anti-Dip Hydraulic Main Valve.

THOMPSON, E., and SIMKINS, F. W., of West Bromwich.

No. 11,787; May 19, 1909.

This invention has for its object an improvement for raising and lowering the caps over the top of ascension pipes, so that the resistance offered by the seal in the hydraulic main, and the usual bend pipes into it, may be dispensed with, and the pressure in the retort relieved, while, at the same time, the advantages of the seal are retained during the process of discharging and charging the retort.



Thompson and Simkins' Hydraulic Main Valve Arrangement.

The caps C are connected by a shaft to spindles S connected by levers to rods or chains R actuated by hand from the retort-house floor. During the period of gas making, the cap is raised into the position indicated by dotted lines; so that the gas issuing from the retort has a free passage from the ascension pipe direct into the hydraulic main, through the bottom of the latter, and thence, by the pipe G, into the foul main. On the other hand, while the retort is being discharged or charged, the rod or chain is released, and the cap falls over the top of the ascension pipe and dips into the liquor, which is maintained at a constant level by a tar-tower in the usual way through the pipe L. In this way, a hydraulic seal is formed, which prevents the passage of gas or air from one side of the seal to the other.

The top of the ascension pipe projects a few inches above the level of the liquor, in order to prevent the liquor from flowing back into the retort.

The level of the bottom of the gas outlet pipe must be intermediate between the liquor level and the top of the ascension pipe; so that in case the pipe L gets stopped up, or the liquor level is raised by any accidental cause, the liquor will leave the hydraulic main by the pipe G before it will overflow the ascension pipe.

The bottom of the hydraulic has a fall from front to back, to facilitate tar being removed by the pipe T in the usual way.

Substance for Igniting Purposes.

KUNHEIM and Co., of Berlin.

No. 16,211; July 12, 1909. Date claimed under International Convention, Jan. 25, 1909.

This invention relates to the production of metallic substances that exhibit pyrophoric properties—that is, small particles detached from them by scratching or scraping with hard objects (files, knives, toothed wheels, or the like) appear in the form of sparks, with which combustible gases can be ignited.

It has now been discovered, the patentees claim, that the hydrides of the rare-earth metals, either singly or mixed together, assume a form that is stable in the air, without impairing their useful properties of producing ignition when they are combined with not difficultly fusible metals, or with hydrides of the latter. The employment of magnesium and aluminium has been found particularly suitable. When the hydrides of metals of the rare earths are used as a basis for the preparation of such combined hydrogeniferous substances, the hydrides are incorporated at a heightened temperature, with some other metal or metallic hydride—more particularly metallic magnesium or aluminium or hydride of magnesium; the amount of the adjunct being selected in accordance with the degree of pyrophoric power desired.

Their invention is thus set forth: The production of (1) Spark-giving substances formed of a hydride of a rare-earth metal or metals fused along with not difficultly fusible metals (especially magnesium and aluminium); these substances being hydrogeniferous and stable in air. 2. A method of preparing highly pyrophoric metallic substances that are stable in the air, and of the kind specified, characterized by the fact that the hydrides of the rare-earth metals, singly or mixed together, are fused along with other metals, especially magnesium or aluminium, or the hydrides of same, and, if desired, subjected to an after treatment with hydrogen. 3. A method of preparing highly pyrophoric metallic substances characterized by the fact that metals of the rare earths, either singly or mixed together, are fused with the supplementary metals, and the resulting substances are heated in a current of hydrogen at a suitable temperature until they acquire the desired degree of pyrophoric power and stability in air.

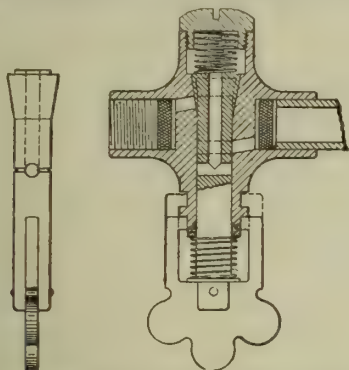
Safety Gas-Cock.

LIDDLE, J.; a communication from the HASTY MANUFACTURING COMPANY, of Chicago.

No. 16,858; July 20, 1909.

This gas-cock (as shown) cannot be accidentally turned on after the gas has been turned off; the construction being such that the cock is absolutely tight either when the gas is turned off or on (thereby doing away with any leakage of gas), as it is necessary to give the thumb-leaf

an upward or a longitudinal movement before it can be turned so as to turn the gas on. In the safety or shut-off position, the thumb-leaf may be turned as much as desired without turning on the gas in the least.



The Hasty Company's Safety Gas-Cock.

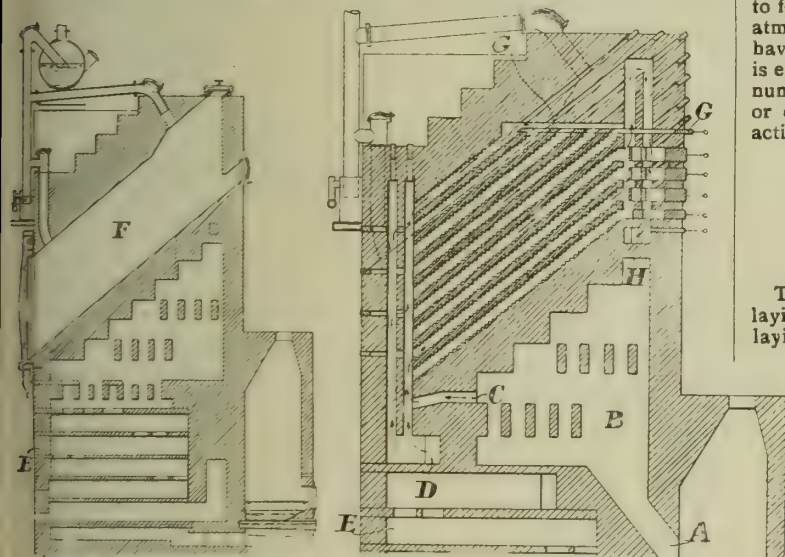
The patentee points out that with ordinary gas-cocks, if the parts are tightened up so as to prevent leakage, they soon wear and become loose, or else the turning on and off of the gas loosens the parts and produces leakage. In the gas-cock shown, there is no chance of a leakage at the top of the valve when the latter is open, if the cap is properly screwed down, or at the bottom of the valve if the packing at the lower portion is in proper shape. The uniform spring pressure on the plunger prevents the tapered portion of it from wearing in the valve-seat and thus becoming loose, as it would do if tightened up by the ordinary screw.

Retort Furnaces.

BRÜKER, H., of Hamburg.

No. 19,419; Aug. 24, 1909.

These retort-furnaces are of the kind in which longitudinal superposed heating flues are provided adjacent to the gasifying chambers to ensure the uniform heating of the side walls of the chambers, and the better regulation and control of the heating flues.



Bröker's Retort Furnaces.

In the retort-furnace illustrated, the heat from the generator passes through the flue-conduit A, the chamber B, and the flue C upwards, in order to combine and burn, in the vertical flues, with the heated air coming from the flue D of the regenerator E. In front of the generator flues, arranged at both sides of each gasifying chamber F, are flues separated from the generator flues by a partition provided with perforations, and connected to the air supply flue D, so as to supply further quantities of air at different levels to the heating gases on rising.

The upper heating gas-flues may be entirely or partly closed by means of a grate valve G adjustable in the horizontal flue shown. The grate valve is adjustable from the charging side of the furnace.

The lower heating gas-flues are shut off from the transverse flue H, leading to the discharge flue, by means of a damming wall or baffle (so as to prevent any excessive draught from acting on them), perforated and used for guiding the valves by means of which the bottom heating gas-flues can be closed singly as required. These valves are perforated in such a manner that, even when one of them is moved to close the corresponding heating flue, the escape of the heating gas from the other flues upwards in the direction of the arrow is not prevented.

The cross section of each of the gasifying chambers F is preferably reduced in the direction of the flow of the heating gases—that is to say, in the construction illustrated, from below upwards. This decrease in capacity is desirable, on account of the fact that the temperature of the heating gases in the flues naturally decreases as the gases approach the outlet.

Mantles for Incandescent Gas-Lamps.

BLOXAM, A. G.; a communication from Sparlicht G.m.b.H., of Remscheid, Germany.

No. 22,703; Oct. 5, 1909.

Attempts have been made, the patentees remark, to provide incandescent mantles with an external retaining rib; and for this purpose,

asbestos threads, platinum threads, or reinforced cotton or other threads (prepared by soaking in solutions, such as silicic acid and its combinations, which, when exposed to high temperatures, change into a vitrified or solid fire-resisting condition) have been used. Thick asbestos threads placed in the light emitting web or woven in with it, and reinforced cotton threads, "leave dark hues in the glowing mantle which absorb a great deal of the light." Besides this, "owing to the intense heat these threads are, generally speaking, far from being very durable."

According to the present invention, threads of quartz or other similar vitreous substance which melts only with difficulty is used to provide an outward strengthening for the mantle. The vitreous substance, however, must be such that the threads do not melt in the bunsen flame usually employed for incandescent lamps; but it does not matter if they become soft, owing to the heat, provided that they are properly fixed.

The quartz threads are placed round the mantle in separate single or multiplex threads and then connected with the retaining ring. Or a network is formed of the strengthening threads which fits as close as possible to the mantle. By carefully handling the mantle the strengthening network may be woven round it. A good form of retaining network is produced by simply inter-crossing threads in such a manner that a certain number of threads emanating from the top of the mantle pass spirally to the right; the rest going to the left. Each thread then goes alternately over and under the threads crossing it, so that a pattern after the mat pattern is obtained—any kinking of the thread being thus prevented, and only slight bends being present. Such a network can easily be made to fit the form of the incinerated mantle.

Vacuum and Pressure Gauges.

SIMMANCE, J. F., of Westminster Palace Gardens, S.W.; and

ABADY, J., of Fountain Court, Temple, W.C.

No. 27,450; Nov. 25, 1909.

This invention relates to gauges of the aneroid barometer type—that is, of the type in which the difference of pressure of the gas inside a flexible metallic box and of the gas outside the box is caused to produce a movement of one part relative to the other, which movement is transmitted to an indicating hand or pointer moving over a dial. The invention consists in, and is restricted to, the use of composite discs, each made from two sheets of metal united together face to face, so as to form one composite corrugated disc. The outer sheet exposed to the atmosphere is of steel, copper, bronze, German silver, or other material having the necessary strength and elasticity. The inner sheet, which is exposed to the gas or liquid, may be of lead, tin, silver, gold, platinum, or other material, selected not on account of its hardness, strength, or elasticity, but solely owing to its properties in resisting chemical action by the particular gas or liquid for which the gauge is designed.

Laying Underground Pipes.

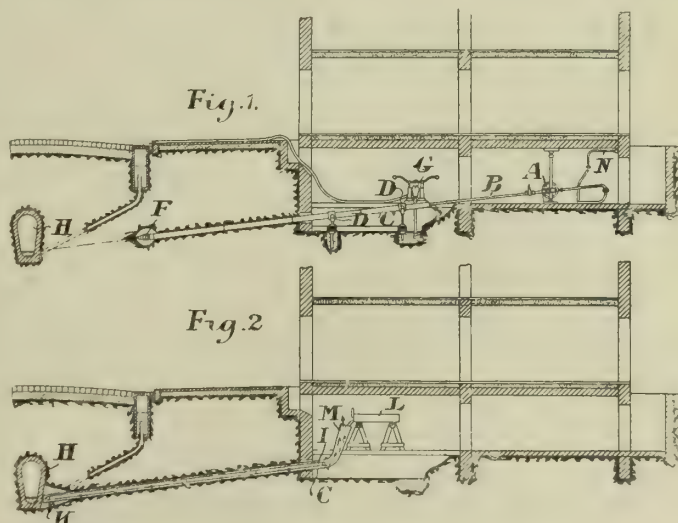
KOEPE, A., of Erkelenz, Germany.

No. 24,473; Oct. 25, 1909.

This invention is applicable for a variety of purposes—such as the laying of underground take-off pipes from houses to street mains, the laying of pipes beneath street surfaces, and so on; and its object is to allow the laying of such underground pipes and connections without sinking any holes, and to enable connections to be made to existing conduits without requiring to sink a hole at the connecting point.

The invention consists primarily in boring a hole larger than the pipe or connecting piece to be laid and filling the space between the connecting piece and the holes of the boring with cement. A lining pipe is preferably forced into the boring immediately behind the drill; a convenient method being to arrange the drill to draw the lining pipe into the hole along with itself. Devices for this purpose are known.

The cross sections shown are through the cellar of a house and part of the underground work of a street, in order to illustrate the method of laying a connecting pipe from the house to an existing street-main



Koepe's Method of Connecting Mains to House Services.

In fig. 1, a rock drill has its rod passing through a tube B; the drill driving mechanism A being arranged to drive a drill F. The tube B is arranged to pass through a lining tube C, which is guided at D. The apparatus is shown as boring a connecting channel from the cellar of a

house to an underground street-main H. Water from a connection N is passed through the tube B to the drill; and this water, together with the material removed by the drill, passes through the annular space between the tube B and the lining tube C. [Such forms of drills are well known and need no further description.] The water and material issuing from the upper end of the tube C is removed by a pump G. The connecting hole is bored up to the exterior of the street-main as shown in fig. 2. During boring, the tube C is preferably drawn in with the head of the rock drill (in the manner well known). The end of the connecting hole near the street-main is preferably widened as at K, fig. 2. The connecting pipe I is now inserted and supported centrally within the tube C; a funnel M being fixed to the end of it, and cement inserted from a trough or holder L. The funnel is then removed, and a drill passed through the pipe I to bore through the wall of the main. By providing a widened part K on the end of the connecting hole, a much larger gripping surface is provided between the connecting pipe and the conduit, while there is no necessity to sink a hole at the connecting point between the pipe and the main.

Purification of Gas.

CHANDLER, S. B., of Streatham, S.W.

No. 214; Jan. 4, 1910.

This invention was described and illustrated last week, p. 26.

APPLICATIONS FOR LETTERS PATENT.

- 7651.—WILLIAMS, G. A., "Gas-regulator." March 29.
 7703.—RICHARDSON, H., "Mantles." March 30.
 7704.—BENNINGHOFF, C., and the firm of AUGUST KLÖNNE, "Chamber and retort furnaces." March 30.
 7717.—FRANKS, E. A., "Gas and water mains." March 30.
 7727.—MACKAY, J., and ANDERSON, J., "Control of gas or like systems or burners." March 30.
 7746.—SAUER, F., "Producing hydrogen gas." March 30.
 7759.—PACE, P. C., "Manufacture of air gas." March 30.
 7766.—FABRY, R., "Recovering ammonia direct from coal gas." March 31.
 7786.—DOHERTY, H. L., "Improvement in processes of treating combustible gases." March 31.
 7794.—HARRIS, H. W., "Gas valves or cocks." March 31.
 7813.—WATKIN, H., "Pyrometers." March 31.
 7845.—WHITE, C., "Gas-engines." March 31.
 7904.—CARTON UND FALTSCHACHTELFABRIK MAX WOLFF, "Package for mantles." April 1.
 7909.—GRIFFITHS, R. A., and GILBART, W. P., "Regulators for coal gas or other gases." April 1.
 7915.—BROUGHAM, F. J., "Removing tar from coal gases." A communication from Solvay et Cie. April 1.
 7919.—WOODALL, H. W., and DUCKHAM, A. M'D., "Continuously working vertical gas-retorts." April 1.
 7925.—ANDERSON, D., "Gas-lamps." April 1.
 7944.—DICKIN, N., "Gas-irons." April 1.
 7947.—MASTERMAN, C. E., "Receptacles for mantles." April 1.
 7951.—LAMKIN, A. E., and HUNTER, L., "Electrical ignition of gas." April 1.
 7967.—TURNER, J. H., "Mantles." April 2.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Sulphur Purification.

SIR,—In reference to your notice of the paper, on "Some Points in the Purification of Gas from Sulphur," by Messrs. R. Ross, F.I.C., F.C.S., and J. Race, A.I.C. [p. 41 of "JOURNAL" for April 5], I have read with great interest the account of their experiments on the estimation of H_2S by means of iodine, and especially the discrepancy they found to be due to another constituent of the gas.

I have for some time been devising a process for the estimation of CS_2 and H_2S in ordinary coal gas by means of iodine, to replace the old and inefficient lead sulphide method, for controlling the working of the purifiers; and, as far as total sulphur compounds are concerned, the estimation is simple, rapid, and accurate. But, in endeavouring to apply the process to the estimation of H_2S , I met with the same difficulty as the authors of the above paper—i.e., there was an absorption of iodine on a test with "clean gas."

My investigations in the matter have led me to the conclusion that this absorption is due almost entirely, if not wholly, to HCN; and a series of comparative estimations with a standard test are now being carried out to prove the point.

A complete description of the process will shortly be given in the "JOURNAL;" and if HCN be proved to be the only other reacting constituent, it should be possible to embody its estimation by the same apparatus.

South Metropolitan Gas Company,
 Bankside, S.E., April 8, 1910.

C. WINTHROPE SOMERVILLE.

Yield of Gas in Vertical Retort Systems Compared.

SIR,—Mr. W. R. Herring, in his interesting communication to the informal meeting of Scottish Gas Managers, on the subject of vertical retorts, is reported to have said that in his opinion the higher yield per ton from these as compared with horizontals is due partly to the absence of the hydraulic main. May I point out that this cannot apply to the Dessau verticals, because these are invariably worked with the hydraulic

main, while the results obtained from them compare favourably with those obtained from any other system.

Take, for example, the multiples derived from the figures given in the recent report of the Bradford Corporation Gas Sub-Committee, which are as under.

| | Gas per Ton. Cubic Feet. | Candle Power. | Multiples. |
|---|-----------------------------|------------------|------------|
| Sunderland verticals | 12,028 | 17½ | 210,490 |
| St. Helens (Glover-West). | 12,400 | 16 | 198,400 |
| Bournemouth (Woodall-Duckham) | 14,000 | 14 | 196,000 |

Your readers are doubtless aware that the Sunderland test which furnished the above figures was made for his Directors by the Company's Engineer, Mr. C. Dru Drury, with the second-class unscreened Durham coal in ordinary use at the works.

C. HOLMES HUNT, Secretary,
 Vertical Gas Retort Syndicate.

17, Victoria Street, S.W.,
 April 9, 1910.

Direct Sulphate of Ammonia Manufacture.

SIR,—Owing to great pressure of work, I have been unable up to now to reply to Mr. G. Stanley Cooper's answer, in the "JOURNAL" for the 15th ult., to my statement *re* the absence of tar in sulphate made by the Otto-Hilgenstock recovery process.

Mr. Cooper suggests in his letter that if I could give the results of a large number of analyses, my results would be more "convincing." He also adds that "while one crystal may be perfectly pure, another might be found to contain a moderate amount of impurities." The sample to which I referred was taken while on a tour of inspection through Westphalia last October, by my Assistant, Mr. G. L. Huds-peth, from a bulk lot of more than 100 tons at the Zeche Vondern plant. For the rest, I am not likely to impose upon yourself or your readers the analysis of a single crystal!

As regards the estimation of tar in sulphate, the method I employ is to shake up 10 grammes with 50 c.c. of chloroform, which wholly dissolves any tarry bodies that may be present; giving a faintly brown solution, which may then be calorimetrically compared with similar solutions from other makes of sulphate. Apart from this, however, the bare colour of the sulphate itself is a sufficient guide in forming an opinion on freedom from tar or otherwise. Concerning the presence of sulphur in direct-recovery sulphate, the sample on which I based my statement was completely soluble in water. Having regard to the fact that sulphur is insoluble, I need not say any more.

Brackley Coke Works, Little Hulton, April 4, 1910. ERNEST BURY.

Coke-Oven Gas Schemes.

SIR,—With reference to your editorial notice of the Brackley coke-oven gas scheme, it may be thought by your readers that this is the first public supply of such gas in this country. This is, however, not the case, though hitherto it has not been found necessary to obtain parliamentary powers in the matter.

The Parish of Canklow has been supplied for more than five years with gas from 65 Simon-Carvè's ovens, erected at the works of Messrs. J. Brown and Co., Limited, of Rotherham; the quantity of gas supplied per day being about 50,000 cubic feet.

Since its inception, the supply has been regular, and has given the utmost satisfaction; and the majority of the users are probably not aware that it is coke-oven gas they are burning.

In justice to one of the earliest, if not the first, works in this country supplying coke-oven gas for domestic lighting, I venture to hope that this note will warrant inclusion in your pages.

Victoria Chambers, Leeds, April 7, 1910.

H. W. SEYMOUR.

Mr. Grafton's Paper on "Gas Combustion"—A Correction.

Mr. Walter Grafton writes to point out that, while the burners illustrated on p. 42 of the last number of the "JOURNAL" are properly described in the lines beneath them, the numbers do not agree with the figure references in the paper, a type-written copy of which was supplied to us. Fig. 1 is correct; but the other references in the text should be altered as follows: Figs. 2 and 3 (in line 8 of the lower half of the second column of p. 42) should be figs. 3 and 4; fig. 4, referred to later, should be fig. 5; fig. 5 should be fig. 2; and figs. 6 and 7 should be transposed—the former and not the latter being the "Universal" 24-hole argand burner mentioned in the text. Readers of the paper probably noted at the time, and allowed for, the alterations now pointed out.

Gas v. Electricity for West-End Lighting.—The substitution of gas for electric light in Regent Street, Pall Mall, Piccadilly, and the neighbourhood, was considered at a meeting of leading Regent Street tradesmen at the Café Royal last Friday; and the Westminster City Council are to be petitioned to postpone acceptance of a gas contract until the matter has been fully considered by the ratepayers of these thoroughfares.

Salford Corporation Coal Contracts.—The Salford Town Council at last Wednesday's meeting approved of the following minute passed by the General Purposes Committee: "That the Gas Committee be instructed to advertise for fresh tenders for the supply of coal and cannel required at the several gas-works during the ensuing twelve months, with an intimation that the lowest price must be quoted, and that no reduction or rebate will be expected." At a meeting of the Gas Committee held previously, tenders for coal and cannel were considered, and also the financial effect on the gas undertaking of the resolution passed by the Council on the 7th of July last year, directing that the prices paid should be published on the Council's agenda. It was decided that the Mayor should be requested to call a meeting of the General Purposes Committee to review the situation with regard to the tendered prices for coal and cannel.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Brighton and Hove Gas Bill.

Bills read the third time and passed: Gowerton Gas Bill, Southend Water Bill.

The Aberdeen Corporation Water Bill has been read a second time and referred to a Select Committee, consisting of Lord Gorell (Chairman), the Earl of Stradbroke, Lord Sackville, Lord Deramore, and Lord Dawnay, who commenced sitting last Thursday.

Lord Sandys and Lord Templemore have replaced Lord St. Levan and Lord Blyth as members of the Select Committee on the Gas Companies (Standard Burner) Bills.

The Lord Chairman of Committees informed the House last Wednesday that the promoters of the Ammanford Gas Bill did not intend to proceed further with the Bill.

Lord Wemyss gave notice last week that he would call the attention of the House to the following resolution, which prior to the late General Election stood in his name, and to the important public bodies that approve of it: "That, in the opinion of this House, it would be for the public good that important trading and other representative societies should each name three members of the existing peerage in the current and each succeeding Parliament to speak and act on behalf of such societies on all questions in which they are interested; and that the names of the Peers so nominated be entered in the Journals of the House." Among the approving bodies are the Gas Companies' Protection Association, the Junior Institution of Engineers, the Society of Engineers (Incorporated), the Surveyors' Institution, the Machinery Users' Association, the Employers' Parliamentary Council, representing thirty central associations connected with the chief industries of the United Kingdom, and the London Chamber of Commerce.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Gowerton Gas Bill, Southend Water Bill.

Lords Bills read a second time and committed: Farnham Gas and Electricity Bill, Wicklow Gas Bill.

Bills reported: Little Hulton Urban District Council Bill, Mallow Gas Bill [parties do not proceed], Mallow Urban District Gas Bill, Pontypridd Water Bill.

Bills read the third time and passed: Brighton and Hove Gas Bill, East Grinstead Gas and Water Bill.

The Standing Orders Committee reported on Tuesday that in the case of the application of the Cudworth Urban District Council for leave to deposit a petition for a Bill, to which reference was made last week, the Standing Orders ought not to be dispensed with; but that the Glasgow Corporation should be allowed to insert in their Bill the additional provision relating to the acquisition of the undertaking of the Baillieston Gas Company, if the Select Committee on the Bill think fit. A similar decision was subsequently come to by the Standing Orders Committee of the House of Lords.

Last Wednesday, the House expressed concurrence with the Lords' resolution as to referring the Water Supplies Protection Bill to a Joint Committee of the two Houses.

Last Tuesday, Mr. J. D. Rees (Montgomery) asked the President of the Local Government Board whether he had in contemplation any scheme for the improvement of sanitation and water supply in villages in Wales. Mr. Burns, in reply, said it was not the province of the Board to make such schemes. Under the Public Health Act and other Acts, the necessary powers for these purposes were vested in the urban and rural district councils. The Board had granted many loans for such improvements in villages in Wales, and applications for sanction to further loans were under consideration. The Board were doing what they could to urge and encourage local authorities to carry out such schemes, where they appeared to be necessary or desirable.

GAS COMPANIES (STANDARD BURNER) (No. 1) BILL.

House of Lords Committee.—Thursday, April 7.

(Before Lord RITCHIE, Chairman, Lord WILLOUGHBY DE BROKE, Lord TEMPLEMORE, Lord SANDYS, and Lord VIVIAN.)

This Bill is promoted with the object of providing, in the case of certain gas companies, for the adoption of the "Metropolitan" argand burner No. 2 as a standard burner, in substitution for the various burners now in use for the official testing of the illuminating power of the gas supplied by them, and for other purposes. It is linked with two other Bills (known as Nos. 2 and 3); the promoters of the three Bills being the following Gas Companies:

No. 1 BILL: Brentford, Croydon, Hastings and St. Leonards, Ilford, Liverpool United, Maidenhead, Scarborough, Swansea, Torquay, and Wandsworth and Putney Gas Companies.

No. 2 BILL: Berkhamstead, Bournemouth, British (in respect of their Staffordshire Potteries, Trowbridge, and Holywell Stations), Cambridge University and Town, Chigwell, Loughton, and Woodford, Faversham, Harrow and Stanmore, Hatfield, Hemel Hempstead District, Herne Bay, Newmarket, Ormskirk, Prescot, Radcliffe and Pilkington, Reading, Shrewsbury, Tunbridge Wells, Waltham Abbey and Cheshunt, West Kent, and Worthing Gas Companies.

No. 3 BILL: Aberdare and Aberaman Consumers', Bath, Exeter, Gloucester, Godalming, Guildford, Hampton Court, Ipswich, Mid-

Kent, Newport (Mon.), Plymouth and Stonehouse, Richmond, Romford, Southampton, Walton-on-Thames and Weybridge, Weston-super-Mare, and Wolverhampton Gas Companies.

The Brentford, Wandsworth and Putney, Gloucester, and Newport Companies, after being among the original promoters, withdrew from the Bill.

For the promoters, Mr. J. D. FITZGERALD, K.C., Mr. HONORATUS LLOYD, K.C., Mr. HUTCHINSON, and Mr. A. M. PADDON appeared. Various local authorities, who were petitioners in opposition, were represented by Mr. RAM, K.C., Mr. J. G. TALBOT, K.C., and Mr. COURTHOPE MUNROE.

Mr. FITZGERALD, in opening for the promoters, said there was one question, and one only, raised by each of the three Bills, and that was the adoption, for the purpose of testing gas, of the "Metropolitan" argand No. 2 burner. These Bills were promoted by a number of gas companies, who might have promoted either one Bill, or 47 different Bills; but after unofficially consulting the Speaker's Counsel, they determined to adopt his advice, and split up the Bills into three. In the first Bill, they put companies as promoters of different descriptions; so that every question that was likely to arise in the course of the discussion could be raised on the first Bill. He asked the Committee, therefore, to decide the matter of principle on the first Bill; and if any question of detail remained, it could properly be raised by any of the local authorities who were opposing Bills Nos. 2 and 3. The local authorities who were opposing the Bills had adopted the very reasonable course of uniting their opposition, recognizing that it was substantially the same. Bill No. 1 was promoted by eight companies. The "Metropolitan" No. 2 burner was prescribed some five years ago by the London Gas Referees, under their parliamentary powers, for the purpose of testing the illuminating power of gas by the Metropolitan Gas Companies. They had prescribed it as the best burner for testing the gas supplied in the Metropolis; and, accordingly, it was used by the Metropolitan Gas Companies. Their example had been followed by eighty gas companies and local authorities. The Board of Trade, who were the Public Department in whom the supervision of gas supply remained, had also adopted the No. 2 burner as the best one for testing illuminating power; and in all Provisional Orders that were granted by the Board of Trade at the present time the new burner was inserted. Finally, the authorities of the House of Lords, in the Model Clauses which they issued every year, had adopted the burner as the one best suited for testing gas. So the result of five years' experience was that burner No. 2 was admittedly the best burner at present known for testing purposes. The companies who were promoting this Bill desired to avail themselves of the modern practice, and to bring themselves into line with the London Gas Companies and the other eighty authorities he had mentioned. There could be no real question that the No. 1 burner was not a suitable one for testing gas of lower than 16-candle power; and as long ago as 1890 Mr. Vernon Harcourt, the Senior Gas Referee for London, stated publicly that, by the use of the No. 1 burner, any deficiencies of the gas were greatly exaggerated. Counsel proceeded to give an outline of the revolution produced by the introduction of the incandescent burner, and the resulting alteration in the practice of Parliament as to the illuminating power. He dwelt on the proceedings of the Board of Trade Departmental Committee in 1904, who recognized the defects of the No. 1 burner for testing 14-candle power gas, and pointed out that when the No. 2 burner was invented it overcame the difficulty, because it was equally suitable for testing 16-candle power or 14-candle power, or any other quality of gas. Hitherto every company or corporation who desired to have this burner was required to promote a separate Bill or Provisional Order; but the companies who promoted this Bill thought it would be better, instead of waiting until the time when it would be necessary for them to go to Parliament for general powers, to promote a Joint Bill for the purpose. He submitted that there ought to be some finality in a matter of this kind, especially when Parliament had over and over again given leave to use this burner. So far as he knew, there was no case where this leave had been refused. In the present instance, although he knew there were some gentlemen connected with the gas industry who always disagreed with other people, and who thought that the No. 2 burner was not a good one, nevertheless he did not anticipate that their opponents would really suggest that the No. 2 burner was not the best for testing the illuminating power. It really was too late to contest this after what had happened within the last five years. But whenever a gas company came before Parliament, there was always an attempt to squeeze a little out of it. In this case, a good many of the local authorities in the districts of these companies, being well advised, had not sought to oppose the adoption of the burner. But what he anticipated Mr. Ram would say was that the gas companies, by relieving themselves from the use of an unsuitable burner, were getting an advantage. They would say that, though the companies were required to provide only 14-candle power gas, owing to the defective burner for testing, they had in fact had to supply 15-candle or 15½-candle gas; and that if they were relieved from this disadvantage, they should reduce the price of gas. In one sense this was perfectly true; but the answer to it was this, that it was a disadvantage from which the company ought never to have suffered, because it was clearly the intention of Parliament, as shown in the London Gas Act, 1905, that the burner to be used for testing should be the most suitable one for obtaining the full illuminating power, provided it was a burner that was practicable for use by ordinary consumers. The "Metropolitan" No. 2 burner answered these conditions. Further, where there was any improvement in the manufacture of gas, it was the consumer who almost always got the bulk of the advantage. In the eighty cases in which Parliament had allowed this burner to be substituted for the old one, there was only one instance in which any alteration was consequently made in the price of gas. Certain of these companies were under the sliding-scale; and where there was any increase in the dividend, the consumer got a corresponding reduction in price. There were three maximum dividend companies among the promoters of the first Bill, all of whom were paying their maximum dividend. Therefore every advantage which resulted from the use of this improved burner would go, not to the shareholders, but to the consumers. In these circumstances, it was preposterous to ask that, in addition to getting the whole of the advantage from the use of the proposed burner, they

should get a reduction in price as well. The saving per candle was about $\frac{1}{2}$ d. per 1000 cubic feet. The position of the companies was that they were now bound to supply 14-candle power gas; but, by reason of the defective burner in use, they were, in fact, supplying 16-candle gas. They would therefore save $\frac{1}{2}$ d. per 1000 cubic feet by the adoption of the new burner. Of this $\frac{1}{2}$ d., four-fifths would go to the consumer, if he were served by a sliding-scale company; and if it were a maximum-price company, paying the maximum dividend, the consumer would get the whole advantage. The regulations in the schedule to the Bill went beyond the provisions in the Model Bill; but they went beyond it with the intention of making the test more perfect, so that they were not disadvantageous to the consumer. Some of the local authorities who were petitioning against the Bill had objected to this difference; and if their objection were insisted upon, rather than have a contest on the question, he was perfectly prepared to accept the provisions of the Model Bill. The question of a calorific test did not properly arise on this Bill; but if it were contended that the alteration of the testing burner involved this question, he would reply that there was not a single case where Parliament had placed the test for calorific value, in addition to the test for illuminating power, on an unwilling company. If the time ever came when Parliament should do away with the test for illuminating power, and substitute the test for calorific power, he had no doubt it would be done by a General Act, like the Gas-Works Clauses Act. But in the present state of knowledge, in which it was hardly possible to frame a calorific power test that would be suitable for a large number of companies, it would be perfectly unreasonable to make an ordinary gas company have both tests.

Mr. RAM said it would not be denied that this application was absolutely unique.

Mr. FITZGERALD replied No. A similar question arose about sulphur compounds a few years ago; and then 17 companies combined for the purpose of getting rid of the provisions in their respective Acts relating to sulphur compounds. The Bill was passed by Parliament; and this Bill went on exactly the same lines. Following that, the next session there was another Bill dealing with 12 companies.

Mr. RAM replied that these Bills dealt with a matter which was identical in the circumstances of every one of the companies affected. The application in this case was highly inconvenient, because it sought, in circumstances which differed with every company, to apply the same method of testing to all the companies. It would be impossible for the Committee to say what ought to be done in all these cases to give to the consumer the concurrent advantage to meet the change made. Of the companies affected, 21 had a maximum price, and 26 a standard price; and the candle power presented varied between 14 and 16. In one case, that of Liverpool, it was 20 candles; but the Bill proposed that a hard-and-fast rule should be applied to all the companies. The test burners used also varied greatly. Twenty-three companies had the argand No. 1 and 15-candle power; thirteen companies had the No. 1 and 14-candle power; four of them had the argand 15-hole burner, which was quite a different thing; and there were other variations. If they proposed to institute entirely new tests in all of these instances, without inquiry into each individual case, they must inflict great injury on the consumers. Moreover, the Model Bill prescribed four tests—the candle power, the burner, the photometer, and the standard light. It was only by taking all four tests that they could arrive at what the light really was; but the promoters proposed to take only one. It was not denied by the companies that the adoption of the new burner would be an advantage to them—indeed, in the Brighton and Hove case, this session, a reduction of $\frac{1}{2}$ d. per 1000 was made as compensation to the consumers for the change. The present Bill was really a misuse, if not an abuse, of the processes of Parliamentary Committees; and it ought not to proceed.

Mr. FITZGERALD said it was not the case that with each one of these companies a separate question arose. Out of the 47 companies, 40 had the No. 1 burner; and in each case what they asked was to substitute the No. 2 burner.

The room having been cleared in order that the Committee might consider this point,

The CHAIRMAN subsequently announced that they had decided to take the Bill as presented to them, and to hear the evidence.

Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, was the first witness called. He said the defect of the argand No. 1 burner arose from the fact that, if the gas did not happen to be of the particular value for which the burner was made, far too much air went up the chimney and over-burnt the flame. To meet this defect, he devised the No. 2 burner. It was the outcome of the examination of Professor Harcourt before a Parliamentary Committee by the Duke of Wellington. The Duke had given considerable attention to the subject, and had come to the conclusion that it was necessary to obviate the defect of the old burner by having some method of adjusting the air supply. The main point of difference between the No. 2 and the No. 1 burner was that the former had an adjustment for regulating the in-flow of air. The damper was screwed up or down, as the case might be, and thus increased or reduced the supply of air. With regard to the claim for a reduction in the price of gas, he would point out that the position of gas companies was very different from what it was 25 years ago. It was now a hand-to-hand fight between themselves and the electricians; and until they had the condition of affairs which the new burner provided, they were fighting with one hand tied behind their backs. They had to spend very large sums of money in "adulterating" the gas—that was, they had to enrich it with added material in the form of canal, oil, or spirit, in order to make it pass the test. The gas companies existed because they could supply light at a cheaper rate than the electrical companies; and they were enabled to do so in London, at any rate to a great extent, by the freedom which the altered method of testing had given them. This had enabled the companies in many cases to dispense with artificial enrichment; and in other cases the necessity for enrichment was not so great as it was. The general effect of the improvement had been beneficial to the consumer. To-day they had to do a great deal for the consumer to induce him to take gas. They had to give him free service in many ways. They put his pipes, his burners, and his gas-fires in order for him, and did all that was necessary to make him a contented con-

sumer. All this had to be paid for, and, compared with 25 years ago, it was quite possible that the value of these services to the consumer reached a figure equal to $\frac{1}{2}$ d. or $\frac{3}{4}$ d. per 1000 cubic feet on the price of gas. Although this was tantamount to a reduction in price, they got no readjustment of the sliding-scale in recompense for their increased expenditure. If they reduced their gas $\frac{1}{2}$ d. per 1000 cubic feet, his Company were allowed, under the sliding-scale, 2s. 8d. in the pound more dividend; but if they gave the consumer a free service, which was equivalent to $\frac{1}{2}$ d., they got no extra dividend. The position of gas companies had also been altered by the rise in the price of coal. All authorities on the subject had stated that, as the result of the Eight Hours Act, there must be a permanent increase in coal prices.

In cross-examination, witness said he would agree that any burner which was not suitable for the lighting of a room was not suitable for a test burner. He did not imagine that there was a single No. 2 burner in use by the consumers.

Mr. RAM: I thought that would be your answer.

Witness: I am not going to leave it there. What is true of the No. 2 is equally true of the No. 1 argand. No. 1 was commonly in use when gas lighting was done by means of the self-luminosity of the gas. With the change to incandescent burners, it fell out of use; but if the lighting had to be done by self-luminosity, the No. 2 burner would be as common as the No. 1 was in the old days. The No. 2 burner gives truer results to the company using it. Both the company and the consumer get an advantage from it.

Is not there a further advantage?—I confess I do not know what you are driving at. Will you suggest another advantage?

I suggest that what you are supplying by that burner to the public is an article less good than he is entitled to?—Less good for some purposes perhaps; but for some purposes it is even better.

For what purposes is the value depreciated?—If the gas is used in a flat-flame burner. By most incandescent burners the consumer gets as good or even better value.

Is the difference between the "Metropolitan" No. 2 and the No. 1 argand practically 2 candles?—Under certain circumstances it would be. There is a loss to the consumer of about one candle in theory, but not in practice. The same argument was put forward when the South Metropolitan Company reduced their illuminating power from 16 candles to 14 candles. It was prophesied that, as a result, the consumer would burn 40 per cent. more gas. We found, in fact, that, from the time the change was made, consumers burnt less gas than before.

Mr. W. J. Atkinson Butterfield expressed the opinion that it would be beneficial to have uniformity in the matter of testing burners, and to bring the provincial companies in this regard into line with the London companies.

Mr. W. C. Young, the Gas Examiner to the City of London, also said he was strongly in favour of the substitution of this new burner for testing purposes.

Mr. J. W. Helps said the old burner was unfair to the companies, and it would be an advantage to the consumer to get rid of it, and to substitute the more modern burner.

In cross-examination, witness said it seemed to him that the users of flat-flame burners were so few, and they were able at such small expense to substitute incandescent gas-burners, which would greatly reduce their gas bills, that they were not worthy of consideration. It was possible that flat-flame burners would not give so good a light, but that only applied to certain kinds of flat-flame burners. Other users of flat-flame burners would not be prejudiced.

Mr. Edward Allen, the Engineer to the Liverpool Gas Company, said his Company at present tested their gas with flat-flame burners, using 20-candle power gas; but that burner was not fair to the Company, and they desired to adopt the new burner.

In cross-examination, witness said he was no longer an advocate of high-grade gas. He was now satisfied, after careful observations, that, in respect to incandescent burners, low-grade gas was the most suitable. In respect to heating, also, he was convinced that low-grade gas would be better. There were 60,000 slot-meters in Liverpool; a great proportion of these consumers using flat-flame burners. But although this was a large number, the users of these meters represented usually only one burner.

Friday, April 8.

When the Committee met this morning, evidence was given by

Mr. Corbet Woodall. He said the companies would reap some advantage from the adoption of the approved burner, and the consumers would benefit from any saving there might be in the cost of manufacture. In the case of a company having a maximum price and a maximum dividend, any saving effected would go fully to the advantage of the consumer in the shape of a reduction in the price of gas; and in the case of a sliding-scale company, the effect would be to give the consumer, on an average, four-fifths or five-sixths of the saving. The effect of making an alteration in the price would be to hurt the sliding-scale company to the extent of the dividends they would be able to pay; but it would not affect the maximum-price company at all. The interest of the maximum-price company was to supply gas at as cheap a rate as it could, because of competition. He did not agree with the opponents of the Bill that there should be a reduction in the standard price. On other occasions he had expressed his strong antipathy to a reduction of the standard price fixed by Parliament, on the ground that the capital had been subscribed on the strength of the standard price and standard dividend. The conditions, if the standard price were reduced, under which a company would be able to supply would be affected. It was reasonable to suppose that the greater the disparity between the selling price and the standard price, the greater being the security of obtaining the dividends, the higher would be the premium. The consumer benefited by getting a larger sum of money, and the price of gas would be lower. He had not found any objection among local authorities to adopt a more scientific burner; and the consumer could not be prejudiced in any way. They were prepared to take either the calorific test or the illuminating test; but it would be a mistake to have the two, because there was a great deal of dispute about tests, and the two did

not necessarily go together. Certain circumstances fitted the one test that would not fit the other. In the present case, the variation in the illuminating power was not necessarily accompanied by a variation in the same ratio in the calorific value. There was only one company in existence at present that was subject to a calorific test—namely, the Gaslight and Coke Company. In this case, it was agreed to insert the test in the Bill between the Gas Company and the London County Council. This had not been accompanied with any special inconvenience; but it had been found that when working with a certain illuminating value, the Company were not able to maintain the calorific value specified. It was, however, quite a temporary arrangement; and at the end of three years the Company and the County Council were at liberty to consider the amount of the standard as to calorific power. On the question of the illuminating power and the calorific standard, he said there was no doubt whatever that the calorific standard was by far the more important; but he thought it would be folly, and perhaps even useless, to have the two. The insertion of a calorific standard in the Gaslight and Coke Company's Bill was a matter of agreement between the London County Council and the Company before actually coming to Parliament. It was recognized by the County Council; and the information available was not sufficient upon which to fix a definite calorific standard for all time. It was, in fact, made provisionally for three years.

In reply to Mr. MUNRO, witness said that the calorific value was certainly most important in cases where a great deal of work was done by gas-engines. In Liverpool, the gas was of 20-candle power, and gas-engines were used. As to whether there would be any difference in the results obtained by testing gas with the No. 1 burner and the "Carpenter" burner, he said it all depended on the quality of the gas. With 16-candle power gas, the adoption of the "Carpenter" burner would make but little difference; but if it were 14-candle gas, a very considerable difference would be shown. If gas of 16-candle power were tested with the No. 1 argand, and then with the "Metropolitan" No. 2, it would be possible to show a difference which he would put at half-a-candle. In all cases there was a difference between the results of the two tests—a high-grade gas showing a small difference and a low-grade gas a big difference. If the suggested burner were adopted in the present case, he agreed that they would be selling an article having a different illuminating value for the same price; but the tendency would be to reduce the price. He thought that it was quite a fair proposition.

Mr. MUNRO: If we establish a case to the Committee that you will be selling an inferior article at the same price, ought it not to be referred to somebody to determine the difference?

Witness: I think definitely not. The company, with the object of increasing its business, would supply at the cheapest rate.

Continuing, witness said there would be a saving which, in the first place, would go to the company; and it must be conveyed on to the consumer. The saving that would be effected could not stop in the pockets of the company. He objected to any alteration of the standard price. He did not agree that for every candle less supplied there should be a reduction of $\frac{1}{3}$ d. in the standard price.

In answer to Mr. FITZGERALD, witness said that the Liverpool Gas Company were the only company in England who now supplied 20-candle power gas. They were a maximum-price company paying their maximum dividend; and under the gas legislation of the country, any surplus profits they made they were obliged to devote to the reduction of the price of gas.

In answer to a question by the CHAIRMAN, it was stated by Counsel that in the Bill there were four maximum-price companies and four sliding-scale companies; in the three Bills, there were 21 maximum-price and 26 sliding-scale companies.

Mr. Wm. Cash said that of late years the cost of distribution had greatly increased, partly on account of the use of gas by small consumers, for whom gas companies had to provide a considerable amount of capital. The companies were also doing much to improve their light, all of which cost money. If gas of less illuminating value were supplied in this case, it would be sold at a less price.

Mr. MUNRO, in reply to the CHAIRMAN, contended that, if the Bill were passed, an inferior gas would be sold for the same price, by reason of which there would be a saving, as a result of which the position of the consumer would be worse and that of the Company better. It was not true to say that the saving to the Company would find its way into the pockets of the consumers.

Evidence was then called in opposition to the Bill.

Mr. Isaac Carr said he had carried out a series of tests in order to determine the difference between the existing and the proposed test-burners, and as to the saving to be effected in the process of manufacture by the proposed change of burner. His opinion was that the 20-candle power gas at present supplied by the Liverpool Gas Company was a most valuable asset to the consumers, and any attempt to reduce the standard of illuminating power without a *quid pro quo* equivalent in a reduction of price should be strenuously resisted. To reduce the illuminating power to the extent proposed would adversely affect every type of burner for illuminating purposes—more especially those of the flat-flame type, as well as consumers who used gas for cooking, heating, and motive power purposes. For a number of years the Widnes Corporation had sold gas within the borough at a lower price than any other town; but although the selling price was abnormally low, no attempt had ever been made to reduce the illuminating power. He was of opinion that a reduction of illuminating power was equivalent to an increase in price. He had made numerous experiments to determine the relation of difference in photometrical value between one test-burner and another; and he found that 14-candle gas, as tested with the 15-hole Sugg-Letheby argand, was returned at over 20 candles when tested in the No. 2 "Metropolitan" argand. He also found that gas returned as 14 candles when tested in the No. 2 "Metropolitan" gave a result of 8 candles when tested in the Sugg-Letheby argand. If the 14-candle gas now supplied by the Widnes Corporation was tested in the No. 2 "Metropolitan" argand, it would be returned as 20 candles, or 22 candles if tested by the parliamentary argand. The gas supplied by the Liverpool Company was 20 candles as tested by the No. 7 standard flat-flame test-burner, or an efficiency of 4 candles per cubic foot; but tested in the No. 2 "Metropolitan" argand,

it would be returned as 22½ or 23½ candles. The proposal in the Bill was to reduce the illuminating power to 20 candles as tested in the No. 2 "Metropolitan" argand, or nominally no reduction; but there would be an actual reduction of 5 candles, or 25 per cent. In the No. 2 "Metropolitan" argand, 20-candle power gas gave an efficiency of about 3 candles per foot, or an illuminating power of 15 candles when consumed at the rate of 5 cubic feet per hour in the flat-flame burner. From a series of tests carried out at the Liverpool Corporation works on coal gas, he found that the net calorific value of 20 candles in the No. 7 standard flat-flame burner was 680 B.Th.U. Gas showing 20 candles in the No. 2 "Metropolitan" argand and 14½ candles in the No. 7 standard flat-flame burner gave a net calorific value of 565 B.Th.U., or a loss in calorific value of 3 per cent. per candle. With gas of over 20 candles in the flat-flame burner, an increase of only 2 to 3 candles was obtained by using the No. 2 "Metropolitan" argand; but with gas of 15-candle power in the standard flat-flame burner an increase of about 5 candles, or 25 per cent., was obtained. Therefore, while the gas was styled 20-candle power gas, as at present, the new test-burner device would admit of enormous loss being inflicted on the consumers. It was constantly claimed that illuminating power had no fixed relationship to calorific value. This might, in a measure, be true in comparing certain districts with various coal supplies; but under comparable conditions, there was an undoubted and marked relationship between the two. At a price of 2s. 6d. per 1000 cubic feet, users of gas for cooking, heating, and motive purposes would have to use 15 per cent. more, which would be equivalent to an increase in price of 4½d. per 1000 per cubic feet. As further proof of the necessity for a greater consumption in incandescent burners with low-grade and high-grade gas, he explained to the Committee two incandescent burners where the orifice in the nipples for the low-grade gas were very much larger than those made for the high-grade gas. He had conducted a series of experiments with these burners, and found that, under a pressure of 15.10ths, the orifice in the burner for the low-grade gas passed 3.3 cubic feet per hour; while the burner for the high-grade gas passed 2.3 cubic feet per hour, and at lower pressures the difference was greater. The ordinary consumer was not capable of a skilful manipulation of the burner. Under the proposals in the Bill, there would be a saving to the Company in the reduced cost of raw material, the improvement in the quality of the coke as a result of the disuse of cannel, and the saving of gas that would arise owing to an increased make per ton of coal carbonized, such as would be possible when manufacturing gas of an illuminating power that required little enrichment. The saving in the cost of manufacture by substituting the proposed burner would be 3.85d. per 1000 cubic feet.

Replying to Mr. FITZGERALD, witness said that this was a matter that had never been understood by Parliament. Asked whether he suggested that, in the case of the Liverpool Company, the savings would be misapplied in some way or other, he replied that it was possible with all companies. There should be a provision inserted in the Bill that any saving there might be should be applied to the reduction of the price of gas.

Mr. J. G. Newbigging, the Engineer to the Manchester Corporation Gas-Works, said the effect of introducing the new burner would be that the gas companies would be able to distribute gas showing 15 candles in the flat-flame burner as against 20 candles in the "Metropolitan" argand No. 2 burner. The reduction in efficiency was 2 per cent. per candle in an incandescent burner; and in the case of 5 candles, it would mean a reduction in efficiency of 10 per cent. The reduction in the heating value would be 15 per cent.

Replying to Mr. HONORATUS LLOYD, witness said that in Manchester the amount of gas profits which were applied in relief of the rates amounted to between £50,000 and £70,000 per annum. In Manchester, the batswing test was satisfactory for the flat-flame consumer; but he could not advise the adoption of that test to-day. He was not opposed to the use of the burner proposed in the Bill, because he took it that it was the best burner; but in any change that was made in this way, the consumer should get the benefit. He agreed that the No. 1 burner was intended to be the most suitable for obtaining from the gas the greatest amount of light, and that the No. 2 burner was the one that ought to have been invented to comply with the revision of the 1860 Act.

Mr. HONORATUS LLOYD: Since 1860, gas purveyors have had unnecessarily to go to the expense of manufacturing an article higher in value in order to produce the value which was intended; and now that the invention has been found which enables the Act to be complied with, you say the companies should give up entirely to the consumer the benefit they have got?

Witness: The saving in cost should go to the consumers.

Professor Percy Frankland said he had made special experiments with Liverpool gas; and he found that, tested with the flat-flame burner, the result was 14.1 candles, with the No. 1 it was 16.3 candles, and with the "Metropolitan" No. 2 19.1 candles. For a reduction of one candle in the illuminating power, there was about 3 per cent. diminution in the calorific power.

Professor Teed said the effect of the proposed change would be that the consumer would get less lighting and heating power for the same price. He thought the No. 2 burner was unscientific, and should not be used for testing purposes at all.

Additional evidence on behalf of the opponents was given by Mr. A. G. Smith, the Gas Examiner to the Liverpool Corporation, and Professor F. W. Bursall.

Monday, April 11.

On the resumption of the proceedings this morning, Mr. Talbot addressed the Committee on behalf of the Mersey Docks and Harbour Board; and evidence was called. He was followed by Mr. Ram, who addressed the Committee on behalf of the joint petitioners against the Bill. After the adjournment, Mr. Honoratus Lloyd summed up for the promoters—making a very powerful criticism of the evidence that had been adduced by the opposition, and pointing out the contradictory nature of much of it. Following his speech, Mr. Carpenter was recalled to the chair, to give some elucidating evidence.

The room was then cleared; and, after very few minutes' deliberation, the Committee found the preamble proved. Clauses will be taken on Wednesday morning. A fuller report will appear next week,

GLASGOW GAS CONSOLIDATION BILL.

House of Commons Committee.—Tuesday, April 5.

(Before Mr. MOONEY, Chairman, Mr. ESSLEMONT, Mr. ELVERSTON, and Captain TRYON.)

This Bill, which is to consolidate, with amendments, the Glasgow Gas Acts, from 1869 to 1909, provide for the reduction of the illuminating power of the gas supplied by the Corporation of Glasgow from 16 to 14 candles, and for other purposes, came under consideration to-day.

Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. H. BEVERIDGE appeared for the promoters. The petitioners were represented as follows: Royal Burgh of Rutherglen and Burgh of Pollokshaws, Mr. FREEMAN, K.C., and Mr. T. JONES; Burgh of Clydebank, Mr. FOREES LANKESTER, K.C., and Mr. COLIN SMITH; Burghs of Dumbarton and Milngavie and Baillieston Gas Company, Limited, Mr. BLENNERHASSETT, K.C.; Burgh of Govan, the Hon. J. D. FITZGERALD, K.C., Mr. RAM, K.C., and the Hon. EVAN CHARTERIS; Burgh of Partick, Mr. TALBOT, K.C., and Mr. CLODE; the County Council of Lanark and the District Committees of the Middle and Lower Wards of that County, Lord R. CECIL, K.C., Mr. WILSON, K.C., and Mr. KING; Caledonian Railway Company, Mr. HENDERSON; Busby and District Gas Company, Mr. WILSON, K.C. Counsel was reserved on behalf of the North British Railway Company and the Glasgow and South-Western Railway Company.

Mr. BALFOUR BROWNE, in opening the case, said the objects of the Bill were, first, to consolidate, with certain amendments, the Acts obtained by the Corporation of Glasgow between 1869 and 1890 and others relating to the gas undertaking—the total number being twenty; secondly, to provide for the continuance of the existing gas-works and the manufacture and supply of gas and residual products; thirdly, to fix the price and illuminating power of the gas; and, fourthly, to define the limits of supply of the Corporation for gas purposes, and to divide them into two districts, to be called the city supply district and the supplementary supply districts. In 1869, the Corporation obtained statutory authority to purchase the undertakings of the two Gas Companies who were then supplying Glasgow and a portion of its suburbs; and in connection with this purchase they obtained power to raise a guarantee rate of 6d. in the pound on the annual value within the city. Though the district of supply extended much beyond Glasgow, the guarantee rate could only be levied on the ratepayers within the city. The capital account of the gas undertaking at the present time was £3,841,282, exclusive of annuities of £27,000 and £7762 10s. payable under the original Purchase Act. In 1869, the price charged for gas was 4s. 7d. per 1000 cubic feet, and the illuminating power was 25 candles. In 1882, the latter figure was reduced to 20, and in 1901 to 16. In 1869, the quantity of gas manufactured was 1206 million cubic feet; whereas it was now 6820 millions. After acquiring the gas-works in 1870, the Corporation reduced the price of gas inside the municipal area by 5d. per 1000 cubic feet, and by 2½d. outside. In 1871, the figure was reduced to 4s.; and no difference was made between any of the places within the city supply district, so far as price was concerned. In 1882, when the Corporation were again in Parliament, some of the outside burghs, such as Partick and Govan, thought Glasgow might impose different rates on them from those levied in Glasgow. The Corporation then said they had no intention of making differential rates in respect of people in the same circumstances; and a clause was introduced into the Act of that year to deal with the point. It was true the clause was ambiguous; but it was made perfectly clear by the Bill now before the Committee. The present price of gas was 2s. instead of 4s. 7d.; and, with the exception of certain small districts, the whole of the area outside Glasgow, having regard to the circumstances of supply, now had gas at the same rate as the inside district. Since 1869 the gas undertaking had not been conducted by the Corporation with a view to making large profit, though like other gas suppliers they would have been entitled to do so; the total amount carried from the undertaking to the relief of rates being only £21,000. Last year Birmingham took £71,000 and Manchester £27,000 for the purpose from the gas undertakings. It would be seen, therefore, that Glasgow had been conducting the gas undertaking in the interests of the consumers, and not with a view to obtaining large profits with which to benefit the ratepayers. Glasgow bore all the risk of the concern, including the burden of the annuities and the liability to the guarantee rate; and therefore if there was a profit the ratepayers were entitled to it. The Corporation sought, in this respect, to be left in exactly the same position as they had occupied since 1869; and they asked the Committee to believe that, as in the past so in the future, they would use their power with discretion. In 1876, an Act, applicable only to Scotland, was passed, which, as originally framed, would have enabled any of the police burghs round such a city as Glasgow to establish gas-works with which to supply themselves. Glasgow held that it would be very unfair to allow works to be established in this way in competition with them; and eventually the provisions of the measure were amended, so that, while enabling burghs to supply themselves with gas in cases in which there was no supply under Act of Parliament, they were prohibited from supplying themselves where there was such a supply. In this way Glasgow was protected against the possibility of competition by such burghs as Partick and Govan. The Corporation had acquired several gas undertakings, and were now purchasing that of the Baillieston Gas Company for a sum of £10,000. The Corporation supplied gas over an area of 98 square miles; the district being 15½ miles across from east to west, and 11½ miles from north to south. They had obtained twenty different Acts; and it was desirable, for the benefit of everybody—for the city generally and for the consumers individually, who should know, if possible, what was the real law with regard to the supply of gas in Glasgow—that these Acts should be consolidated. This could be done without doing damage to anyone interested in the undertaking. The Secretary for Scotland reported that the Bill, if passed, would effect a material simplification of the local legislation relating to the supply of gas by the Corporation. There

were certain additional matters in regard to which Glasgow desired legislation. Clause 27 in the Bill would confer permissive power on the Corporation with reference to the prompt payment of accounts. A similar clause existed in a great number of Acts of Parliament; and it seemed fair that people who paid promptly should derive benefit. By clause 30 it was proposed to reduce the illuminating power of the gas from 16 to 14 candles, the figure at which it now stood in the Acts of the three London Companies. Clause 42, which directed that fittings were not to be subject to distress, was new. So, too, was clause 43, which related to the use of anti-fluctuators for gas-engines. Clause 9, relating to the supply of non-illuminating gas, was taken from the Corporation Act of 1882. When the Corporation obtained power to supply non-illuminating gas, they apparently thought a separate supply of such gas might be given. While no special plant had been erected for the production of this gas, a large amount of it was being supplied for heating and power purposes; and therefore it was desired to retain the powers contained in clause 9. The County Council of Lanark and the District Councils held that as the Bill provided for the Corporation obtaining the consent of the Council of any burgh outside Glasgow before laying pipes for the supply of non-illuminating gas within the burgh, it should also provide for the consent of the County Council being obtained before such pipes were laid in the county area. Clause 9 contained practically merely the same power as the Corporation now possessed, and therefore there was no reason why it should be altered. The prices at present charged for gas were these: For lighting and domestic purposes within the city and the suburbs generally, 2s.; for motive power purposes within the same area, 1s. 8d.; for manufacturing purposes, also within this area, for gas supplied in quantities of not less than 30,000 cubic feet, 2s. 1d., and for quantities above this figure, 1s. 8d.; and for gas supplied to hotels, clubs, and institutions other than for lighting purposes, if less than 100,000 cubic feet, 2s., and if more, 1s. 8d. Within the Milngavie district, 1s. per 1000 cubic feet extra was charged. In 1882, when the Corporation were applying to Parliament, there was some discussion with regard to their power to charge differentially. Doubt arose as to whether they could charge (say) in Govan differently from what they charged in Glasgow; and Counsel for the Corporation said they had no intention of doing any such thing. The scale, however, showed that they really did charge different rates. The person who took a large quantity of gas for power or lighting purposes had the advantage of being charged only 1s. 8d. per 1000 cubic feet. But they treated his competitor, who took as much, in exactly the same way; and they wished to do the same thing in future. It was the custom to differentiate between large and small supplies; the reason being that if they did not supply gas for power at low rates they could not induce people to take it for such purposes. Some of the petitioners asserted that the Corporation were going to give Glasgow a preference over (say) Govan and Partick; but this was not the case. They in Glasgow were enormous consumers of gas for public purposes. In Govan and Partick they had built electric lighting works, and were lighting their public lamps to a large extent by means of electricity; using only a very small quantity of gas for outlying lamps. Yet these places held that they were entitled to be charged at the same rate as Glasgow. The Corporation argued that this was not fair, and said that anybody taking the same amount of gas as Glasgow would be treated in exactly the same way as Glasgow. To say that the small consumer was to be treated in the same way as the large one was contrary to the practice of most of the great gas-supplying corporations and companies in this country. Glasgow proposed an arrangement of this kind: For gas for lighting supplied in quantities of less than 500,000 cubic feet, 2s.; 1s. 11d. per 1000 cubic feet to be charged above this quantity and up to 6 millions; 1s. 10d. between 6 and 20 millions; and 1s. 9d. for quantities above the latter figure. This scale was something like what they thought fair. A large number of local authorities and companies had similar scales. Clause 49 raised some very important matters, and was the centre of a good deal of opposition. It provided that the Council should apply money received by them under the Bill to the payment of expenses and annuities, and in carrying into execution the powers and provisions of the Bill, and that they might carry any balance to the credit of the Corporation for their general purposes. The petitioners desired that instead of the surplus (if any) being carried to the credit of the Corporation, it should be applied in reduction of the price of gas. The provision did not alter the law; but made it perfectly clear. The petitioners really had no ground of complaint. The Corporation had possessed the power in the past; but they had only transferred £21,335 since 1869. Of this sum, £6000 was carried, in 1883, towards the recoupment of the Common Good fund of the Corporation, for advances made from time to time to meet the expenses of administering the Sales of Gas Act since 1863—expenditure which was really connected with gas. He maintained, as the Salford Corporation maintained last year when promoting a Bill, that the position of inside to outside was never intended by Parliament to be that of a bare trustee. For the ratepayers in a town a corporation was, of course, in the position of a trustee; but with regard to people outside its rating area, it was in the position not of a trustee, but of a company. The latter point had been decided in the case of the Wolverhampton Corporation against the Bilston Commissioners. The outside districts should, he claimed, be treated no worse by the Corporation of Glasgow than if they were supplied by a company, as, in law, the Corporation were, as regarded these districts. If the outside districts had been supplied by the two Companies whom the Corporation expropriated in 1869, the Companies would have had a large profit—10 per cent. on the original capital, and 7 or 5 per cent. on subsequent capital. Why were the districts to be treated better by the Corporation now? The ratepayers of the districts were not Glasgow ratepayers. Glasgow had borne the heat and burden of the day, and had taken all the risk, and Glasgow said: "I will treat you a great deal better than you would be treated by a company; but you shall not have any share of reasonable profits which we in the past have been justified in appropriating, and which in future we may feel justified in appropriating to similar public purposes." Partick and Govan, although they were supplying electricity, did not use their surplus profits from electric lighting to reduce the price. The surplus of these places was carried to the relief of rates. In a number of the petitions, it was suggested that the time had come when the gas undertaking should be

taken away from the Corporation of Glasgow and placed in the hands of a Joint Board. If a Joint Board was to be formed, it was a matter for a Bill; but there was no such Bill before the Committee. If the necessity arose, the Corporation would have a great deal to say against the formation of a Board. Such a Board would be improper in several ways. The Glasgow Corporation were, as had been decided in the Wolverhampton case, virtually a company in an outside area. If the Committee declared in favour of a Gas Board, the declaration would, in effect, oust the Corporation from their position of a company, and hand over their property in the outside districts to another authority—a Joint Board; it would be a compulsory transfer of their undertaking into the hands of the Joint Board, although, of course, they would be constituents of the Board. This, however, was not the custom when a company had been doing its duty; and there was no allegation here that the Corporation had not been doing their duty. It was ridiculous for these people to propose a Joint Board. Glasgow had 72 per cent. of the whole population supplied with gas. The valuation of the city was 76·64 per cent. of the total valuation of the gas area; and of the consumers, 73·9 per cent. were in Glasgow. It was the small minority which asked the Committee to force upon the Corporation the Joint Board. If these outer areas became part of the city, the question of limiting the amount of profit would go, because the outer areas would share the profit; and the question of a Gas Board would also go, because they would then be all one body. The Committee could not, however, inquire into the extension of the district; and he would suggest that they could not inquire into the question of a Gas Board. In conclusion, he referred briefly to the petitions, the main points of which he had already dealt with. Three other matters to which the evidence would be directed were the limits of supply, the differential rates, and the application of the revenue. He should have to take the guidance of the Committee as to whether they were to go into the question of the formation of a Gas Board. If the Committee said they would go into the matter, he would call evidence on it.

The CHAIRMAN: I do not suppose we shall reach the question to-day. My opinion at the moment would be that if this were purely a Consolidation Bill, it would be outside our province to hear anything of the kind; but as you are getting larger powers under the Bill, I am inclined to think (I am not giving the decision of the Committee) that it is germane to the subject before the Committee—the subject whether or not you ought to get any extension of your powers. I shall be in a position to-morrow to give a definite ruling on the point.

Mr. FITZGERALD: We are not asking you to form a Joint Board now. We are simply on the question of principle, to decide the principle whether you should insert a clause which has been put into other Bills.

Mr. BALFOUR BROWNE: It never has been put into other Bills.

The CHAIRMAN: I understand that Mr. Fitzgerald's position is that the Committee should not give any further powers to the Corporation, as circumstances have so changed that the proper method of dealing with this matter would be to create a new Board for the purpose?

Mr. FITZGERALD: That is so.

Mr. BALFOUR BROWNE: That I can clearly understand; but in order to do this, my learned friend must call evidence to show that a Joint Board is expedient. You said, Sir, that if this had been simply a Consolidation Bill, you would not have listened to any further proposal, but that we are asking for additional powers. But the further powers that we are seeking are not the things that are objected to. The thing the petitioners are most objecting to is the carrying of our surplus to the relief of our rates. There is not a word about a Joint Board in the Bill. With regard to the delimitation of districts, there is nothing new in that; and as regards the differential rate, we say the meaning of the clause is what we have been acting on—that we have differentiated in the power of rating, and that we are charging 2s. to-day to the ordinary consumers and 1s. 8d. to another person, and we have not been set right by the Courts. Nobody has said that it is illegal; and all we want to do is to continue it. All the other powers in the Bill that are new are not objected to at all.

Mr. M. W. Montgomery, the Convener of the Gas Committee of the Glasgow Corporation, examined by Mr. HONORATUS LLOYD, stated that the capital expended on the gas undertaking was fully £4,000,000, and that the revenue last year was about £864,000. They had over 1000 miles of mains, nearly 260,000 consumers, and supplied annually 6000 million cubic feet of gas. The works were capable of supplying 46 million cubic feet daily; and the largest day's supply was nearly 39 millions. The price now charged was 2s. per 1000 cubic feet for lighting and domestic purposes, and 1s. 8d. for motive power. Consolidation of the Corporation's various Gas Acts, nineteen or twenty in number, would provide, in one volume, an easy reference and a much better understanding of their powers. The provisions of the Bill were almost entirely a repetition of the provisions of existing Acts. Power was, however, sought to apply some additional modern provisions. The limits of supply in clause 6 of the Bill included the names of one or two places not mentioned in existing Acts, but in which the Corporation were at present giving a supply. Some towns and villages—Bowling, in the parish of Old Kilpatrick, Clarkston, Giffnock, Thornliebank, and Pollokshaws—the names of which had been inserted in clause 6, were included in one or more of the parishes named in the existing Acts, although the actual names did not appear. There were other places, the names of which were now inserted in the description of the limits of supply which, though not specifically named in existing Acts, the Corporation considered came under the words "other places intermediate and adjacent," in one of the Acts, and in which they were supplying. These places were Hawkhead, the parish of Carmunnock, Mearns, Renfrew, Cadder, and Paisley. Hitherto there had never been a definite boundary line showing the limits of supply; but the Corporation had endeavoured to arrange mutual boundary lines with the local authorities and companies who were supplying round about Glasgow. The Bill proposed to divide the area of supply into the City Supply District and the Supplementary Supply District. The City Supply District would embrace Glasgow and a number of populous burghs round the city, such as Govan and Partick. The Corporation had agreed provisionally to acquire the undertaking of the Baillieston Gaslight Company for £10,000. By clause 26, power was sought to give the consumer of a large quantity of gas an advantage—whether the gas was consumed in Glasgow or in a surrounding burgh.

Glasgow as a large consumer would, of course, get the benefit which would accrue to a large consumer. This was a fair and legitimate advantage. Ultimately he believed the effect would be to cheapen gas all round, because it would develop the general consumption and prevent other means of power and lighting being substituted for gas. There was no idea of altering the policy of the Corporation in the future in order to keep up the price of gas, and thus to relieve the City rates. Cheap gas was essential to the policy that Glasgow had hitherto been pursuing.

Cross-examined by Mr. FITZGERALD: At present, the Glasgow Corporation were bound to supply gas to private consumers in Govan at the same rate as they supplied private consumers in Glasgow; and they were also bound to supply the Govan Corporation at the same rate as they (the Glasgow Corporation) supplied themselves. Glasgow did not want to get out of this obligation. The clause relating to this point did not re-enact the provisions in the earlier Act. It altered them by giving an advantage to large consumers.

Mr. FITZGERALD: Under your existing legislation, there is a specific enactment that when a consumer is supplied by meter, the charge is to be the same in the whole of the district whether inside or outside Glasgow?

Witness: Yes.

You are repealing that provision and not re-enacting it anywhere; and under clause 26, as it stands, you may charge one price in Glasgow and a different price in Govan or Partick, or any other place?—That is not the intention.

The CHAIRMAN: The Committee are of opinion that the clause in the Bill, as proposed, would undoubtedly make an alteration in the existing gas supply. This may be a matter for argument afterwards; but I do not think there is any necessity to put it to the witness.

In further cross-examination, witness said he objected to coming under the general Scotch law, under which gas profits went to reduce the price to the consumer. They had had the power contained in the Bill in this respect for forty years, they had not abused it, and they saw no reason for departing from the terms they had already obtained. Glasgow enjoyed similar power with regard to the water undertaking, and were charging 4d. inside and 10d. outside the City. The Lord Provost in several speeches had mentioned a proposition to supply free water within the City of Glasgow; but the proposal had not come before the Corporation. Counsel put to witness the following alleged statement of the Lord Provost: "A free water supply to Glasgow would probably cause jealousy in the adjoining burghs who received their supply from the City; but if they wished to share in the benefit, they would amalgamate with Glasgow." Witness, however, did not see what that had to do with the gas undertaking.

Mr. FITZGERALD: If you are going to have free water in Glasgow, why not free gas? What is to prevent you?

Witness: Free gas has never been mentioned.

But it is coming you know?—Of course, under our clauses we should require to give free gas to everyone. Continuing, witness declined to suppose, unless a rise in the price of coal or other consideration justified them, that the Corporation would increase the price of gas to (say) 3s., and make a large profit and apply it entirely in relief of the rates of Glasgow. In the 41 years the Corporation had had the gas-works, not a penny had come from the ratepayers of Glasgow to support them.

Cross-examined by Mr. FREEMAN: When, in 1874, the Rutherglen Gas Company was transferred to the Glasgow Corporation, a distinct parliamentary bargain was made between Rutherglen and Glasgow to preserve equality of price. He thought the Bill re-enacted this bargain.

Wednesday, April 6.

On the resumption of the proceedings this morning,

Mr. BEVERIDGE asked whether the Chairman intended to go into the Gas Board question. If so, he should have to examine Mr. Montgomery upon the point.

The CHAIRMAN: No; I think our decision will obviate the need for any further examination on this question. The decision we have come to, after consultation, is that it is very unusual to hear an alternative scheme; but we may call on Counsel to speak on the point at the end, and, if necessary, we might ask for evidence. But we will not take evidence-in-chief now on the desirability of a Joint Board.

Mr. Montgomery, in cross-examination by Mr. TALBOT, said he did not think it would be possible for the Corporation of Glasgow, in virtue of their statutory monopoly of supply, to maintain the price of gas at a higher rate than was absolutely necessary in order to earn surplus profits which might be applied to reduce the rates within the area of the City of Glasgow.

Cross-examined by Lord R. CECIL: The maximum price chargeable was 4s. 7d. In Glasgow, the charge was actually 2s. They could therefore charge 2s. 7d. more in the supplementary area. They had, however, only charged 1s. more. The charges in different parts of the supplementary district might vary under the Bill. He did not say there was no intention of levying a higher charge than 1s. extra. Baillieston had been in the city supply district; but it was proposed to place it in the supplementary district; the reason for this being that the Corporation were paying £10,000 for the Company's works, and that unless Baillieston was placed in the supplementary district, with the consequent increase of price, it would not pay the Corporation to acquire the undertaking on the terms stated.

Lord R. CECIL: If it is the policy of the future to use the differential rates in order to drive outside districts into the city of Glasgow, it is not much satisfaction to us to know that they have hitherto only charged 1s. extra?

Witness: I cannot consent to the statement that that is the policy of the Corporation so far as the Gas Department is concerned.

Is there not a motion before the Corporation that the Common Good fund should be devoted to the reduction of rates?—No. There may be a motion to consider it; but I do not think there is a direct proposal to that effect.

If the policy is carried out, there will be nothing to prevent an increased rate up to 4s. 7d. on the whole of the supplementary area, in order to pay for the gas of the citizens of Glasgow, and so compel the outside areas to come into the City of Glasgow?—The supplementary

area is so small that the contribution would have no effect whatever in helping the rates. I do not recognize the possibility that such a thing could ever take place.

Mr. BLENNERHASSETT : I appear for the Baillieston Gaslight Company. Since we presented a petition against the Bill, terms of purchase have been arranged between the Glasgow Corporation and the Company; and these terms are embodied in additional clauses. It would not be possible for me to cross-examine on this matter at present; but in case the purchase should not be sanctioned by the Committee, I would ask leave to be heard in support of the petition, and to call evidence.

Mr. *Montgomery*, in further cross-examination by Mr. WILSON, said the Busby and District Gas Company, or their predecessors, had had power for seventy years to supply gas in the parishes of Mearns, Cathcart, and East Kilbride, and for twenty years in the parishes of Eastwood and Carmannock. Following on the withdrawal of a large annexation scheme, Glasgow, in response to requisitions, laid pipes, side by side with the gas-mains and pipes of the Company in the parish of Eastwood, and about Giffnock. The Company (a small concern, with £10,000 capital) charged 4s. there; but the Glasgow Corporation had to charge the city price of 2s., because the district was within the city boundary. Subsequently an agreement was entered into with the Company. Glasgow bought the pipes in the parishes of Eastwood and Cathcart, and left the works to the Company. They also left to the Company the mains supplying Mearns, Carmannock, and East Kilbride. There was an understanding also that the Corporation were to supply the parish of White Craigs; and boundaries were arranged accordingly. This arrangement had not been departed from by Glasgow. Asked whether it was fair that Glasgow should compete with the Company in Mearns and Carmannock, witness said there was an agreement with the Company; and he had understood that their opposition was entirely withdrawn.

In cross-examination by Mr. FORBES LANKESTER, witness said that hitherto the Corporation had had no power to charge differential rates to private consumers. As a fact, however, where gas had been used in large quantities for power for manufacturing purposes, rebates had been allowed. They thought they had a clause with reference to the supply of non-illuminating gas; and this gas was used for non-illuminating purposes. There might be a doubt as to whether they were acting *ultra vires*. While Messrs. Brown's works in Clydebank had been paying 2s. per 1000 cubic feet for gas for illuminating purposes, and 1s. 8d. or 1s. 9d. for manufacturing purposes, the Burgh of Clydebank itself, although taking more gas than Messrs. Brown, had had to pay 2s. or 2s. 2d.

Cross-examined by Mr. KING : The Caledonian Railway Company were almost, if not actually, the largest consumers of gas, except the Corporation itself, in Glasgow; their gas account in 1908 having been £5900. The Bill discriminated between private lighting and lighting for any other purpose. Whatever advantage would result under the Bill to gas consumed in large quantities for private lighting would benefit the Company. They would not get any of the advantage which would result under the Bill to large consumers of gas for public lighting. At present, whatever was charged the Railway Company for their public lamps, and for the stations, railway roads, and approaches, was also charged the Corporation. Under the Bill, this would be altered. Yet the Act was intended to benefit the largest consumer.

Mr. HONORATUS LLOYD read correspondence which indicated that negotiations between the Corporation and the Busby Gas Company for the withdrawal of the Company's petition broke off on the Corporation refusing to pay the Company's expenses.

In re-examination by Mr. HONORATUS LLOYD, witness said that in 1901, when the Glasgow Corporation purchased the Company supplying in Milngavie, there was a distinct understanding that a differential rate would be charged.

By the COMMITTEE : It would be a very difficult thing to embody a scale of charges in the Bill, because the price of gas rose and fell according to the price of coal and other articles. A limit of some kind, with regard to the amount of differentiation between one district and another, might be embodied. The Corporation were supplying 18-candle power gas, although they were obliged to supply only 16-candle power. He could not say what profit would result from the proposed reduction in the candle power. Asked whether he knew of any case in which a reduction of candle power, without some corresponding reduction in maximum price, had been allowed, he said he believed it was usual to have a corresponding reduction in the maximum price. He could not name any authority which in recent years had obtained power to apply profit to the Common Good.

Mr. Alex. Wilson, Engineer and General Manager of the Glasgow Corporation Gas Department, examined by Mr. BEVERIDGE, said that since 1902 the additional cost of supplying Milngavie amounted to £7320, while the total extra revenue obtained from the place during the same period was £6289; so that there was a loss of over £1000. He knew of no arrangement under which, after the Corporation had recouped themselves the cost of purchasing the Company which supplied Milngavie, that place should be put in the same position as Glasgow. The price charged by the old Company in Milngavie was 4s. 7d.; now the charge there was 3s. The County Council objected to the proposed limits of supply, on the ground that they were vague and inadvisable. But the limits of supply had never been defined by any hard-and-fast boundary. The Corporation had no intention of competing with any gas authority or company around their city supply district; but they were of opinion that in any particular part where gas was not now supplied, and which was quite close to their district, it would be very hard on the inhabitants to draw a hard-and-fast line. With regard to the price of gas, witness explained that, when the competition of electricity sprang up, he prepared a scale showing reduced prices to meet the case of large consumers. He felt at the time that the Gas Department was being fettered. The competition was affecting the Corporation's best customers; and the Corporation were unable to give a better rate to them, as they would have been entitled to do had they had the usual clauses. The Corporation, however, shortly afterwards gave a reduced rate for gas supplied for power and manufacturing purposes. There might be some dubiety about the charge. The clause now in the Bill would free the matter from all ambiguity.

Such a scale as had been suggested here had been adopted by many undertakings. Some large consumers in Glasgow had actually introduced their own plant to provide themselves with gas power. Several others had said that, unless the Corporation reduced the price, they would put in plant for the production of gas of one kind or another. Unless there was some concession, the number of consumers who took gas from the Corporation for power purposes would in a year or two be very much reduced. If the suggested scale were adopted, it would mean a saving to the local authorities outside as public lighting authorities. The competition of the electric light, especially with regard to street lighting, was very severe. Of the gas used for public lighting purposes, 81 per cent. was consumed in Glasgow.

Mr. BLENNERHASSETT, at this point, informed the Committee that an arrangement had been come to between the Burgh of Dumbarton and the promoters.

In cross-examination by Mr. FREEMAN, in regard to the charges to be made for gas for public lamps inside and outside Glasgow, witness said he thought they should have the power to make an extra charge for the sake of competition by electric light.

Mr. FREEMAN : The Glasgow Corporation are the electric lighting authority in Pollokshaws. Why do they want a weapon of defence against themselves? It looks rather like a suicidal policy?

Witness : But the two departments are run quite separately; the competition as regarded electricity is as keen in Glasgow as anywhere else.

Further cross-examined : On the differential rate suggested, Glasgow would save £5478, Rutherglen £58, and Pollokshaws £21.

Cross-examined by Mr. WILSON : They were not going to hurt or affect the Busby Company. That Company were asked to supply in a particular area, but would not do so. Thereupon the Corporation gave a supply there.

Thursday, April 7.

When the hearing was resumed this morning,

Mr. Wilson was cross-examined by Mr. BLENNERHASSETT. He said there was no desire to make any distinction between the inside and the outside areas excepting under special circumstances. Therefore, if it could be shown that the special cost of supplying Milngavie had been repaid, there was no objection to reducing the rates. With regard to the £4000 paid for the Milngavie gas undertaking, £1335 had been struck off for depreciation. He did not agree that the gas consumers in Milngavie had to pay more now than under the old system because the illuminating power was inferior.

Replying to Counsel for the promoters, witness said the £1335 referred to was an allocation from all sources on the Milngavie undertaking. Although the population of the outside areas had increased rapidly, the consumption of gas in the last five years had not increased. It would be advantageous to have a reduction in the charge for taking a quantity of gas for public and private lighting. Of the total revenue, the public lighting amounted to 10 per cent. By increasing the consumption they hoped to reduce the price. It was also the intention of the Corporation that the original price of gas for public and private lighting was to be the same to every body in similar circumstances. Cadder was the only district in which there was not a gas supply. The Glasgow gas undertaking was for the benefit of all the consumers; and their chief object was to cheapen the price of gas so as to increase the consumption.

Replying to questions by the CHAIRMAN, witness said that if there was a benefit in the cost of production it went to the consumer; and if it was found that, by reducing the quality of the gas there was a surplus, it was carried forward. They had used their profits to keep down the price and to depreciate what they knew was an excessive price for an undertaking. In the districts supplied, the increase had not been great; and in one year there was a heavy deficit. In Glasgow, the increase in the gas supply was not what it ought to have been in a city of its size.

Mr. Robert Macfarlan, Auditor to the Corporation, gave evidence. He said the liabilities of the shareholders of the old Companies were regulated by the gas guarantee rate; and in the event of the undertaking becoming a total failure, the working debts would be covered by the Common Good of the City. His opinion was that the Glasgow gas undertaking had been efficiently carried on. He agreed that a sum of £21,000 had been taken from gas profits and applied to municipal purposes, and on one occasion £13,000 was applied to electric lighting.

Mr. Walter Nelson, a Chartered Accountant and a member of the Corporation, said that for many years the volume of business in the gas undertaking had been steadily increasing. The consumption of gas in twenty-four hours in the year 1873-4 was 9,162,080 cubic feet; in 1883-4, 13,700,000 feet; in 1893-4, 22,853,000 feet; in 1897-8, 31,354,000 feet; and in 1908-9, 34,830,000 feet. After providing for the maintenance of the gas undertaking, any surplus, whether within or outside the borough, should be applied for the benefit of the borough.

Replying to Mr. FREEMAN, witness said he did not agree that they might keep the price of gas for all time at its present figure, or even increase it and carry every farthing of profit to the benefit of the citizens of the borough. The works they now possessed were capable, when fully completed, of manufacturing about twice the quantity of gas per day which could be produced by the works prior to 1899.

In answer to the CHAIRMAN, who asked whether there was any fixed limit for writing off depreciation, because it seemed that the smaller the gross profits the more was written off for depreciation, witness said that since the year 1906 there had been a fixed rate of depreciation of 2 per cent.

Replying to Lord R. CECIL, witness said the percentage of depreciation varied according to the profits.

Mr. Corbet Woodall said that for many years the Glasgow Corporation had carried on the gas undertaking to the great advantage of the consumers both inside and outside the city. Unlike most municipal gas undertakings in Scotland, Glasgow was not restricted from charging a higher price for gas than was requisite to meet the expenses of the undertaking. With regard to the appropriation of surplus profits in the past, the Corporation, he thought, had done well in only carrying

a small amount of the credit to the rates. They had splendidly resisted the temptation. The sum did not, in fact, equal 1d. per 1000 cubic feet of gas sold in one year. If an extravagant amount were written off for depreciation, it would tend, no doubt, to increase the value of property in the hands of the Corporation. The sooner items which were not really represented by real assets were written off from the accounts the better. The powers that were being sought for in the Bill had been granted without question to a large number of corporations. He did not know of any cases where the maximum price had been affected where an alteration in the illuminating power of gas had been allowed. He was in favour of a differential rate for gas governed by the distance from (say) the generating station on the gas-works. Without it, there could be no doubt that consumers in the district where the gas-works were placed were damaged, because the cost of distributing to the outside was very much greater than to the inside. Where there was no differential rate, he thought there was a clear case for appropriating a certain amount, or something like a clear case, to the special benefit of the gas supplying authority. If there was no differential rate, there ought to be an allocation of surplus profits. There were many cases in which the illuminating power had been reduced without any corresponding reduction in the price of gas; Coatbridge being one. There the illuminating power was brought down from 20 candles to 14 candles without any modification whatever of the standard price.

Replying to Mr. FITZGERALD, witness agreed that where a discount was given to a consumer for prompt payment there did not, on the face of it, seem to be any reason why a man with a large account should have more for prompt payment than one with a small account. The proposal in the Bill was to allow a discount or rebate to consumers "in consideration of prompt payment of the gas charges, not exceeding in any case 5 per cent., provided that all discounts or rebates shall be of equal amount under like circumstances to all consumers." It was the same in the Model Bill, with the exception that the discount was 10 per cent. He could not recall any case where an outside district had obtained from Parliament a flat-rate where Parliament had allowed a differential rate to be put upon the district against its will. Asked with regard to the differential rate whether he was applying that rate according to the quantity taken being more or less, witness said the differential rate would apply rather to the question of distance from the point of generation than to the sparsity or otherwise of the population. He admitted the extreme awkwardness of modifying arrangements made by agreement before Parliament. The whole point in regard to supplying the big consumer and the small one was that there was less trouble to deliver at one large place which took 10,000 cubic feet as compared with ten small places which each took 1000 feet.

Friday, April 8.

When the proceedings were resumed this morning, the first witness called was

Mr. Charles Hunt. He dealt with the question of the proposed reduction of price to large consumers of gas. He saw no reason why such power should not be conferred. Corporations put their surplus profit to the benefit of the rates of the town. In many cases they had parliamentary power so to do. He considered this was a fair provision in view of the risks of gas being superseded by electricity. Replying to a question as to whether it was quite fair that the benefit should be entirely given to the large consumer, witness said that the idea was to encourage consumption on a large scale. They would not encourage consumption to a proportionate extent by reducing the price all round, because the large consumer was a more variable customer. He was not aware that when the Glasgow Corporation previously purchased Companies in one case they put in a clause to charge everybody alike. Their gas undertaking at present was very successful.

Mr. WILSON: What is there to justify the tearing up of a parliamentary agreement which has lasted for twenty years?

Witness: Conditions have changed. We have now to face the competition of electricity.

Do not the Corporation own the electricity undertaking?—Yes.

Then if the right hand makes more than the left hand, is it a very great hardship?—It is hard on the gas undertaking.

I suggest that there is no reason why a parliamentary bargain should be torn up at the expense of the small consumer?—We are asking to be put on the same basis as other corporations.

It is the general law of Scotland that corporations carrying on gas-works cannot allocate profits to their general benefits. Why should not this apply to Glasgow?—One or two districts outside Glasgow are supplied at the same rate as Glasgow.

What do you mean by the word "risk"?—For example, Partick has taken the whole of its lighting away.

The Corporation have never yet been called upon to find a halfpenny of guarantee fund, and they have substantial margins to carry forward, while they have from time to time tried to raise the price of gas. So that if the price of coal went up, or anything like that, they could increase their charges?—Yes; but that would mean a reduction of the consumption.

Witness went on to say that during the time he was at Birmingham, there was a differential rate of 50 per cent. Immediately after its adoption, a Bill was promoted; and they were completely successful.

Mr. ELVERSTON: The loss in Partick you spoke of as being a risk to Glasgow, yet while the decrease has taken place in public lighting, there has been an increase of 41·69 per cent. in private lighting in the same period. That does not show much loss to Partick on the face of it. It is a gain of 41 per cent. in the ten years.

In further cross-examination by Mr. WILSON, witness said the consumption of gas in Birmingham was a little more than in Glasgow. The price, as shown by the last returns, was from 1s. 9d. to 2s. 4d. per 1000 cubic feet, according to the amount consumed. In 1875, there was a differential rate as regarded districts. He had previously stated it at 1s. This had been abolished on the application of the outside districts. He believed Perth had a differential rate.

Counsel having pointed out that in one case, in the parish of Old Monklands, 2s. and 3s. were the respective prices for gas on the two sides of an imaginary line, witness said that they must draw the line somewhere.

Replying to Mr. CRAIG HENDERSON, witness said they supplied railway companies at Birmingham. They gave discounts, according to the quantity used, to all large consumers there, under authority of the Gas-Works Clauses Act.

Mr. W. R. Herring, the Chief Engineer and General Manager of the Edinburgh and Leith Corporations' Gas Commissioners, was next called. He held that it was a fair bargain for the Glasgow Corporation to charge a higher rate to the outlying districts. The practice was a common one. There were many instances in Scotland since the Act of 1886. In Edinburgh, they had power to charge not more than 6d. per 1000 cubic feet above the inside rate. In Perth, they were entitled to charge 4d. per 1000 feet extra for every mile beyond the boundary. These powers had been granted since 1886—some of them in 1900 and 1907. The main object of the Corporation was to supply gas for industrial purposes at a lower rate than for lighting, because it was consumed for a greater number of hours. There were other charges which arose in the case of the small consumer, but which did not affect the large consumer, such as the supply, inspection, and repair of meters. He cited Edinburgh as an instance where a territorial differential rate was enforced. In that case, there was a provision in the Statute that they must fix the price so that the revenue would meet the expenditure, and they could not make a penny of profit. Asked if he saw any objection to Glasgow putting in a similar clause, witness said the Scottish Office opposed it, in so far as they had to give a very full explanation. There was no popular opposition. In Partick, the price was fixed so that the revenue must meet the expenditure. Replying to further questions, witness said that in Edinburgh the differential rate was 6d. The figure which ought to be put upon a loss by transmission per mile varied from 5 per cent. or 6 per cent. up to 10 per cent. It was true that Edinburgh and Leith had removed their gas-works miles from the centre of the town.

Mr. FRASER, for the Milngavie township, pointed out the hard case of his clients, whose boundary ran up to the line over which it was proposed to charge a higher rate; but it was on the wrong side of the line. They were to be mulcted just as if they were miles away.

Witness: The line must be drawn somewhere. It was largely a question of the distance workmen had to go to attend to the works, and of the sparsity of population.

The distance is exactly the same as from your own works to the centre of Edinburgh?—But that is the smallest part of the work. I am speaking of the administration of the outdoor department, which is from the centre of the town, not from the works. Milngavie was very unfortunately situated.

If we can show that Glasgow has been recouped for the cost of the works and has made a profit out of Milngavie, should not the extra rate cease?—Yes; but you cannot show that.

Mr. CRAIG HENDERSON: You are the first witness to say it is just to charge more for private than for public lighting. Is the upkeep of the meters the sole justification?

Witness: That is my opinion. The labour involved in lighting gas is not included in the gas-rate.

If every consumer pays for his own fitting, how does that apply to the Forth and Clyde Canal, which belongs to my clients? We are charged not by meter, but at the same rate as the public lamps. But now there is a proposal to discriminate?—I should think it might be taken the same as street lighting.

Does it matter whether you are lighting a street lamp or a railway station?—Yes. We must draw a distinction between public and private lighting. Public lighting is a necessity required by public convenience or by Statute. If an accident happens on their private road, the Railway Company are responsible. They are responsible for lighting their own premises.

Replying to further questions, witness said they supplied Railway Companies in Edinburgh. Their practice in regard to discounts was to make it subject to the particular premises concerned. What would the Railway Companies say if their stations and roads were to be treated as public property in other respects? In Edinburgh, they had one district within half-a-mile of the gas-works which was charged 1s. per 1000 cubic feet above the City rate. It was a matter of uniformity to treat all the outside districts alike.

Mr. John Cowan, an engineer in practice in Glasgow but residing in Giffnock, was the next witness. He viewed with the utmost alarm any proposal for the Corporation withdrawing from that area. He had approached the Busby Gas Company with a view to supply; but their terms were too onerous. Taking all the circumstances into account, he thought the area allotted to the Company in the Bill was fair. It would not be an advantage to have all under one authority. He would like to see some competition. At present, the Corporation had authority to supply two parishes (Eastwood and Cathcart) formerly served by the Busby Company, and they sought powers to extend into two areas in the parishes of Carmunnock and Mearns. Counsel suggested that what Busby asked for was a guarantee for the return on the capital expended over the half-mile for bringing a pipe from Giffnock; and witness replied that he thought the price was high.

Replying to Mr. BEVERIDGE, witness said the Busby Company was not a statutory concern, and had no limit to its price whatever.

Mr. William Gibb, a Director of the Baillieston Gas Company, said their district was over three miles from the nearest municipal boundary of Glasgow. Their capital had risen from £1500 in 1866 to £4573, and they had spent considerable money on extending and improving their works. They could not manufacture gas as cheaply as the Glasgow Corporation.

Mr. T. Eaton Robinson, City Accountant and Registrar under the Glasgow Corporation, in reply to Mr. BALFOUR BROWNE, gave evidence as to the borrowing powers from the report of the Secretary for Scotland on the Bill. The aggregate borrowing powers of the Gas Department at May 31 last were £3,072,268, as set forth in the statement of borrowing powers printed for the Committee. Of this sum, there had been borrowed £2,142,268; leaving a balance of £930,000 borrowing powers unexhausted. A special item of £15,000 was referred to in the Scottish Office report as having been over-borrowed by the Gas Department during a short period when the then authorized borrowing powers were exhausted. The sum was temporarily taken from

the borrowing powers for electricity, and refunded within a very few months. The Corporation, being of the opinion that the Scottish Office would prefer an equated sinking fund to a continuation of the varying sinking funds under the present Acts, instructed the drafting of the clauses. The new proposals were arrived at by estimating a rate which would produce an amount somewhat in excess of the total which must be set aside annually under the present Acts. The balance unapplied, but invested in statutory securities, is, as stated by the Scottish Office, £84,934, of which £43,663 was applicable to annuities. In regard to the suggestion that the annuity sinking fund should be accumulated, this was exhaustively considered by the Scottish Office and the Committee, when the sinking fund was fixed at 1½ per cent. on the then estimated market value of the outstanding annuities; and it was not provided that this sinking fund should be accumulated. The annuity stock was irredeemable; and the greater part of the balance was now held by permanent trusts, and would not come into the market. The sinking fund now proposed would probably have to be paid for many years to come, and would, it was believed, be most simple. The Bill provided for a sinking fund of 2 per cent. on the present market value of the annuities. This represented £11,791, to which there fell to be added £6126—being 2½ per cent. on £272,268, the amount of Corporation stock issued in lieu of converted annuities. These sums together amount to £17,917, as compared with the minimum of £15,000 suggested by the Scottish Office, which, he thought, was an unnecessary provision.

Mr. CLODE, in the course of a speech, said it was perfectly obvious that the Corporation were seeking powers to differentiate between private gas lighting and gas used for other purposes. A lower rate for the streets of Glasgow than for their stations and footpaths was aimed at. At present, they were not entitled to do this; and his clients objected to the amendment. It was true that they professed to make the amount of gas consumed the test as to whether the reduced rate was charged; but the Corporation counted as one consumer, and the Railway Company did not.

Mr. W. S. Brown, the principal shareholder of the Busby Gas Company, gave evidence. The Company had a capital of £10,000, of which he owned about half. It was a pioneer Company in those parts. In 1888, Clarkston and Busby applied to Glasgow to extend their pipes so as to compete with the new Company, and they refused; so they were left to develop the district. They had been supplying Giffnock for some years before Glasgow took over the pipes from them. When they resolved to extend their mains to Giffnock, they laid them beside the Company's pipes. The Company reduced their price; and the people, with few exceptions, refused to have anything to do with the Glasgow supply. They had no enthusiastic representatives there; but they bought the Company out for £9000.

Mr. WILSON: Was it not a staggering blow when you saw it in the Bill that the Corporation were asking for powers to include the whole parishes of Mearns and Carmunnock?

Witness: Yes. They should either leave the district to us, or buy us out.

Mr. William J. G. Shaw and Mr. David Arthur Keay, giving evidence on behalf of the local ratepayers, supported the previous witness.

Mr. WILSON, summing up on behalf of the Busby Company, said it was a parliamentary practice that a non-statutory Company who had been supplying the district for so long should not be disturbed by any outside authority or company with statutory powers. They made the same fight with regard to the Busby Water-Works in 1857; and they were beaten. They should take the common-sense view of Mr. Brown, and either buy up the Company or keep out of the business altogether.

The Committee adjourned until yesterday (Monday).

LITTLE HULTON URBAN DISTRICT COUNCIL BILL.

The Committee of the House of Commons presided over by Sir FRANCIS LEYLAND-BARRATT had before them on Wednesday last the clause dealing with gas matters in the Little Hulton Urban District Council Bill (*ante*, p. 53).

Mr. LEES, the Agent for the Bill, read the clause, as follows:

(1) The agreement made the 14th day of March, 1910, between the Corporation of the one part and the Council of the other part, set forth in the first schedule to this Act, is hereby confirmed and made binding on the parties thereto.

(2) The sale of the undertaking shall be carried into effect and evidenced by deed in accordance with the provisions of the said agreement; and on the execution of the deed by the Corporation, the gas undertaking of the Corporation, with its rights, powers, and privileges, shall, by virtue of the deed and of this Act, become, and shall thenceforth be transferred to, and vested in, the Council, and such transfer and vesting is in this Act referred to as "the transfer."

(3) The before-mentioned purchase money, when received by the Corporation, shall be applied by them to gas-works purposes to which capital is properly applicable, or in the repayment of any outstanding moneys borrowed by the Corporation for gas-works purposes, or in such other manner as may be approved by the Local Government Board.

Mr. CRIPPS, on behalf of the Salford Corporation, said the only point he wished to raise on the clause was that if there were any variation of the agreement between the Salford Corporation and the Little Hulton Urban District Council, another application to Parliament would be rendered necessary. He thought the Committee might assent to the insertion of a provision in the clause so that, if need be, the parties could agree to a variation.

The CHAIRMAN pointed out that the agreement was put in before the Committee; and it was on the agreement that the Committee had given their decision. He could not see what possible variation the parties could desire, because it was clearly the transfer of mains and goodwill for a definite sum of money.

The Committee decided against the application, and the clause was added to the Bill.

LEGAL INTELLIGENCE.

CLAIM UNDER THE WORKMEN'S COMPENSATION ACT.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Wednesday, April 6.

(Before Justices DARLING and BUCKNILL.)

Flower v. Southampton Gas Company.

This was an appeal by the defendants from the decision of his Honour Judge Gye, ordering an agreement for compromise under the Workmen's Compensation Act to be registered. The claim arose under the Act of 1897, which provided that the accident must have happened "on, in, or about" the premises of the employer. As a matter of fact, it occurred in this case about a mile from the works; and when, after about twelve months, this came to the defendants' knowledge, they stopped further payments, and the plaintiff applied to the County Court Judge to file a memorandum of agreement. In spite of the defendants' opposition, this was done.

Mr. SIMON, K.C., and Mr. S. H. EMANUEL appeared for the appellants; Mr. BARRINGTON WARD and Mr. CLARKE HALL represented the respondent.

Justice DARLING, in giving judgment, said he had come to the conclusion that the appeal must be allowed. The facts were these: The plaintiff, while in the employment of the defendants, met with an accident at a distance from the works, which, as the law then stood, gave him no claim under the Workmen's Compensation Act, as the accident did not occur "in, on, or about" the premises. The claim made, so far as it conveyed any information, led the defendants to believe that the accident did occur upon their premises under circumstances which gave the plaintiff a legal claim under the Act; and they paid him 11s. per week. Afterwards, when there was some negotiation for a settlement of the claim in full, it came to their knowledge that they had been paying under a misapprehension; but because one of their clerks, twelve months after the accident happened, and six months before the defendants finally refused to pay, knew the place where it had occurred, the County Court Judge came to the conclusion that there was an agreement that the defendants should go on paying the plaintiff 11s. per week. He did not think there was any evidence that they agreed to do anything of the kind. There was no consideration for the agreement; and the plaintiff had admittedly no claim on the defendants, as it appeared that he knew perfectly well where the accident occurred and they did not. It must be assumed that the plaintiff knew the law, and that he had no claim on the defendants; and if they had known where the accident occurred, they also would have known that he had none. There was no evidence whatever upon which the County Court Judge could come to the conclusion that there was an agreement between the parties. It was said by Mr. Barrington Ward that the agreement must be registered, even though it might be a bad one; and in support of this statement he cited the Scotch case of *Macdonald v. Fairfield Company*. But there the agreement was a good one. The Scotch Court decided that, there being a real agreement, it must be registered, though it was possible some relief might be gained by one of the parties. In the present case there was no agreement; and, therefore, the memorandum ought not to have been registered.

Justice BUCKNILL concurred.

The appeal was accordingly allowed, with costs; but their Lordships gave leave to appeal.

Position of the Perfect Mantle Company, Limited.

In the Chancery Division of the High Court of Justice last Wednesday, Mr. Justice Swinfen Eady heard a petition by the Perfect Mantle Company, Limited, which Mr. Martin, for the petitioners, said was for the confirmation by the Court of a scheme of arrangement entered into between the Company and their creditors, providing for a composition. His Lordship sanctioned the scheme.

Receiver Appointed for the Cobham Gas Company.

In the Chancery Division of the High Court of Justice last Tuesday, before Mr. Justice Neville, Mr. H. E. Wright moved for the appointment of a Receiver for the Cobham Gas Company, at the instance of Mr. Fitter and two other debenture holders. He said the total amount of debentures issued was £5400; and the interest was two years in arrear. There was no appearance on behalf of the Company. His Lordship said the order would be in the regular form where a statutory company was concerned; and he appointed Mr. Augustus C. Palmer Receiver, on giving security.

Bens Gas Company to be Wound Up.

His Honour Judge Scully had before him at the Brighton County Court, a few days ago, an application on behalf of the Bens Gas Company, Limited, of Chichester, for the winding-up of the undertaking. Mr. H. Lemon, who represented the Company, said it was incorporated in August, 1908, for the purpose of carrying on the business of manufacturing plant for the production of petrol gas to be used for lighting and heating. His Honour pointed out that the balance-sheet down to Sept. 25 last showed a gross profit of £704; and he asked how it was that the Company had got into such low water. Mr. Lemon replied that in August last a claim was set up against the Company for damages for an alleged explosion; and a verdict was given against them for £151 damages and costs. The Company could not pay this amount or their debts, and desired to be wound up. Mr. Cannot, barrister, opposed the application on behalf of Mr. Pine, the creditor who had obtained the judgment against the Company. He urged that the real object of the petition was to defeat the judgment creditor,

though from the balance-sheet and statements made by defendants at the trial, the Company were doing an excellent business. In support of the petition, Mr. L. E. Currey, Secretary of the Company, gave figures which his Honour said showed that to meet liabilities of £2040 the Company had assets of £1615. Witness said the object of winding-up the Company was not to defeat the judgment creditor, but to secure the creditors, and provide for an equitable distribution of the assets among them. Last November the Company were experiencing financial strain; and the Directors were of opinion that they should wind up. Negotiations were going on; and it was hoped the concern would be sold. They therefore kept the Company going; but the negotiations fell through, and they were not able to get the additional capital anticipated. The result of the action on the goodwill was that it was really worth nothing; and witness did not think it was now possible for the Company to carry on business. After hearing Counsel on the legal points, his Honour said that, upon the evidence, it was clear the Company was insolvent, and he saw no reason why it should not be wound up. He therefore made an order accordingly. He added that the judgment creditor had no power to enforce his execution unless the Company waived their right to have notice. Mr. Lemon intimated that the Company would not do that. His Honour pointed out that application could be made at the next Court; and Mr. Cannott said this should be done.

Bampton and Aston District Water Company.

Last Friday, Mr. Rolt applied to Mr. Justice Swinfen Eady, on behalf of Messrs. Willey and Co., Limited, for the appointment of a receiver and manager of the above-named Company; plaintiffs being the holders of debentures for £600 out of an issue of £4000 which were secured on the undertaking and assets. Interest was a year-and-a-half in arrear; and though the Company had endeavoured to pay, they had not succeeded in doing so. They now asked applicants to agree to a renewal; but this was not assented to. His Lordship asked whether the Company were supplying water. Mr. Rolt replied that they were; but he said he gathered from the correspondence that they had not many customers. He understood that Mr. Luxmore, on behalf of the Company, was willing to consent to Mr. William Cash being appointed Receiver and Manager, and to the usual debenture holder's judgment. His Lordship made the order, and limited the appointment of Mr. Cash to three months; the time not to be extended without the sanction of the Court.

Facilities for Rifling Prepayment Meter Boxes.

When presiding a few days ago over the Children's Court for the north-eastern and eastern districts of London, at Old Street Police Court, Mr. Cluer, the Magistrate, offered some advice to gas companies who supply penny-in-the-slot meters. The remarks were made during the hearing of a charge against James Mudd, a boy of 12, for stealing 3s. 4d. from a gas-meter at the house of his father in Grove Road, Bow. The father, in giving evidence, said he had caught his boy rifling the money-box attached to the meter, having opened it by means of a small box-key. It was exhibited, and proved to be a very ordinary one, such as is used for cheap workboxes. Having examined it, Mr. Cluer said he would suggest that someone from the prosecuting Company (the Commercial) should visit some well-known lock maker, when he had no doubt they would be supplied with locks which no ordinary key would open. Mr. Frowde Phelps, solicitor, representing the Company, said his Worship's remarks should be conveyed to them. Continuing his evidence, the father said his boy admitted that he had on previous occasions taken small sums of money from the meter by means of the key. He added that the boy was more than he could manage, and he would like him to be sent away. Mr. Cluer refused to relieve the parent of his proper responsibility, and advised him to punish his boy for the offence. He bound the accused over for twelve months in the father's recognizance of £5; remarking that if the boy misbehaved the father would suffer.

Water-Gas Plant for Birkenhead.—At the meeting of the Birkenhead Town Council last Wednesday, the Chairman of the Gas Committee (Mr. J. H. M'Gaul) said that the Local Government Board had sanctioned the expenditure of £20,162 for the purchase of water-gas plant. The period in which the money must be repaid is 23 years; 10 years being allowed for the repayment of £600 borrowed for other extensions at the gas-works.

Gas Fatality at Cardiff.—A verdict of "Death from misadventure" was returned by a Cardiff Coroner's Jury who inquired into the death of Mary Marks, the thirty-year-old wife of a clerk, who was asphyxiated by gas. She had for some time suffered from weakness and depression; and one morning her husband going to see if she was all right, found her dead in bed. The gas-bracket (the tap of which was partly turned on) was near the window-curtains; and the supposition was that deceased, in endeavouring to obtain more daylight, had pulled back the curtains, which had caught the gas-tap.

Monte Video Water-Works Company, Limited.—The ordinary general meeting of this Company was held on March 22—Mr. J. Anderson in the chair. In moving the adoption of the report, noticed last week (p. 822), the Chairman said it was a matter of great satisfaction to the Board that they had this year seen their way to recommend an increase in the dividend from 7 to 8 per cent., in view of the steady progress of the Company's business and profits; and also bearing in mind that their big extension works were now completed, and that they had no further capital expenditure of a serious character to meet for a considerable time. The number of new customers secured during the year was 1933, or 12 per cent.; and the increase in their gross income was £12,255, or 10 per cent. The approximate cost of the additions to the plant was £251,000, of which the new 30-inch steel pumping main accounted for £172,000. A further reduction of 4c. per cubic metre in the price of water would be granted to those who paid on the maximum scale when the number of their customers had reached 20,000 and had remained at this figure for twelve months. Their relations with the authorities continued to be very satisfactory. The report was adopted.

MISCELLANEOUS NEWS.

ROCHDALE GAS-WORKS EXTENSIONS.

Council Approve Installation of Glover-West Vertical Retorts.

At last Thursday's Meeting of the Rochdale Town Council, the recommendations of the Gas Committee for the installation of vertical gas-retorts on the Glover-West system, together with other improvements at the gas-works, were approved.

Mr. WALKER, the Chairman of the Gas Committee, explained to the meeting that the estimated cost of the installation (exclusive of foundations and chimney) was £18,085; and he proceeded to give particulars as to the Glover-West system of vertical retorts. He made special reference to the minimizing of the emission of smoke and steam by the system, and the avoidance of the necessity of any exposure of the men to the heat of the retorts—adding that a similar installation had given full satisfaction at St. Helens and was now being adopted by the Manchester Corporation. It was beyond question, he said, that considerable economies would be effected with this plant—not only in fuel and labour, but in the quantity of gas which could be produced. The scheme met with the hearty approval of Mr. Ball, their Gas Manager; and the Committee were satisfied that there were solid economic advantages which warranted them in recommending the scheme. "Having met many of the principal and noted men in the gas industry," continued Mr. Walker, "I believe that among a community of gentlemen who are enthusiastic, earnest, and fully alive to everything down to the smallest detail concerning gas making, Rochdale has in Mr. Ball an Engineer who is the equal of any of them."

Mr. OGDEN, who seconded the confirmation of the Committee's minutes, expressed the opinion (from what he had seen at the different works) that the system of vertical retorts would be rapidly adopted at other places, as it was more cleanly and economical than the old system.

In answer to a question, Mr. WALKER said the estimated cost for the whole scheme—including the building of the new retort-house—was £25,500, which would have to come out of reserve and revenue.

Mr. BLOMLEY, while supporting the Committee's recommendations, said that the fact that the new system would do away with probably 75 per cent. of the manual labour at the works was a serious matter in these distressing times; for it meant that the men discharged would either join the ranks of the unemployed or have to find work in some other occupation. At the same time, he admitted that the conditions of labour under the new system would be vastly improved.

BRISTOL GAS COMPANY'S BILL.

Municipal Opposition Ceases.

At a Meeting of the Bristol City Council to-day (Tuesday), the Parliamentary Bills Committee will advise the Council to allow the Gas Company's Bill to proceed without opposition. This is the outcome of a compromise. One of the chief factors in bringing it about was the withdrawal by the Company of the clause relating to the formation of a second reserve fund. The Committee objected to the removal of the restriction upon the presence of sulphur in the gas, to the reduction of the illuminating power from 14½ candles to 14 candles, and to the proposed new method of testing the gas. As Parliament does not now require gas companies to remove sulphur impurities from their gas, and in view of the other two points being in accord with the Model Gas Bill, the objection fails. The Company will amend the clauses in the Bill relating to neglect or refusal to supply gas, and to the repair of pipes by consumers, so as to comply in the one case with the Model Bill, and in the other to restrict the consumer's liability for defects of the service pipe between the boundary of his premises and the meter or the house. In all, six clauses are withdrawn, and among them that relating to the repeal in certain cases of the Company's obligation to supply gas for other purposes than light, and also the power of refusal to supply gas where the consumer has electric power, except upon payment of a minimum annual sum.

GAS-METER TESTING IN LONDON.

Report by Mr. James Stratford.

The Gas-Meter Inspector to the Corporation of London (Mr. James Stratford) has lately submitted to the County Purposes Committee his report for last year, from which we take the following particulars.

The Inspector commences with the statement that all the tests ordered by the Sales of Gas Act were applied to each meter; "great care being taken to ensure justice between the gas companies and the consumers, to correct the accidents of manufacture, and by certificates of actual consumption to decide disputes." He adds that "nothing has been neglected or strained with the purpose of showing a profitable return." The number of meters tested last year was 86,383, and the fees received amounted to £2580 14s., compared with 83,369 meters tested and £2533 14s. 6d. received as fees in 1908. There were 85,618 dry meters tested, ranging in size from 1250 lights to 1 light; the largest numbers being 10-light (11,246), 5-light (29,692), and 3-light (41,906). Of the 765 wet meters tested, 175 were 10-light, 418 were 5-light, and 88 were 3-light. The total number was divided thus: New, 32,728; repaired, 46,111; disputed registration, 7544. Last year 49,258 prepayment meters were tested; the total being made up as follows: 20-light, 3; 10-light, 515; 5-light, 13,463; 3-light, 35,244; and 2-light, 33. The following is a statement of the numbers of new and repaired meters rejected and returned to the makers for correction. These when returned correct were re-tested and stamped free of charge. Many of them were correct according to the Sales of Gas Act, but

or enlarged after the passing of the Act, takes water from, or conveys water through, any county district or any part of one for supply outside, the district council may demand a supply of water in bulk for use and for supply for use within the district or any part thereof; and the authorized undertaker is, subject as subsequently provided, to afford such supply, in such quantity, at such price, and upon such terms and conditions, as, in default of agreement, may be determined. It is provided that such water is not to be used or supplied for use in the part (if any) of the county district that is within the limits of supply of any authorized undertaker, not being the one on whom the demand is made, except with his consent in writing, which consent is not to be unreasonably withheld.

Any difference or question arising under the preceding section is to be determined by the Local Government Board, who are to hold an inquiry into the subject-matter, at which all parties concerned are to be entitled to be heard; and the Board, after holding the inquiry and considering all the circumstances of the case, may make such order as they think fit. Any such order may (in particular) determine all or any of the following matters, so far as they or any of them are in question: (a) Whether a supply of water is or is not to be afforded under the section, and in the former case in what quantity, at what price, and upon what terms and conditions; (b) whether any consent required is or is not being unreasonably withheld, and may dispense with such consent either absolutely or upon terms; and (c) how the costs of any of the parties attending the inquiry shall be borne. The provisions of sections 294-6 of the Public Health Act, 1875, are to apply to inquiries and orders under the section. Any order made by the Local Government Board may be enforced by *mandamus*.

Clause 6 specifies that, except so far as is expressly provided, nothing in the Act is to operate to relieve any authorized undertaker from any obligation or disability, or from any action, suit, claim, demand, or liability to which but for the passing of the Act he would be or become liable.

The Act is to be cited as the Water Supplies Protection Act, 1910; and it is not to extend to Scotland or Ireland.

PROPOSED SMOKE ABATEMENT BOARD.

The Smoke Abatement League are memorializing local authorities in support of a petition to the Local Government Board with the view of having made applicable to the whole country the provisions for the control of smoke which are embodied in a Bill of the London County Council. The following are some of the objects of the League, as set forth in the petition: "We suggest the creation of a Smoke Department of the Local Government Board, with inspectors who should be competent men with scientific training, paid as such, experts in the chemistry of fuel and combustion, and with some knowledge of mechanical engineering also. We desire to remove, so far as public action can, the domestic smoke nuisance also; and for this end we would propose that, after a reasonable delay, all new fireplaces should be inspected and passed, as drains and plans are. There is a great difference between the smoke-producing qualities of good and bad grates. Believing that cheap gas will be a large factor in the ultimate solution of the smoke question, we trust that the Board, in dealing with the borrowing powers asked for by gas undertakings, will absolutely prohibit the pernicious practice of selling gas dear to relieve the rates. This leads to wasteful expenditure, is unfair to large users of gas, and prevents the development of this clean and civilized way of obtaining heat and power."

Gas Explosion at a Soap-Works.—An explosion of gas caused a good deal of damage a few days ago at the Portsmouth Soap-Works of Messrs. Doudney and Co. A bracket had been removed in the office, which became filled with gas owing to the tap in the main having been turned on without any intimation being given of the fact. An employee named Craven took steps to clear the office of gas after stopping up the leaky bracket; but this had not been effectual when he struck a match. The result was that the windows and doors were blown off, and Craven sustained such injuries about the head that he had to be medically attended at the local hospital.

Dartmouth Gas Company.—Mr. R. W. Prideaux presided at the recent annual meeting of this Company. It was reported that the new washer and scrubber, the new sulphate plant, and other additions to the works, had been in use for about six months, and had given satisfactory results. The accounts showed receipts to the amount of £4811 and expenditure of £4103; the profit balance being £708. Both receipts and expenditure were rather less than last year, owing to the lower price obtained for residuals and the amount paid for coal. There are 763 prepayment meters and stoves in use—an increase of 64. It was decided to pay a dividend of 9s. per share.

Exmouth Gas Company.—In the report presented at the recent annual general meeting of this Company, the Directors stated that there had again been a satisfactory increase in business, which fully justified the forward policy of which the Company's Bill now before Parliament was evidence. The accounts showed a credit balance of £4477; and after payment of the usual dividends, there would be £3627 to pay interest on the debenture stock, preference shares, &c. The Chairman (Rev. C. R. Carr), in moving the adoption of the report, remarked that the increase in the receipts was very encouraging, in view of the large extension of works which had been recently undertaken. When the scheme was completed, they would be capable of meeting the demand for gas for a long time to come without unfair and wasteful pressure upon the plant, and extra labour and anxiety to those in charge. The works had not for many years been in a proper condition to meet all requirements. Mr. L. D. Thomas, a Director, said the sale of gas had increased year by year; and when the mains were extended to Lympstone and Woodbury, as was proposed by the Bill, the Company would have a new area to draw upon for customers. The report was adopted, and the dividends of 10 and 7 per cent. upon the different classes of shares recommended therein were declared.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Informal Meeting of Scottish Gas Managers—already the twenty-seventh of the series—which was held in Glasgow on Wednesday, underwent trials the outcome of which is to establish the gathering upon a basis more secure than it has ever occupied. The first of these trials was the declination of Mr. J. Ballantyne, of Hamilton, to take up the post of President. Mr. Ballantyne was nominated last year in his absence; and evidently his tastes do not lie in the direction of public life. To get out of the difficulty, the Convener of the meeting—Mr. W. B. M'Lusky, of Perth—to whom the greatest credit must be given for the success of the gathering, fell back upon the expedient of asking Mr. D. Vass, of Airdrie, who was President at last year's meeting, to continue in office. Mr. Vass was sufficiently loyal to the cause of the gas industry to agree at once to the request. But then there arose the second trial. Mr. Vass must be presumed to have delivered himself of his best in his last year's address; and it might have been jeopardizing the success of the meeting to have asked him to prepare another address and submit it for the informal knocks which abound at the spring meeting. It was felt, too, that it would be scarcely fair to Mr. Vass to ask him to submit to the ordeal a second time in succession. Mr. M'Lusky got out of this difficulty by asking the Engineers of the three largest gas undertakings in Scotland to submit short notes upon subjects of which they have made a special study—the President to do the same. The scheme was so exceedingly well devised that, when the gentlemen approached consented to take up the subjects allotted to them—which each of them graciously agreed to do—the success of the meeting was no longer in doubt. There was then the question of the trading element. The Informal Meeting had, till this year, been exceedingly free in the admission of all who thought they had an interest in coming. Following the trend of events in other quarters, Mr. M'Lusky resolved upon the step of endeavouring to confine the business of the meeting to those who are managers or assistants, or members of Junior Gas Associations, among the latter of whom are clerks in gas offices, and the like. Not to be too exclusive, however, he allowed the introduction, as visitors, of directors of gas companies or members of corporation gas committees, and principals or managers of engineering or other concerns connected with the gas industry; this being the restrictive qualification now laid down by the North British Association. The step was a bold one to take; but its entire success altogether justified its being taken. The number of gas managers and other duly qualified persons attending was, if not the largest, considerably above the average; and the discussion upon the papers was, in every way, all that could be desired. Of the papers themselves, they all dealt with subjects which are of the first interest at the present time. But another, and a most extraordinary and unlooked-for, trial arose at the end of the day, when it was announced that the Committee of the North British Association had that day decided to make the proposal that the Informal Meeting should be taken over by the Association. The extraordinary part of the proposal was that no reasons were given for it; and when this was pointed out, it was replied that it was intended that the Informal Meeting should find reasons for the annexation. This is not the usual way of doing business; and, indeed, it was so unusual that it failed in its object. The gentlemen assembled could find no reason why their highly-prosperous gathering should be handed over to other administration; and they, without a vote, rejected the proposal. There is some speculation as to the reason for the proposal being made. It was banteringly remarked in the meeting that it was probably the President's badge and chain of office which it was sought to annex. This was probably not a reason which weighed with the Committee. The probability rather is that they wished to strengthen the North British Association; and possibly the success which has attended the Junior Gas Association was the heaviest moving power in the matter. The proposal that the Informal Meeting should be administered by the North British Association was advocated by me years ago. It did not find favour then; neither did it do so four years ago, when Mr. Vass made the same proposal. The situation is now altered, if in no other way by the institution of the Junior Association. It was probably not considered by the Committee of the North British Association that the Junior Association admits to its membership gentlemen who would not be eligible for membership in any class of the North British Association. These would have been either excluded from the Informal Meeting or admitted by favour—a few of them, probably, who might be qualified, becoming associate members of the North British Association. On all counts, the rejection of the proposal was, in the meantime, the right course to take. If circumstances alter, the proposal can be brought forward again. The point to be noted is that managers assembled in an informal manner have resolved, notwithstanding that their proceedings were this year more formal than usual, to maintain the informality of the spring gathering, which, to many, is the charm of the meeting; the business being got to at once.

The joint meeting of the Eastern and Western Districts of the Scottish Junior Gas Association at Falkirk to-day was as happy in realization as it was in conception. The members fraternized together as became colleagues in the same cause. Everyone was delighted with the appearance of the gas-works at Falkirk, which are, as was described by Bailie Bogle, of the most up-to-date description. The Corporation are proud of their works and of their Engineer. The members of the Corporation who were present very courteously received and entertained the Association; and the juniors were highly gratified at their reception.

It will be remembered that it was proposed to hold an exhibition of gas appliances on an extensive scale in Glasgow in the course of the past winter, but that the proposal had to be abandoned, as, on account of the General Election, it was impossible to find a place in which to hold the exhibition. A Sub-Committee have been on the look-out for premises which would be suitable for the event, and it is announced that they have secured, for not less than a month from about the middle of September, the structure in Victoria Road, South Side, occupied by the American Roller Skating Rink. The Corporation have agreed to this, and have empowered the Committee to make arrangements for holding the exhibition. Last Monday an exhibition of gas

appliances held under the auspices of the Corporation of Glasgow, was opened in the public hall at Muirhead. The Corporation gas-mains have recently been extended to the villages of Muirhead and Chryston. In opening the exhibition, Dr. Lamont said he had already proved gas to be a cleanly and most efficient fuel, besides being only about half the cost of oil, his previous illuminant. Bailie Kirkland expressed his pleasure at the fact that, although the mains had been laid only a few weeks, already between 60 and 70 gas-cookers had been installed. Cookery demonstrations were given during the week by Miss E. M. Dods, late Principal of the Dundee School of Cookery.

The death occurred in Grangemouth on Saturday last of Mrs. White, the wife of one of the Magistrates of the burgh, from injuries sustained in an explosion of gas nearly a fortnight before.

A new petrol air-gas plant, the design of Mr. Walter Simpson, has been fitted up in the Loirston Hotel, Ballater. The system has been patented by Mr. Simpson; and is known by the name of the "Britannia" safety air-gas plant. A small hot-air engine, using part of the gas produced, supplies the power. The rising of the gasholder puts a stop to the manufacture of gas, and its fall starts it again. It is claimed that the gas is non-explosive; the quantity used being so small in relation to the quantity of air that the gas will not light unless with a mantle for incandescent lighting, or in a bunsen burner for cooking and heating. About 60 burners are supplied. The gas may be used also for cooking and heating. There is no public gas supply in Ballater.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, April 9.

Notwithstanding the decrease in the output from gas-works at this time of the year, demand has hardly been sufficient to absorb current production, and an easier market has again to be recorded. The inquiry for home consumption continues good; but there is still a paucity of new export orders, and the week closes with values reduced to £12 2s. 6d. per ton f.o.b. Hull, £12 3s. 9d. to £12 5s. per ton f.o.b. Liverpool, and £12 6s. 3d. per ton f.o.b. Leith. In the forward position, no further transactions are reported; but makers maintain a firm attitude, and refuse to quote less than £11 17s. 6d. per ton f.o.b. at the best ports for equal monthly quantities July-December, 1910.

Nitrate of Soda.

The tone is rather firmer again, but quotations are unchanged at 9s. 9d. per cwt. for ordinary, and at 9s. 10½d. for refined quality, on spot.

Tar Products.

LONDON, April 11.

The markets for tar products remained firm during the past week. Pitch has shown further signs of improvement. The demand for solvent continues, and makers are very firm in their ideas of price. The

majority are very well sold to the end of the year, and are asking as much as 1s. 6d. for any surplus. Crude carbolic acid consumers are offering 1s. per gallon on the east coast, but makers do not feel inclined to sell even at this figure. Creosote is steady.

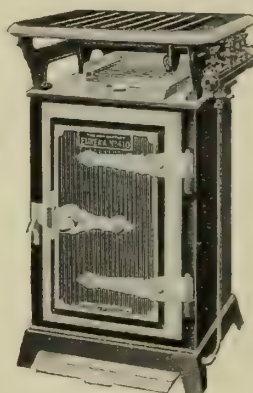
The average values during the week were: Tar, 16s. 9d. to 20s. 9d., ex works. Pitch, London, 33s. 6d.; east coast, 33s. 6d.; west coast, 32s. 6d. to 33s. 6d. f.a.s. Mersey ports, 33s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 8d.; North, 8d.; 50-90 per cent., London, 9d.; North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 3d. to 1s. 5d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, east and west coasts, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

Although the market remains steady, buyers do not feel inclined to pay to-day's prices, but the majority of makers report that they are well sold for the next month or two, and therefore are not anxious sellers to-day. Actual Beckton is quoted at £12 10s.; and outside makes upon Beckton terms at £12 5s. In Hull, £12 3s. 9d. is asked; and in Liverpool, £12 5s. to £12 6s. 3d. In Leith, £12 7s. 6d. is quoted; and in Middlesbrough, £12 3s. 9d.

Automatic Lamplighting at Bournemouth.—The Lighting Committee of the Bournemouth Corporation have lately had before them the question of the automatic lighting of the public lamps. The matter came up on the report of a Sub-Committee who had considered offers from Messrs. Alder and Mackay and from the Company who now hold the lamp-lighting contract, and also a report by the Outdoor Lighting Inspector. After very full consideration of all the information before them, they decided to recommend the Council to enter into a fresh agreement with the Company, on terms which are to be subsequently settled.

Keighley Water-Works Extension.—The Keighley Town Council have passed a series of resolutions instructing the Town Clerk to take the steps necessary to obtain possession of lands in the Sladen Valley, near Stanbury, required for the construction of two new reservoirs; appointing Mr. James Watson, the Bradford Water Engineer, as Consulting Engineer, and Mr. Ratcliffe Burnett as Resident Engineer; and empowering the Water Committee to make arrangements for the commencement of the new works. Mr. B. S. Brigg said the resolutions marked the beginning of a very important, lengthy, and costly undertaking. If commenced at once, the works would probably occupy quite eight years.



WRIGHT'S
EUREKA

Here is a picture of our
New Season's Cooker and
Hot Water Boiler.
We shall be pleased to
receive your instructions
for printing, and quantity
required.
John Wright & Co

This season —
The "Eureka"
is as much as ever
in advance of all
competition.
Essex Works - Birmingham

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is active; but prices have fallen for some kinds of coal since it was known that work at the collieries would be increased. The fall is chiefly in the steam coal trade. Best Northumbrians are down to about 11s. 4½d. per ton f.o.b. For second-class steams, the price seems steady at from 10s. 6d. to 11s.; and steam smalls are quiet at from 6s. to 7s. 6d. The work is fuller now at the collieries; but the opening of the Baltic will soon help to increase the demand for export. In the gas coal trade, the request is steady; and the price of Durham gas coals varies, according to quality, from 10s. 3d. to 11s. per ton f.o.b. for the usual classes, and up to 11s. 6d. for "Wear specials." The home demand is rather less than it was, but exports are fuller. In regard to contracts, some for Paris have been settled—about 150,000 tons, it is said, over two years, of best sorts, and 60,000 tons of seconds, at prices somewhat near those that are current. It is reported that there have been begun negotiations for the great London coal contracts; but little as yet seems to be known about this, and it is believed that tolerably full stocks will prevent any hurry over such negotiations. Coke is steady; and good gas coke is quoted at from 14s. to 14s. 3d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade has the appearance of being easier, splint particularly having been on sale at a little less than last week's quotations. Ell has been in fair request, and the price steady. The prices now quoted are: Ell, 9s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. to 10s. 6d.; and steam, 10s. to 10s. 6d. The shipments for the week amounted to 365,776 tons—an increase of 36,247 tons upon the previous week, and of 90,024 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,771,901 tons—an increase of 658,660 tons upon the corresponding period.

Penkridge Water Supply.—The Cannock Rural District Council having applied to the Local Government Board for sanction to borrow £4800 for works of water supply for the township of Penkridge (including the execution of works in the parish of Teddesley Hay), an inquiry was held last Wednesday, at Penkridge, by Mr. Courtenay Cliff, M.Inst.C.E., one of the Board's Inspectors. The Clerk to the Council (Mr. A. W. Carver) submitted particulars as to their proposals; and Dr. Reid, the County Medical Officer of Health, gave evidence as to the necessity for an alteration of the existing condition of things. The application was opposed by ratepayers on the ground that a supply of water could be obtained from the South Staffordshire Water Company at a cost of 3d. per house, compared with 5d. under the Council's scheme. Witnesses were called in support of the opposition; and the inquiry closed.

Gas in the Laundry.

The Laundry Exhibition held at the Agricultural Hall, Islington, last week, afforded evidence that gas has steadily increased in favour for heating appliances connected with rotary ironers; and there are very few laundry engineers who have not adapted it for shirt and collar machines and for calendars. The firm of Appleyard, of Bradford, exhibited a five-roller ironer, each roller under atmospheric gas. Other firms showed starch-boilers, soap-tanks, polishing irons, goffering-machines, and collar-presses, all being worked without atmospheric blast. These were mostly the production of the Cork Gas Engineering Company, of Rosebery Avenue. A new iron by Messrs. Wallwin and Co., of Salford, was one closed in, and with a perfect combustion chamber.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards placed three new issues of capital by order of Directors. The first lots in the particulars of sale consisted of £10 shares and 4 per cent. perpetual debenture stock of the Lowestoft Water and Gas Company. The shares rank for a maximum dividend of 7 per cent., and the last one paid on similar shares was at the rate of 5½ per cent. They were all sold at from £10 5s. to £11 5s. each; and the debenture stock fetched from par to £102 per £100. Some consolidated ordinary stock of the Worthing Gas Company was placed at from £103 10s. to £104 10s. per £100. The other new issue was £32,000 of 4 per cent. perpetual debenture stock of the Alliance and Dublin Consumers' Gas Company; and it realized prices ranging from £95 to £96 10s. per £100. On the same occasion, Messrs. Richards sold a small quantity of "A" stock of the Horley District Gas Company, ranking for a standard dividend of 10 per cent. per annum, subject to the sliding-scale (the last dividend having been at the rate of 5 per cent.), at £101 to £104 per £100. Next day, Messrs. H. W. Watson and Son sold at Renishaw 59 £1 shares in the Eckington and Mosbro' Gas Company at £1 13s. each, and a few £5 shares in the same Company at £6 10s. apiece.

Salaries in the Manchester Corporation Departments.—The Special Committee appointed by the Manchester City Council to inquire into the conditions of service of employees in the different departments have drawn up some important recommendations. With regard to men in the gas-works and other departments, it is recommended that those with more than six months' service be paid half wages for one month in case of sickness, after which each case will be dealt with on its merits. The following holidays, with full pay, are recommended: The four Bank Holidays, Christmas Day, and Good Friday. The Committee express the opinion that it is not desirable to establish an eight-hour day for the Corporation workmen.

APRIL

THE MONTH FOR "SPRING CLEANING."

Spring is also the time when a Gas Engineer can "wake up" his customers to "Cook by Gas."

It is the month when arguments of "hot weather coming" and "Coal Fires NOT wanted" most impress.

LONG DAYS and SHORT NIGHTS diminish lighting output.

RICHMOND'S "CRUSADER" COOKER

can and will make up this difference. It is THE Cooker for LOW MAINTENANCE.

Richmond Gas Stove
& Meter Co., Ltd.

The INVENTORS of the White Enamel Crown Plate—Loose Burners—
Screwless Enamels—and Removable Gas Bars.

Gas-Workers' Wages at Leeds.—The Leeds Gas Committee have passed a resolution adopting the following recommendations of a Consultative Committee respecting the wages of various employees: 2d. per shift advance to chargers (inclined retorts), drawers, firemen (on inclined retorts), attendants (machine work), firemen (machine work), stokers (handwork), coal wheelers (handwork), purifiers, yardmen, and coke fillers, coke slackers, and firemen (handwork); 3d. per shift advance to coke-wheelers; 1d. per shift advance to machine-men; and 1s. per week advance to various meter and stove repairers and cartmen. Applications of enginemen, boiler-firemen, and scurfers at the works, and a packer and some labourers in the meter and stoves department were not acceded to.

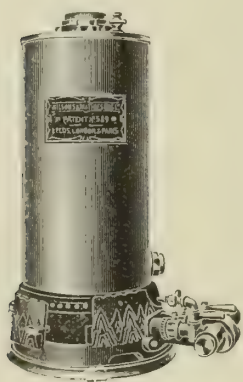
Public Lighting of Torquay.—Recommendations for improving the public lighting of the town were submitted to the Torquay Town Council yesterday week by a Committee. It was proposed to substitute a better kind of electric lamp for those now in use, and to convert 121 gas-lamps on the existing low-tension cable routes into electric lamps; also to replace the remainder of the ordinary flat-flame gas burners by incandescents. A report by the Borough Surveyor showed that the total number of gas-lamps in the area of the Torquay Gas Company is 922, of which 233 are incandescent; and in the St. Mary Church district there are 213 gas-lamps, of which 92 are incandescent. During last year, 37 new lamps were put up, and 57 were converted to the incandescent system. The gas consumed was 9,787,000 cubic feet, compared with 9,946,000 cubic feet in the previous year. The total cost was £3896—an average of £2 7s. 5d. per lamp. The Council approved of the alterations suggested; though a member remarked that the cost of the public lighting equalled a rate of 6d. in the pound.

Municipal Coal Supply and Gas Residuals Question at Leeds.—The question of the establishment of a municipal coal supply and the treatment of the gas residual products came again before the Leeds City Council at their meeting last Wednesday, on the following motion by Mr. Badlay: "For the purpose of securing information in regard to establishing a municipal coal supply department, and the effect such a revenue-producing public service would have in minimizing the burden of high rates, it is hereby resolved that a small Committee be elected by the Council to make the necessary investigations with a view to fully advising the Council on the matter, a report of such investigations to be presented to the Council as early as possible. Further, that the Committee be authorized to report upon the methods of dealing with bye-products in the Gas Department, and state the estimated cost of establishing plant to deal with the same, instead of, as now, supplying them to private manufacturers." Mr. Brown contended that it would not be to the advantage of the city to set up a municipal coal supply, or, as he showed by a comparison of figures, to deal with the bye-products of the Gas Department. The Chairman of the Gas Committee, Alderman C. F. Tetley, urged that it was never intended that a Corporation should become a kind of co-operative stores, and that nothing could be gained by the Corporation turning themselves into manufacturers. The motion was defeated by 27 votes to 6.

Irish-Made Gas-Meters for Ireland.—At the weekly meeting of the Council of the Dublin Industrial Development Association on Monday last week, a letter was received from Mr. John Farren calling attention to the desirability of the Association getting into communication with the other Industrial Development Associations, with a view to their bringing pressure to bear on the different corporate bodies in their districts to specify for Irish-made gas-meters. Nearly all of them, the writer said, were being imported, while they could be made as cheaply and as well in Dublin. The Council decided to accede to Mr. Farren's request.

Proposed Joint Water Board for the Rhymney Valley.—The question of a Joint Water Board for the Rhymney Valley was again discussed at a conference which took place at Hengoed last Thursday. Mr. C. S. Goodfellow (Caerphilly) presided, and at the opening of the proceedings read a letter from the County Council, referring to section 35 of the Rhymney and Aber Valleys Gas and Water Company's Act of 1908, which, it was stated, was inserted at the instance of the Council, and provided, in effect, that if, in any of the next three available sessions of Parliament, any combination of local authorities within the county, with the consent of the County Council, should promote a Bill for an Act to constitute a Water Board with power to purchase the water undertaking, the Company would not oppose it except on details, and the purchase would be on arbitration terms. The "third session of Parliament" referred to would be the session of next year. Having emphasized the importance of immediate action, the Chairman said the longer they delayed the more the proposed Board would have to pay for the undertaking. It was ultimately resolved that the representatives should recommend the respective Councils to engage the services of a water engineer to prepare a report in regard to the sources of water, and that his fees should be paid *pro rata* by the Councils.

Instow Water Supply.—The Barnstaple Rural District Council have decided to support the scheme of the Barnstaple Water Company for the supply of water to Instow. The subject is one which has been under consideration for about twenty years, and recently the Local Government Board sent an Inspector to hold an inquiry into the merits of two proposals which have been submitted—one for a supply from Barnstaple, and the other from Northam. In the opinion of the Board, either scheme might be regarded as satisfactory. It was pointed out, however, that the Northam scheme would cost £4500, and the margin of borrowing powers of the parish would not be sufficient to permit of sanction being given to a loan of this amount at present. The estimate of the cost of the Barnstaple scheme was £6500; and the Company required a guarantee of 10 per cent. per annum on this amount, or £650. It was estimated £333 would be received from water-rates and meter supplies; leaving a balance to be met out of a special expenses rate in Instow of £317. One of the members of the District Council expressed the opinion that the cost of both schemes was prohibitive, but that of the two the Northam proposal was preferable, as the cost would be a diminishing one. The majority of the Council, however, approved of the Barnstaple proposal, which was said to be strongly favoured at Instow.



HOT WATER SERVICE? THE WILSON "CIRCULATOR"

gives your consumers

Happy Independence of Coal

at uncomplaining cost and

TO GAS AUTHORITIES a steady permanent consumption.

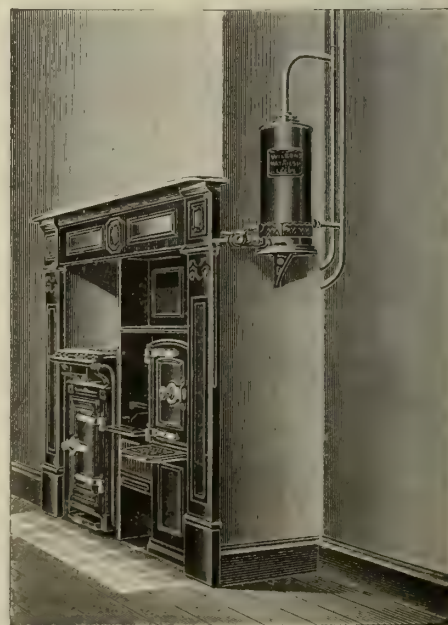
PAYING POINTS.

1. **EASY FIXTURE**—to present Pipes.
2. **UTMOST EFFICIENCY**—Water absorbs 97½% of Heat Value of Gas.
3. **STRENGTH and DURABILITY.** Each tested to 50 lbs. Pressure and made throughout of Copper.
4. **GREAT DEMAND. THOUSANDS** in daily use, many constantly worked over 5 years and still going.

Pamphlets and all Particulars from the Manufacturers:

WILSONS & MATHIESONS, LTD.,
Carlton Works, Armley, LEEDS.

London Show-Rooms: 76, Queen Street, Cheapside, E.C.



Explosion Caused by Rats.—Considerable damage was done to a house in the main thoroughfare of Nenagh, Tipperary, late last Wednesday night by a gas explosion which investigation showed to have been caused by rats gnawing a pipe. Fortunately no one was seriously hurt.

Electric Light Question at Bishop's Stortford.—At the recent election for members of the Bishop's Stortford Urban District Council, the outstanding issue was the question whether the town should run its own electric light undertaking, or whether it should be left to the Gas Company to exercise in regard thereto the powers which their Bill will confer. It has now been practically settled; for of the fifteen members elected, nine at least are adverse to such a departure. These candidates received in all a total of 6183 votes; whereas for the six who may be taken as favourable to the scheme, only 3010 votes were recorded. Consequently, the majority of the Council as now constituted is against undertaking the supply of electricity in the town.

Swansea Gas Company.—At the recent annual meeting of this Company, the Chairman (Mr. J. Glasbrook), in moving the adoption of the report, referred to the very satisfactory results of the year's working, and said there had been an increase of upwards of 3 per cent. in the sales of gas in comparison with the previous year. He also touched upon the large extensions of mains at Llansamler, Clase, and Cockett, and said that, with the view of meeting the desire of the District Council for further extensions, they had applied for a Provisional Order for carrying them out in the areas mentioned. He hoped an increase in the consumption of gas would result from the great expenditure the Company were being put to. The price of gas had been reduced, and was the lowest as yet reached by the Company—viz., 2s. 8d. for private, and 2s. 6d. for public lighting. There had been an increase of 1200 in the number of consumers during the year. A dividend at the rate of 5 per cent. per annum (less income-tax) was declared; and resolutions were passed expressing approval of the Directors, Engineer (Mr. G. Thornton Andrews), and staff.

Leyland Water Supply.—Early last year a loan of £3160 was obtained from the Local Government Board by the Leyland Urban District Council for the purpose of laying a line of pipes to convey to their reservoir at Clayton-le-Woods a supply of water from the Thirlmere main of the Manchester Corporation. The work was commenced on the 1st of November last, under the supervision of the Council's Surveyor (Mr. M. H. Wilkinson); and it has just been brought to a successful conclusion. The event was celebrated last Wednesday, when the Chairman of the Council (Mr. J. W. Lomax) formally turned on the water, in the presence of a numerous company, who afterwards drank success to the undertaking at a dinner at the Queen's Hotel, Leyland. In the course of the subsequent proceedings, a silver-gilt replica of the key used for opening the meter-house was presented to the Chairman by the Vice-Chairman (Mr. T. Smith), on behalf of the members of the Council. It bore the following inscription: "Presented to J. W. Lomax, Esq., J.P., Chairman Leyland Urban District Council, on Connecting Thirlmere Water, April 6th, 1910.—From his Fellow-Members."

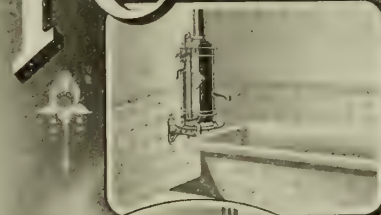
New Joint-Stock Companies.—The Chinley Gas Company, Limited, has been registered with a capital of £10,000, in £1 shares, to manufacture, sell, and supply gas in the parishes of Chinley, Bugsworth, and elsewhere in Cheshire. S. Foskett and Co., Limited, is the title of a Company registered with a capital of £1000, in £1 shares (divided equally as vendors' and ordinary), to carry on the business of manufacturers and vendors of atmospheric gas-heaters, &c. Under the title of Fuel Gas, Limited, a Company has been registered with a capital of £1512, in £1 shares, to carry on the business of manufacturers and generators of gas for light, heat, and other purposes, by the exercise (under a licence proposed to be acquired) of an invention relating to the vaporization of oil and other volatile substances, for which Mr. H. A. Kittle has applied for a patent, or by any other process. The Gas and Water Works Finance and Contract Company, Limited, was registered last Tuesday with a capital of £4000, in £1 shares (3000 preference), to "raise money by the issue of shares, and to invest the moneys so raised in the purchase of, or otherwise to acquire and hold, stocks, bonds, debentures, shares, scrip, or securities secured upon, or issued in respect of, any light or other illuminant scheme or undertaking." We do not know all the signatories; but one of them, at all events, is connected with two, at least, of the Eaton group of undertakings.

Mr. Fred T. Jeffery, son of Mr. Clark Jeffery, the Manager of the Tiverton Gas-Works, who has been in his father's office for the past three years, has been appointed by Messrs. Biggs, Wall, and Co. as their representative for the western counties.

About eleven o'clock last Friday morning, a gas explosion occurred in Hyde Road, Hoxton, by which two persons were injured. A gas-fitter, who had been erecting three lamps outside the shop of Mr. W. Byrne, a pawnbroker and jeweller, was about to test the lamps when the explosion took place, and a great mass of flames shot upward. Walter Dayson, a salesman, who was engaged on a ladder arranging some clothes outside the shop, was thrown to the pavement, and sustained injuries to his head; while a woman who was passing at the time was thrown to the ground, and had the back of her head cut. It is conjectured that gas had accumulated under the balcony of the window.

We have received from the Appleby Crane and Transporter Company, Limited (late Applebys, Limited, and the Temperley Transporter Company), of 58, Victoria Street, Westminster, Section "C" of their catalogue, in which will be found a fairly representative collection of the hand jib cranes in general use. They are most effectively illustrated, and are preceded by two pages of small views of electric and steam cranes and Temperley transporters. The illustrations are accompanied by descriptive particulars, and followed by the Company's copyright code for correspondence by telegram. Accompanying the section is a schedule of prices of the cranes shown. The wide scope of the Company's operations will be appreciated when it is mentioned that their complete catalogue contains twelve sections; and their half-century's experience in connection with all types of cranes enables them to satisfy all requirements.

PARKINSON Gas Cooking



AND WATER HEATING APPLIANCES

OUR NEW BOOKLET

Contains Particulars of all the latest developments and improvements.

May we send you a supply for distribution among your Consumers?

THE PARKINSON STOVE CO., LTD.

(Incorporating Maughan's
Patent Geyser Co.),

Stour St., Spring Hill, & 129, High Holborn,
BIRMINGHAM. LONDON.

Mr. W. L. Jackson, a former member of the firm of Messrs. W. S. Iles and Co., of No. 1, Monument Street, E.C., has joined the Board of Williamson Cliff Limited, of Stamford, and will in future represent the Company in London.

The Manchester Corporation Gas Department have placed with the Richmond Gas Stove and Meter Company, Limited, an order for the whole of their requirements for the next two years for gas-cookers for use with automatic meters.

Minutes of the Belfast Gas and Law Committees, appointing a Sub-Committee to confer with the Harbour Commissioners as to the acquisition of the Twin Island site for the proposed new gas-works have been adopted by the Council.

The Directors of the Oriental Gas Company, Limited, have resolved to pay an interim dividend at the rate of $3\frac{1}{2}$ per cent., free of income-tax, on account of the year ending the 30th of June next. The dividend is at the same rate as last year.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ENGINEER AND MANAGER. Nelson Gas Department. Applications by April 21.
SUPERINTENDENT OF PUBLIC LIGHTING. Calcutta Corporation. Applications by May 3.
GENERAL FOREMAN. No. 5216.
WORKING FOREMAN. Pembroke Dock Gas-Works.
WORKING FOREMAN. No. 5215.
GAS-FITTER. Bromsgrove Gas-Works.
FITTER. No. 5218.

Agencies Wanted by

Firm of Gas Engineers (Sydney, N.S.W.). No. 5217.

Situation Wanted.

SLOT COLLECTOR AND RENTAL CLERK. No. 5219.

Plant (Second Hand) for Sale.

RETORT-BENCH MOUNTINGS, WASHER-SCRUBBER, EXHAUSTER COMPENSATOR, STATION METER, PURIFIER CRANE, STEAM PUMP, COAL-TESTING PLANT, SULPHATE PLANT, &c., PIPE CONNECTIONS, BARROWS, AND TOOLS. Kilmarnock Gas Department. Tenders by April 25.

Meeting.

IMPERIAL CONTINENTAL GAS ASSOCIATION. Cannon Street Hotel, May 3, 2.30 o'clock.

Stocks and Shares.

ANNFIELD PLAIN AND DISTRICT GAS COMPANY. April 13.
BRYNMAWR AND BLAINA GAS COMPANY. April 30.
SOUTHEND WATER COMPANY. April 19.

TENDERS FOR

Benzol.

BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by April 25.
DARWEN GAS DEPARTMENT. Tenders by April 23.

Boilers (Gas).

DARWEN GAS DEPARTMENT. Tenders by April 23.

Coal and Cannel.

BLACKPOOL GAS DEPARTMENT. Tenders by April 24.
DARWEN GAS DEPARTMENT. Tenders by April 23.
DENBIGH GAS AND WATER COMPANIES. Tenders by April 20.
ISLE OF THANET GAS COMPANY. Tenders by April 20.
LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by April 30.
RHYL GAS DEPARTMENT. Tenders by April 27.

Fire-Clay Goods.

LIMERICK GAS COMMITTEE. Tenders by April 18.

Gasholder (Addition).

MORECAMBE GAS DEPARTMENT. Tenders by April 23.

General Stores—

(Brass and Copper Tube and Fittings, &c., Lime, Castings, Lead Gas Pipe).
DARWEN GAS DEPARTMENT. Tenders by April 23.
LEEDS GAS DEPARTMENT. Tenders by April 23.
WIGAN GAS DEPARTMENT. Tenders by April 18.

Incandescent Burners.

CALCUTTA CORPORATION. Tenders by June 6.

Lanterns.

CALCUTTA CORPORATION. Tenders by June 6.

Oxide.

LIMERICK GAS COMMITTEE. Tenders by April 18.

Pipes, &c.

DARWEN GAS DEPARTMENT. Tenders by April 23.
LEEDS GAS DEPARTMENT. Tenders by April 23.
WIGAN GAS DEPARTMENT. Tenders by April 18.

Purifiers, &c.

SOWERBY BRIDGE GAS DEPARTMENT. Tenders by April 25.

Retort Settings, &c.

LIMERICK GAS COMMITTEE. Tenders by April 18.

Sulphuric Acid.

BURY CORPORATION. Tenders by April 16.
WIGAN GAS DEPARTMENT. Tenders by April 18.

Tar.

COLNE GAS DEPARTMENT. Tenders by April 16.
DARWEN GAS DEPARTMENT. Tenders by April 23.
WIGAN GAS DEPARTMENT. Tenders by April 18.

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WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 93.

| Issue | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|------------|--------|-------------------|-------------------------------|--------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|-------------------------------|--------------------------|-----------------|---------------------|------------------------|
| £ | | | p.c. | | | | £ s. d. | £ | | | p.c. | | | | £ s. d. |
| 1,474,000 | Stk. | Apr. 1 | 5 | Alliance & Dublin Ord. | 84 86 | .. | 5 16 3 | 4,940,000 | Stk. | Nov. 11 | 8 | Imperial Continental | 181-183 | +1 | 4 7 5 |
| 310,000 | Stk. | Jan. 13 | 4 | Do. 4 p.c. Deb. | 100-102 | +2 | 3 18 5 | 1,235,000 | Stk. | Feb. 10 | 34 | Do. 3 p.c. Deb. Red. | 94-96 | +1 | 3 12 11 |
| 200,000 | 5 | Oct. 28 | 7 | Bombay, Ltd. | 68-69 | .. | 5 5 8 | 195,242 | Stk. | Mar. 16 | 6 | Lea Bridge Ord. 5 p.c. | 122-124 | +2 | 4 16 9 |
| 40,000 | 5 | " | 21 | Do. New, £4 paid. | 5-51 | .. | 5 6 8 | 561,000 | Stk. | Feb. 25 | 10 | Liverpool United A. | 222-224 | .. | 4 9 3 |
| 50,000 | 13 | Feb. 25 | 15 | Bourne 10 p.c. | 20-30 | .. | 5 0 0 | 718,100 | " | " | 7 | Do. B. | 1634-1654 | .. | 4 4 7 |
| 311,810 | 13 | " | 7 | mouth Gas B 7 p.c. | 162-163 | .. | 4 3 7 | 306,083 | " | Dec. 29 | 8 | Do. Deb. Stk. | 103-105 | .. | 3 16 2 |
| 75,000 | 10 | " | 6 | and Water Pref. 6 p.c. | 15-154 | .. | 3 17 5 | 75,000 | 5 | Nov. 26 | 6 | Malta & Mediterranean. | 43-5 | .. | 6 0 0 |
| 380,000 | Stk. | " | 124 | Brentford Consolidated | 251-254 | +1 | 4 18 5 | 560,000 | 100 | Apr. 1 | 5 | Met. of 15 p.c. Deb. | 100-102 | .. | 4 18 0 |
| 300,000 | " | " | 94 | Do. New | 183-190 | +1 | 5 0 0 | 250,000 | 100 | " | 44 | Melbourne 4 p.c. Deb. | 100-102 | .. | 4 8 3 |
| 50,000 | " | Aug. 12 | 5 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 0 | 541,920 | 20 | Nov. 11 | 34 | Monte Video, Ltd. | 124-134 | .. | 5 5 8 |
| 206,250 | " | Dec. 29 | 4 | Do. 4 p.c. Deb. | 101-103 | .. | 3 17 8 | 1,775,392 | Stk. | Feb. 25 | 44 | Newcastle & Gt. North | 104-105 | .. | 4 3 4 |
| 220,000 | Stk. | Mar. 16 | 11 | Brighton & Hove Orig. | 213-216 | .. | 5 1 0 | 529,435 | Stk. | Dec. 29 | 34 | Do. 3 p.c. Deb. | 91-93 | .. | 3 15 3 |
| 246,320 | " | " | 108 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 55,940 | 10 | Feb. 25 | 7 | North Middlesex 7 p.c. | 134-134 | +2 | 5 1 10 |
| 460,000 | 23 | Apr. 1 | 108 | British | 44-45 | .. | 4 14 8 | 300,000 | Stk. | Nov. 26 | 8 | Oriental, Ltd. | 147-147 | +1 | 5 11 11 |
| 109,000 | Stk. | Feb. 25 | 6 | Bromley, A 5 p.c. | 116-118 | .. | 5 1 8 | 60,000 | 5 | Apr. 1 | 8 | Ottoman, Ltd. | 6-6 | .. | 6 8 0 |
| 165,700 | " | " | 44 | Do. B 3 p.c. | 87-89 | .. | 5 1 2 | 31,800 | 53 | Feb. 25 | 13 | Portsea Island A. | 134-156 | .. | 5 1 0 |
| 82,278 | " | " | 54 | Do. C 5 p.c. | 104-106 | .. | 5 3 9 | 60,000 | 50 | " | 13 | Do. B. | 126-128 | .. | 5 1 7 |
| 55,000 | " | Dec. 29 | 34 | Do. 3 p.c. Deb. | 87-89 | .. | 3 18 8 | 100,000 | 50 | " | 12 | Do. C. | 119-121 | .. | 4 19 2 |
| 500,000 | 10 | Oct. 14 | 7 | Buenos Ayres (New) Ltd. | .. | .. | .. | 114,800 | 50 | " | 10 | Do. D and E. | 100-102 | .. | 4 18 0 |
| 250,000 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 98-100 | .. | 4 0 0 | 398,490 | 5 | Oct. 28 | 7 | Primitiva Ord. | 74-8 | .. | 4 7 6 |
| 100,000 | 13 | " | — | Cape Town & Dis., Ltd. | 4-5 | .. | .. | 796,980 | 5 | Jan. 27 | 5 | Do. 5 p.c. Pref. | 58-58 | .. | 4 11 11 |
| 100,000 | 13 | " | — | Do. 4 p.c. Pref. | 6-7 | .. | .. | 488,900 | 100 | Dec. 1 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 50,000 | 50 | Nov. 2 | 6 | Do. 6 p.c. 1st Mort. | 49-50 | .. | 6 0 0 | 1,000,000 | 10 | Oct. 14 | 8 | River Plate Ord. | .. | .. | .. |
| 100,000 | Stk. | Dec. 29 | 44 | Do. 4 p.c. Deb. Stk. | 86-88 | .. | 5 2 3 | 312,650 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 157 150 | Stk. | Feb. 25 | 5 | Chester 5 p.c. Ord. | 105-108 | .. | 4 12 7 | 250,000 | 10 | Apr. 1 | 9 | San Paulo, Ltd. | 15-15 | .. | 5 10 1 |
| 1,513,280 | Stk. | Feb. 25 | 510 | Commercial 4 p.c. Stk. | 105-108 | .. | 4 16 4 | 62,500 | 10 | " | 6 | Do. 6 p.c. Pref. | 114-121 | .. | 5 0 0 |
| 560,000 | " | " | 5 | Do. 3 p.c. do. | 103-105 | .. | 4 15 3 | 125,000 | 50 | Jan. 3 | 5 | Do. 5 p.c. Deb. | 56-58 | .. | 4 17 1 |
| 475,000 | " | Dec. 29 | 3 | Do. 3 p.c. Deb. Stk. | 81-83 | .. | 3 12 3 | 135,000 | Stk. | Mar. 16 | 10 | Sheffield A. | 232-234 | .. | 4 5 5 |
| 800,000 | Stk. | Dec. 10 | 5 | Continental Union, Ltd. | 98-100 | .. | 5 0 0 | 209,984 | " | " | 10 | Do. B. | 232-234 | .. | 4 5 5 |
| 200,000 | " | " | 7 | Do. 7 p.c. Pref. | 138-140 | .. | 5 0 0 | 523,000 | " | " | 10 | Do. C. | 232-234 | .. | 4 5 5 |
| 492,270 | Stk. | " | 51 | Derby Con. Stk. | 121-123 | .. | 4 9 5 | 70,000 | 10 | Oct. 14 | 10 | South African | 124-124 | .. | 7 10 11 |
| 55,000 | " | " | 1 | Do. Deb. Stk. | 104-105 | .. | 3 16 2 | 6,429,895 | Stk. | Feb. 10 | 519/4 | South Met., 4 p.c. Ord. | 120-122 | .. | 4 9 7 |
| 145,995 | " | Apr. 1 | 5 | East Hull 5 p.c. Ord. | 96-98 | .. | 5 2 0 | 1,895,445 | Stk. | Jan. 13 | 3 | Do. 3 p.c. Deb. | 81-83 | .. | 3 12 3 |
| 486,090 | 10 | Jan. 27 | 12 | European, Ltd. | 24-25 | +1 | 4 16 0 | 209,823 | Stk. | Mar. 16 | 8 | South Shields Con. Stk. | 157-158 | .. | 5 1 3 |
| 354,060 | 10 | " | 12 | Do. £7 ros. paid. | 183-19 | .. | 4 14 9 | 605,000 | Stk. | Feb. 25 | 54 | Sth Suburban Ord. 5 p.c. | 121-123 | .. | 4 12 0 |
| 16,191,671 | Stk. | Feb. 10 | 44 | Gas 4 p.c. Ord. | 1034-1044 | +1 | 4 9 3 | 60,000 | " | " | 5 | Do. 5 p.c. Pref. | 120-122 | +1 | 4 0 8 |
| 2,690,000 | " | " | 34 | light 3 p.c. max. | 88-90 | .. | 3 17 9 | 117,058 | " | Jan. 13 | 5 | Do. 5 p.c. Deb. Stk. | 122-124 | +1 | 4 0 8 |
| 4,002,235 | " | " | 4 | and 4 p.c. Con. Pref. | 104-106 | +1 | 3 15 0 | 502,310 | Stk. | Nov. 11 | 5 | Southampton Ord. | 110-112 | .. | 4 9 3 |
| 4,531,700 | " | Dec. 29 | 3 | Coke 3 p.c. Con. Deb. | 81-83 | +1 | 3 12 3 | 120,000 | Stk. | Feb. 10 | 64 | Tottenham A 5 p.c. | 133-135 | .. | 5 1 9 |
| 258,740 | Stk. | Mar. 16 | 5 | Hastings & St. L. 3 p.c. | 93-95 | .. | 5 3 3 | 453,940 | " | " | 54 | and B 3 p.c. | 112-114 | .. | 4 14 4 |
| 62,500 | " | " | 64 | Do. do. 5 p.c. | 117-119 | .. | 5 9 3 | 149,470 | " | Dec. 29 | 4 | Edmonton 1 p.c. Deb. | 59-60 | .. | 3 19 3 |
| 70,000 | 10 | Sep. 29 | 11 | Hongkong & China, Ltd. | 174-18 | .. | 6 2 3 | 182,380 | 10 | Dec. 29 | 8 | Tuscan, Ltd. | 94-94 | .. | 8 4 0 |
| 131,000 | Stk. | Mar. 16 | 7 | Hford A and C | 145-147 | .. | 4 15 3 | 249,900 | 10 | Jan. 3 | 5 | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 19 0 |
| 65,780 | " | " | 54 | Do. B | 105-110 | .. | 5 0 0 | 236,476 | Stk. | Feb. 25 | 5 | Tynemouth, 5 p.c. max. | 112-114 | .. | 4 7 9 |
| 65,500 | " | Dec. 29 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 255,636 | Stk. | Feb. 25 | 68 | Wands 1 B 3 p.c. | 139-141 | .. | 4 14 0 |
| | | | | | | | | 79,416 | " | Dec. 29 | 3 | worth 1 3 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |

Prices marked * are Ex div.

† Next dividend will be at this rate.

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For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

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Resists 4500° Fahr. Best for GAS-WORKS.

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MILNE LEEDS,
MILNE LONDON,
GASLIGHTS GLASGOW,

Large Stock of METERS and GAS FITTINGS.

AMMONIACAL Liquor wanted.BROTHERTON AND CO., LTD., Ammonia Distillers.
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Cleaning of Mains and Services.It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, Killingworth, or through his
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Telephone No. 2497.**EDGAR OF HAMMERSMITH,**
SOLICITS YOUR ENQUIRIES FOR GAS
APPARATUS.

BLENHEIM WORKS, LONDON, W.

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See Advertisement on p. 77.

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BROTHERTON AND CO., LTD., Chemical Manufacturers,
WORKS: BIRMINGHAM, LEEDS, WAKEFIELD, AND SUNDER-
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89, VICTORIA STREET, S.W.

AMMONIACAL Liquor wanted.CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.
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CHANCE AND HUNT, LIMITED,

WORKS: OLDBURY, WEDNESBURY, AND STAFFORD.

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WORCS.

Telegrams: "CHEMICALS, OLDBURY."

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For all Gas Joints.

For all Tar Joints.

For all Ammonia Joints.

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grams: "Patent London." Telephone: No. 243 Holborn.**AMMONIA.**Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.**OXIDE OF IRON**

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WESTBURY, WILTS.

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SULPHURIC ACID.**SPECIALLY prepared for the Manu-
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**JOHN RILEY & SONS, Chemical Manu-
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WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
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Enrichment, 18, EXCHANGE STREET, MANCHESTER, and
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Oxide Lightly.

See Illustrated Advertisement, April 5, p. 8.

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Gas prevents Flashbacks and Carbonization, and
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Cannon Street, LONDON.**SULPHATE OF AMMONIA**SATURATORS and all LEAD and TIMBER
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Prices Reasonable; quality and results, the best. Satis-
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Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
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MOUNT IRON-WORKS, ELLAND.

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

SLOT Collector and Rental Clerk desires
CHANGE. Nine Years' Experience with a 130
Millions Gas Company. Colonies not objected to.
Excellent References from previous employers.
Address No. 5219, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

AGENCIES WANTED.

THE Managing-Director of a well-
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at Sydney (N.S.W.), is visiting London shortly, and will
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such as Plant, Automatic Lighting Appliances, Pressure,
and Testing Instruments, &c.
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WANTED, a good Gas-Fitter. None
but Good, Steady Workmen need Apply.
Apply, stating Age and Wages required, to the MAN-
AGER, Gas-Works, BRIMS-GROVE.

WANTED, a Working Foreman used
to Regenerators, Sulphate Plant, Purifiers, &c.
State Wages required, together with Personal Ref-
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PEMBROKE DOCK.

WANTED, as Working Foreman, a Man
with a thorough Knowledge of Carburetted
Water-Gas Plant. Make about Four Millions per diem.
Age, about 30 Years. Wages to commence, £2 15s. per
week.
Apply, by letter only, to No. 5215, care of Mr. King,
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WANTED, a Gas-Works Fitter for a
Small Works near London. Must be a good
Blacksmith, and able to undertake Repairs on Works
and District, and be thoroughly competent to deal
with Gas-Engines.
Apply, by letter only, stating Age and Experience,
to No. 5218, care of Mr. King, 11, Bolt Court, FLEET
STREET, E.C.

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Works making 150 Millions per Annum, situate
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Capable Man.
Apply, by letter, stating Age, Experience, Wages
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STREET, E.C.

CORPORATION OF CALCUTTA.

1. THE Corporation of Calcutta are
prepared to receive APPLICATIONS for
the Post of SUPERINTENDENT OF PUBLIC
LIGHTING of the City of Calcutta.

2. Calcutta has a street mileage of about 270 Miles, and
is Lighted by means of about 9000 Incandescent Gas-
Lamps; the Gas being supplied by a Public Company,
with the exception of a few of the outlying Streets and
Roads, where there are no Gas-Mains, which are at
present lighted by Oil-Lamps, but the Area lighted by
Gas is being extended every Year. It is in contempla-
tion to light some of the principal thoroughfares by
means of Electric Lamps.

3. Candidates must have Experience of the Manage-
ment and Control of Lighting Departments in some
other City or Town, and must be capable of advising
the Corporation as regards the formation of a Municipal
Lighting Department and also regarding the selection
of Burners, Mantles, &c. Candidates must also be ex-
perienced in Photometric Work, and the Corporation
has a thoroughly up-to-date and well-equipped Photo-
metric Laboratory. Candidates must be capable of
accurately Testing Pressures in, and outside of, the
Laboratory, and of determining the discharging capa-
city of Burner Nipples, as this will be the measure of
the amount of Gas to be paid for in the lighting contract
about to be entered into. The Corporation have proper
and efficient Apparatus for doing this. Candidates
should not exceed 45 Years of Age and should furnish
a Certificate of Age and also a Certificate of Physical
Fitness. The appointment will be for Five Years,
with option of renewal, and the Corporation will pay
First-Class Passage from England to Calcutta. The
appointment will be terminable on Three Months' notice
by either side. In case the Corporation gives the
notice, a First-Class Passage to England will be
provided if required for that purpose. In the event of
the selected Candidate giving notice during the currency
of his Agreement, he will be required to refund the
amount of his First-Class Passage.

4. One Month's leave on full pay may be granted
every Year, and longer leave out of India at intervals.
The pay of the Post is Rs. 500 per Month, rising to
Rs. 750 per month by equal annual increments; but
the Corporation are prepared to give the maximum
pay of the post—viz., Rs. 750 per month—to a well-
qualified and otherwise specially suitable Candidate.
The exchange value of the Rupee may be taken as
equivalent to One Shilling and Four pence.

5. Applications, stating Experience, Age, and Quali-
fications, and accompanied by Copies of Testimonials,
should be addressed to the Secretary, Calcutta Cor-
poration (not by name), Calcutta, India, and should
reach him on or before the 3rd of May, 1910.

P. N. MOOKERJEE,
Secretary to the Corporation.

Municipal Office,
March 3, 1910.

BOROUGH OF NELSON.

GAS ENGINEER AND MANAGER.

APPLICATIONS are invited for the
above post.
Salary, £400 per Annum.
Applications, stating Age, present Appointment and
Experience, and enclosing copies of Three recent Testi-
monials, must be sent to me, endorsed "Gas Engineer,"
not later than Thursday, April 21, inst.
Canvassing directly or indirectly will be a disquali-
fication.

J. H. BALDWIN,
Town Clerk.

Town Hall, Nelson,
April 7, 1910.

GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap for
immediate Sale.

FIRTH BLAKELEYS, Thornhill, DEWSBURY.

KILMARNOCK CORPORATION.

(GAS DEPARTMENT.)

THE Gas Department of the above Cor-
poration have for DISPOSAL at their Langlands
Street Works, Kilmarnock, the following SECOND-
HAND PLANT:

RETORT BENCH MOUNTINGS, consisting of
Mouthpieces, Ascension, Bridge, and Dip Pipes, Hy-
draulic Main, Connections, Valves, Bench Binding
Frame, &c.; one Kirkham, Hulett, and Chandler
Horizontal Rotary WASHER SCRUBBER, One Million
Cubic Feet per day capacity, Complete with driving
gear; One GAS EXHAUSTER COMPENSATOR; One
TRAVELLING LIFTING CRANE for Purifiers;
Cylindrical STATION METER, with Bye-Pass Com-
plete; Tangyes STEAM PUMP for Tar; COAL
TESTING PLANT, Complete for a Charge of $\frac{1}{2}$ cwt.;
Three Tons per day "Gillespie" SULPHATE PLANT,
Complete in every respect.

In addition to the above, there is a large assortment
of CAST-IRON GAS-PIPE CONNECTIONS 12-inch to
15-inch diameter, as well as an assortment of COAL
BOGIES, COKE BARROWS, and GAS-WORKS
TOOLS.

Particulars will be supplied on Application.
Offers for any portion of the foregoing Plant will be
received up till Tuesday, April 26, 1910.

WM. & CHAS. FAIRWEATHER,

Gas Offices, Kilmarnock,
April 2, 1910. Joint Managers.

GAS COMMITTEE FOR THE CITY OF LIMERICK.

TO RETORT SETTLERS AND OTHERS.

THE Gas Committee are prepared to re-
ceive TENDERS for RETORT-SETTING, &c.,
required by them at their Works, Dock Road, Limerick.
Full Particulars and Form of Tender can be obtained
from the Engineer and Manager, Mr. H. Hawkins.
Tenders, endorsed "Retort-Setting, &c.," addressed
to the Chairman, Gas Committee, Gas Offices, William
Street, Limerick, to be sent in not later than Five p.m.
on April 18, 1910.

The Committee do not bind themselves to accept the
lowest or any Tender.

By order,
H. HAWKINS,
Engineer and Manager.

Gas-Works, Limerick,
March 22, 1910.

GAS COMMITTEE FOR THE CITY OF LIMERICK.

TENDERS FOR OXIDE, &c.

THE Gas Committee for the City of
Limerick invite TENDERS for the Supply of
200 Tons of NEW OXIDE, to be delivered at the Gas-
Works, Dock Road, Limerick; also for the purchase of
about 250 Tons of SPENT OXIDE, delivered f.o.b.
Limerick Docks.

Samples of the New Oxide tendered for must be sent
with each Tender with full Particulars.

Tender Forms can be obtained from the Engineer
and Manager, Mr. H. Hawkins.

The Committee do not bind themselves to accept
the lowest or highest Tender, as the case may be.

Tenders to be sent in not later than Five p.m. on
April 18, 1910, addressed to the Chairman, Gas Com-
mittee, Gas Offices, Limerick.

By order,
H. HAWKINS,
Engineer and Manager.

Gas-Works, Limerick,
March 22, 1910.

SOWERBY BRIDGE URBAN DISTRICT COUNCIL.

PURIFIERS.

THE Gas Committee invite Tenders for
the following WORK, to be done at their
Luddenden Foot Gas-Works: Pulling out Two Purifiers,
Valve, and Connections, and Supplying and Erecting in
their place two "GREEN'S" PURIFIERS, Weck
Valve, and Connections complete.

On receipt of £1 is., which will be returned for bond-
fide Tender, Specification and Form of Tender will be
forwarded; and any other Information can be obtained
from the Engineer, Mr. A. W. Bissell, Gas-Works,
Sowerby Bridge.

The Council do not bind themselves to accept the
lowest or any Tender.

Sealed Tenders, endorsed "Purifiers," to be received
by the undersigned not later than Twelve o'clock noon
on Monday, April 25, 1910.

LEWIS RHODES,
Solicitor and Clerk to the Council.
Commercial Bank Chambers,
Halifax.

THE Denbigh Gas and Water Companies

invite TENDERS for the Supply of 1700 to 2000
Tons of GAS COAL, and 90 to 100 Tons of AN-
THRACITE PEAS, to be delivered at Denbigh Station
(London and North Western Railway), as required.

For further Particulars Apply to the undersigned, to
whom Tenders must be sent, endorsed "Tender for
Coal," on or before Wednesday, the 20th inst.

W. EWART BROCK,

Gas-Works, Denbigh,
April 7, 1910.

BOROUGH OF DARWEN.

TENDERS FOR GAS SLACK AND NUTS.

THE Gas Committee of the above Cor-
poration are prepared to receive TENDERS for
the Supply of Rough GAS SLACK and NUTS for One
Year, to be delivered at the Gas-Works Siding in Cor-
poration Waggon.

Forms of Tender and all Information as to Quantities
may be obtained on Application to Mr. A. H. Smith,
Gas Engineer, Darwen.

Sealed Tenders, endorsed "Gas Slack," must be de-
livered to the undersigned not later than Saturday, the
23rd day of April, 1910.

No Tender necessarily accepted.
By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, March 23, 1910.

BOROUGH OF DARWEN.

TENDERS FOR TAR.

THE Gas Committee of the above Cor-
poration are prepared to receive TENDERS for
all the Surplus TAR produced at their Gas-Works for
One Year.

Further Particulars and Forms of Tender may be
obtained on Application to Mr. A. H. Smith, Gas
Engineer, Darwen.

Sealed Tenders, endorsed "Tender for Tar," must
be delivered to me, the undersigned, not later than
Saturday, the 23rd day of April, 1910.

The highest or any Tender not necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, March 23, 1910.

BOROUGH OF DARWEN.

THE Gas Committee of the above Cor-
poration are prepared to receive TENDERS for
the Supply of the following GOODS for One Year:—

Benzol.
Wrought-Iron Tubes and Fittings.
Cast-Iron Mains and Specials.
Brass Fittings.
Gas Wash Boilers.

Full Particulars and Forms of Tender may be ob-
tained on Application to Mr. A. H. Smith, Gas En-
gineer, Darwen.

Sealed and Endorsed Tenders must be delivered to
me, the undersigned, not later than Saturday, the 23rd
day of April, 1910.

The lowest or any Tender not necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, March 23, 1910.

BRIDGEWATER COLLIERIES COKE-WORKS.

(THE EARL OF ELLESMERE.)

TENDERS are invited for the Crude

BENZOL produced at the above Works (estimated
at 8000 to 10,000 Gallons per Month) testing 80 per cent.
at 120° C., during the next Three, Six, Nine, or Twelve
Months, delivered into Contractor's Tanks at the
Bridgewater Colliery Siding, Wharton Hall, on the
Pendleton and Hindley Branch of the Lancashire and
Yorkshire Railway, or at the Brackley Siding on the
Little Hulton Mineral Branch of the London and North
Western Railway.

Tenders, endorsed "Tender for Crude Benzol," to be
addressed to Mr. Thomas M. Brown, Bridgewater
Coal Offices, 4, Chapel Walks, Manchester, not later
than the 25th inst.

Manchester, April 5, 1910.

ISLE OF THANET GASLIGHT AND COKE COMPANY, MARGATE.

TENDER FOR COAL.

THE Directors of the above Company
are prepared to receive TENDERS for the Supply
of COAL for One Year from May 1, 1910, for their
Works at Margate.

The quantity required is 30,000 Tons (comprising
10,000 Tons of Good Yorkshire Washed Nuts, and 20,000
Tons of Good Durham Unscreened Gas Coal), such Nuts
and Coal to be delivered at the Quayside, Margate, in
Monthly Quantities according to Schedule.

The Gas Company will unload the Nuts and Coal into
their carts, and will also pay the Pier and Harbour
Dues of 1s. 3d. per Ton. All other costs and charges
must be paid by the Vendor; and it is to be noted that
barges can generally be accommodated, or steamers,
having a draught of about 10 or 11 ft., at Spring tides
only. The Company have their own steam crane at the
Quayside, Margate, and can discharge at a Maximum
Rate of about 200 Tons per day.

Tender Forms and any further Information required
will be supplied on Application to the Company's
Engineer and Manager, Mr. J. M. Campbell.

Sealed Tenders, endorsed "Tender for Coal," ad-
dressed to the Chairman, are to be sent in not later
than the 20th of April, 1910.

The Directors do not bind themselves to accept the
lowest or any Tender.

By order,
THOS. C. FULLER, F.C.I.S.,
Secretary.

Offices: Addington Street,
Margate, March 31, 1910.

RYHL URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE Ryhl Urban District Council are prepared to receive TENDERS for the Supply of 5300 Tons of Screened GAS COAL, to be delivered f.o.r. Ryhl during the Twelve Months ending June 30, 1911, in such Quantities and at such times as may be required.

Form of Tender and Particulars of Conditions may be obtained on Application to Mr. Leonard G. Hall, Assoc. M.Inst.C.E., Gas Engineer.

Sealed Tenders, endorsed "Tenders for Coal," to be delivered to me, the undersigned, not later than April 27, 1910.

Approved Security will be required. The Council do not bind themselves to accept the lowest or any Tender.

ARTHUR ROWLANDS,
Clerk to the Council.

Council Offices, Clwyd Street,
Ryhl, April 4, 1910.

THE Llandudno Urban District Council invite TENDERS for the Supply of about 7000 Tons of Best Screened GAS COAL and about 800 Tons of CANNEL.

The Coal must be capable of producing a Minimum of 10,600 Cubic Feet of 17-Candle Power Gas per Ton.

The whole will be required to be delivered in the Council's own waggons between the 1st of July next and the 30th of June, 1911, at the Llandudno Station of the London and North-Western Railway, in such Quantities and at such periods as may be ordered from time to time.

Forms of Tender may be obtained on Application to the undersigned; and only such Tenders as are on the prescribed Form will be considered.

In every case where the Particulars asked for are not given, the Tenders will be thrown out and not considered.

Tenders, endorsed "Gas Coal," &c., must be sent to the undersigned not later than the 30th day of April, 1910.

The Tender of any Person or Firm who, personally or through an agent, canvasses any of the Officers or Members of the Council will be rejected.

The Council do not bind themselves to accept the lowest or any Tender.

ALFRED CONOLLY,
Clerk to the Council.

Town Hall, Llandudno,

April 4, 1910.

CORPORATION OF CALCUTTA.

THE Corporation of Calcutta invite TENDERS for Three Thousand COPPER LANTERNS suitable for Single Light Inverted Incandescent Gas-Burners.

It is absolutely necessary that the Lanterns should be insect proof; but the means of making them so is left to the discretion of the Manufacturer.

The Lanterns should not be painted, as this will be done locally.

Tenders are to be submitted for shipment c.i.f. direct to Calcutta; payment being made when the Lanterns have been passed and accepted in Calcutta.

Samples of what it is proposed to Supply should be sent with each Tender; but Firms who have already submitted Samples through Messrs. Mansfield and Sons, of Liverpool, need not again submit Samples.

Tenderers must state the time for Delivery from receipt of Order.

Tenders should reach the Corporation, addressed to the Vice-Chairman, Calcutta Corporation, Calcutta, India, not later than the 6th of June, 1910.

P. N. MOOKERJEE,
Secretary to the Corporation.

Municipal Office, Calcutta,
March 23, 1910.

CORPORATION OF CALCUTTA.

THE Corporation of Calcutta invite TENDERS for a total number of 10,000 INCANDESCENT GAS BURNERS, to consume (a) 3 Cubic Feet Per Hour, (b) 2½ Cubic Feet Per Hour, (c) 4 Cubic Feet Per Hour, and (d) 5 Cubic Feet Per Hour, at 20-10ths pressure.

The Burners must have arrangements by which the Nipples can be easily and quickly changed to make the burner suit different pressures; but 20-10ths will be the minimum pressure on which they will be used. The Air Inlet should not be adjustable, as it is found that the Lamp Lighters and Cleaners are apt to interfere with adjustable openings. The quality of the Gas is 14-Candle Power when tested with the No. 2 "Metropolitan" burner; and it is of rather Low Calorific Value.

Tenderers should submit two Samples each of (a), (b), (c), and (d); one being of the Inverted Type and the other the Erect Type of Burner, but each must be submitted Complete with all necessary Glass-Ware, &c., and with One Dozen Assorted Nipples suitable for each Burner, together with One Dozen suitable Mantles for each.

Tenderers should state their price per 100 for spare Nipples of any size; the size of each Nipple being stamped legibly on it by a number representing its diameter in 100ths of an inch. The Samples will all be tested carefully for Consumption and Illuminating Power; and the Order will be given to the Firm supplying the Sample which gives the greatest efficiency per foot of gas consumed.

Tenders are to be submitted for shipment c.i.f. direct to Calcutta; Payment being made after receipt in Calcutta.

Tenderers must state the time they require to deliver the total number of 10,000 Burners from the date of order to proceed with the work. The successful Tenderer will be informed by Cable; and must then proceed to carry out the Contract. Samples, however, should be sent direct to Calcutta.

Tenderers must guarantee that the Burners supplied will be in every way exactly as per Sample.

Sealed Tenders should reach the Corporation, addressed to the Vice-Chairman, Calcutta Corporation, Calcutta, India, not later than the 6th of June, 1910.

P. N. MOOKERJEE,
Secretary to the Corporation.

Municipal Office, Calcutta,
March 23, 1910.

COUNTY BOROUGH OF BLACKPOOL.

THE Gas Committee are prepared to receive TENDERS for the Supply of GAS COAL or COBBLES to May 1, 1911.

Tenders to be endorsed outside, and addressed to the Chairman, by the 24th day of April, 1910.

Forms of Tender may be had from the undersigned.

JOHN CHEW,
Gas Engineer.

Gas Office, Princess Street,
April 7, 1910.

TO SULPHURIC ACID MAKERS.

THE Corporation of Bury invite Tenders for the Supply of about 400 Tons of SULPHURIC ACID for the Manufacture of Sulphate of Ammonia, during a period of One Year from the 1st day of May, 1910.

Forms of Tender and Conditions may be obtained upon Application to Mr. H. Simmonds, Engineer and General Manager, Gas-Works, Bury.

Sealed Tenders to be sent to the Town Clerk, Bury, not later than Saturday, April 16, 1910.

BOROUGH OF COLNE.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Surplus TAR made at their Works during the Twelve Months ending March 31, 1911.

Particulars may be obtained on Application to the undersigned.

Sealed Tenders, endorsed "Tar," must be addressed to the Chairman of the Gas Committee, Gas-Works, Knotts Lane, Colne, Lancashire, and delivered not later than Saturday, the 16th day of April, 1910.

The highest or any Tender not necessarily accepted.

FRED. THORPE,
Engineer and Manager.

Gas-Works, Colne, Lancashire,
March 29, 1910.

LEEDS CORPORATION GAS-WORKS.

THE Gas Committee are prepared to receive TENDERS for the SUPPLY of about 12,000 Tons of BEST CRAVEN or DERBYSHIRE LIME, required for the Purification of Gas at the Several Gas-Works during the Twelve Months commencing on the 1st of May, 1910; also for the SUPPLY of CAST-IRON PIPES, RETORT CASTINGS, &c.

Specifications and Forms of Tender may be obtained on Application to the undersigned.

Sealed Tenders, suitably endorsed, addressed to the Town Clerk, Town Hall, Leeds, to be delivered not later than Saturday, the 23rd inst.

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSELEY,
General Manager.

Gas Offices, East Parade,
Leeds, April 9, 1910.

BOROUGH OF MORECAMBE.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Erection of an OUTER LIFT on one of their GASHOLDERS.

Particulars may be obtained on Application to the undersigned.

Sealed Tenders, endorsed "Gasholder Extension," must be addressed to the Chairman of the Gas Committee, Gas-Works, Morecambe and delivered on or before the 23rd day of April, 1910.

The Gas Committee do not bind themselves to accept the lowest or any Tender.

C. RHODES ARMITAGE,
Engineer and Manager.

Gas-Works, Morecambe,
April 7, 1910.

COUNTY BOROUGH OF WIGAN.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of STORES over the Year ending on March 31, 1911, as follows:—

- Wrought-Iron Tube and Fittings.
- Brass and Copper Tube and Fittings.
- Lead Gas Pipe.
- Cast Mains and Connections.
- Sulphuric Acid.
- Surplus Tar.

Forms of Tender may be obtained from the undersigned.

The Committee do not bind themselves to the acceptance of any Tender.

Tenders, sealed and endorsed with the name of the article tendered for, to be delivered to Harold Jevons, Esq., Town Clerk, Wigan, on or before Monday, the 18th of April next ensuing.

A Sample of each Article to be forwarded, addressed to the Gas Engineer.

JOS. TIMMINS, M.Inst.C.E.,
Engineer, &c.

Borough Gas-Works,
March 30, 1910.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 3rd day of May next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors; a Dividend declared for the Half Year ended the 31st of December, 1909; and the usual Ordinary Business of such Meeting transacted.

NOTICE is HEREBY ALSO GIVEN, that the REGISTER OF TRANSFERS OF CAPITAL STOCK WILL BE CLOSED from the 19th inst. to the 3rd prox., both days inclusive.

By order of the Board,
ROBT. W. WILSON,
Secretary.

Offices: 21, Austin Friars,
London, E.C., April 11, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEAD WATER-WORKS COMPANY.

NEW ISSUE OF 1000 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 19, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

ANNFIELD PLAIN AND DISTRICT GAS COMPANY.

ISSUE OF 100 £10 ORDINARY SHARES,

AND

200 £10 FIVE PER CENT. PREFERENCE SHARES.

BY Public Auction, at the Old Store Committee Room, Annfield Plain, on Wednesday, the 13th of April, at Seven o'clock, in Lots of Five Shares.

Intending Purchasers may send Instructions to bid, at Price per Share not less than par, to the SECRETARY, Gas-Works, Annfield Plain, Co. DURHAM.

BRYNMAWR AND BLAINA GAS COMPANY.

(Pursuant to the Company's Special Acts, 1866 to 1894.)

SALE BY TENDER OF £8000 FIVE PER CENT.

CUMULATIVE PREFERENCE STOCK.

MINIMUM PRICE, £100 FOR £100 OF STOCK.

THE Company has been Established

since 1866, and supplies the large and populous area comprised in the Urban Districts of Brynmawr and Nantyglo and Blaina; and this Additional Capital is required for the Extension of the Company's Works and Plant to enable the Directors to carry on the Increasing Business of the Company. During last Year there were over 100 New Consumers.

Any amount of Stock, being £1 or a multiple thereof, may be tendered for; but no Tender for less than £10 of Stock will be accepted.

This is a unique opportunity for small Investors as well as those with larger means.

Last day for delivering Tenders, Saturday, April 30, 1910.

Particulars and Forms of Tender may be obtained of the Secretary, at the Gas-Works, Blaina, Mon.

By order of the Directors.

(Signed) D. ARTHUR PRICE,
Secretary.

April 2, 1910.

A HANDSOME F'CAP VOLUME GIVING AN ACCOUNT OF THE

GRANTON GAS-WORKS

of the Edinburgh and Leith Corporations' Gas Commissioners,

Their Design, Construction, and Equipment, with Illustrations, Plates, and Details of Costs.

By W. R. HERRING, M.Inst.C.E., &c.

Bound in Cloth, price 16s. net ea h, free delivery in United Kingdom.

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

NEWTONGRANGE, MIDLOTHIAN.

Testing Instruments

ALEXANDER WRIGHT & CO., LD.
WESTMINSTER.

MIRFIELD GAS COAL. UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

MIDLAND ENAMELLING CO., Manufacturers of

DIALS (Enamelled)

For Gas, Water, Electric, &c., Meters.

DIALS

For Pressure Scales in One Length up to 4 feet.

DIALS

For Clocks, Barometers, Thermometer
Indicators, and for every purpose.

140, Finch Rd., Handsworth, Birmingham.

HEATHCOTE GAS COAL

from the

GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

BIRTLEY IRON COMPANY,

ESTABLISHED 1820,

Owners of the Birtley Iron Works and
Pelaw Main Collieries,

GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNEC-
TIONS for Gas, Water, Steam, Electrical,
Sanitary, and other purposes; also TANKS,
COLUMNS of every description, Hydraulic,
Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of
our manufactures, on application.

Works: BIRTLEY, CO. DURHAM.
Newcastle-on-Tyne Offices: MILBURN HOUSE.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER,
Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND
ALL OTHER GAS APPARATUS.

Inquiries Solicited.

Telegrams: "DARWINIAN, MANCHESTER,"
Telephone 1806.

ALL the BOYS CALORIMETERS

which have been in daily use in
all the Official Testing-Stations in
London for the last Three Years

WERE MADE BY

JOHN J. GRIFFIN & SONS,
— LIMITED —

KINGSWAY, LONDON, W.C.

Those desiring to obtain Gas Calorimeters
as used in the Official Testing Places
should see that the apparatus bears the
name of the Original makers.

Descriptive Catalogue on Application.

TROTTER, HAINES, & CORBETT

BRETTELL'S ESTATE, LIMITED,

FIRE-CLAY & BRICK WORKS STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS
TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

JAMES OAKES & CO., ALFRETON IRON-WORKS, DERBYSHIRE, AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, $1\frac{1}{2}$ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
or without planed joints, COLUMNS,
GIRDERS, SPECIAL CASTINGS, &c., re-
quired by Gas, Water, Railway, Telegraph,
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
lets; doing away with Bolts, Nuts, and Covers,
and rendering Leakage impossible.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

CAST-IRON PIPES FOR GAS, WATER, & STEAM,
also VALVES of all descriptions.
R. LAIDLAW & SON, LTD.,
ALLIANCE FOUNDRY, 147, MILTON STREET, GLASGOW,
And LAMBHILL FOUNDRY, GLASGOW.
OFFICE: 147, MILTON STREET, GLASGOW.

THE WIGAN COAL & IRON CO., LIM^{TD.}

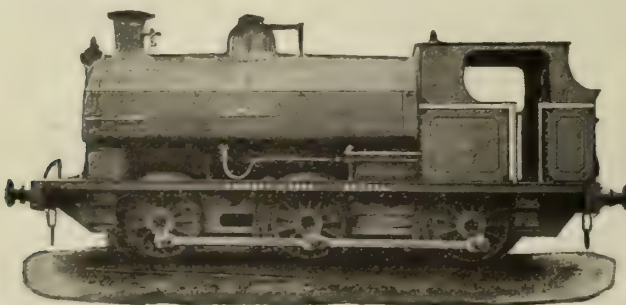
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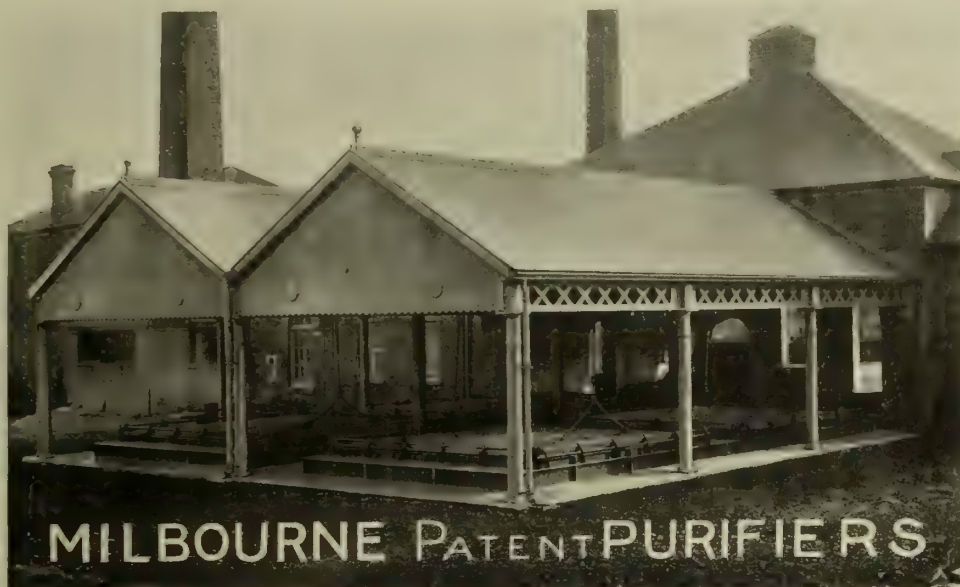
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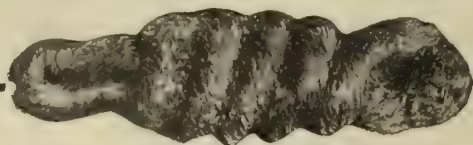
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LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—

For Exterior Lighting.

Welsbach-Kern

(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 8 ins. |
| 2-light | . . . | 2 ft. 4 ins. |
| 3-light | . . . | 2 ft. 4 ins. |
| 4-light | . . . | 2 ft. 7 ins. |

Width over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in. |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

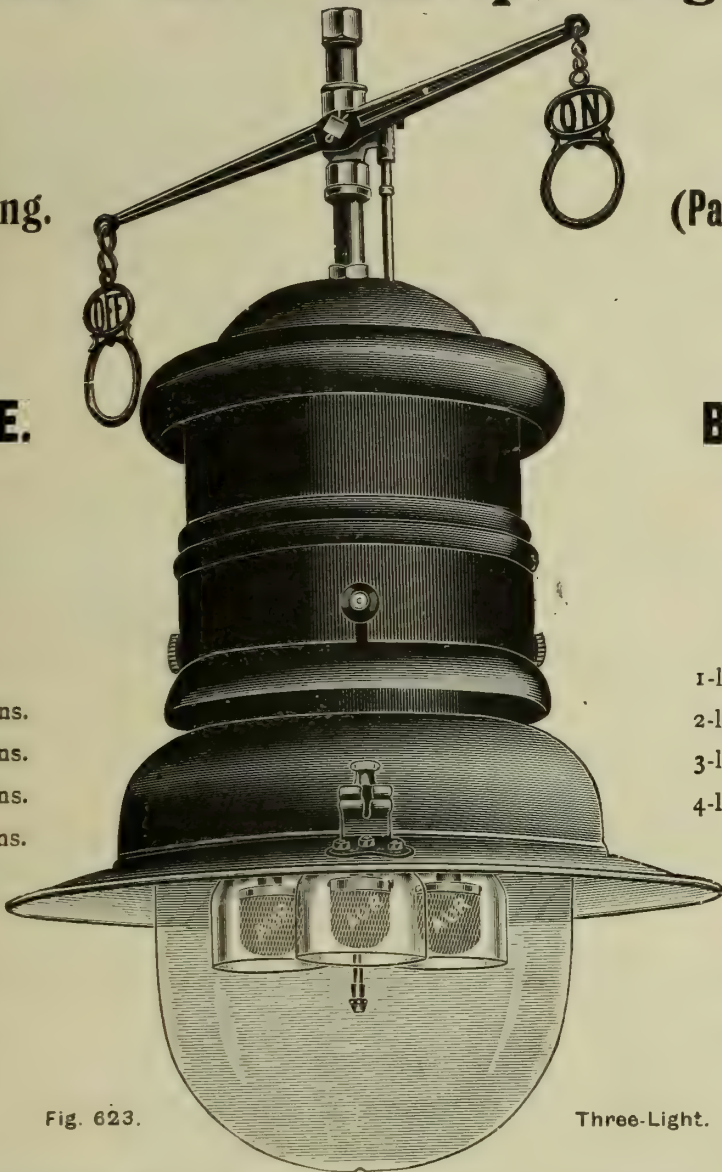


Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Mag-nesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

| | Gas per hour. | C.P. | Steel. | Copper Case. | | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
| 2-light | 8 feet | 260 | 47/6 | 6/- extra. | 4-light | 16 feet | 550 | 72/6 | 9/- extra. |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

| | 1-Light. | 2-Light. | 3-Light. | 4-Light. | | 1-Light. | 2-Light. | 3-Light. | 4-Light. |
|-------------------------------|----------|----------|----------|----------|----------------------------|----------|----------|-------------------|----------|
| Clear Glass Globes, each | 2/3 | 5/9 | 5/9 | 9/- | Wired Globes, extra | each | 2/- | 2/- | 2/9 3/6 |
| " " " In Case lots per dozen. | 19/6 | 57/9 | 57/9 | 93/- | Parabolic Reflector, extra | " | 3/6 | 6/- | 7/6 |
| Case contains | 80 | 18 | 18 | 12 | Welsbach Mantles, each | | 6d. | subject as usual. | Not made |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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Telegrams and Cables: "WELSBACH LONDON."
Telephone 2410 NORTH.

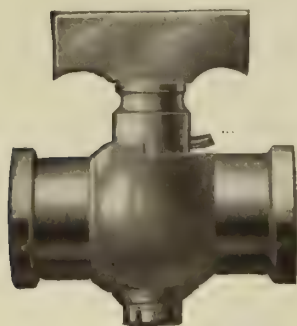


FIG. 1. The Old Style with the Old Trouble.
Note the Pin A.



FIG. 2. Evered's Patent "Safety Stop." No Pin.
No trouble.

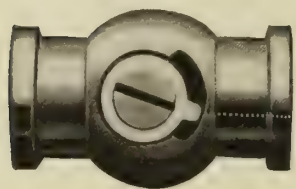


FIG. 3. Underside showing "Safety Stop" in lieu of Pin.

EVERED'S PATENT "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

EVERED'S PATENT "SAFETY STOP"

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The projection shown in Fig. 3, marked **B**, working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

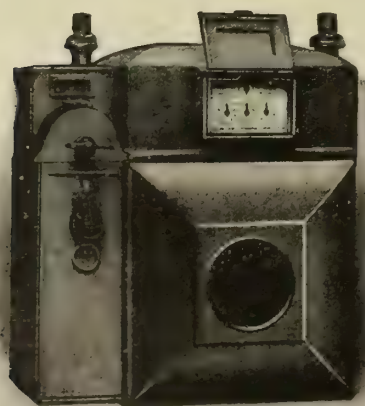
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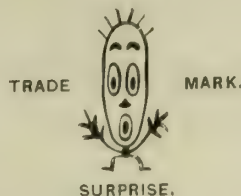
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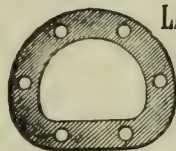


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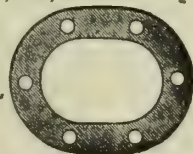
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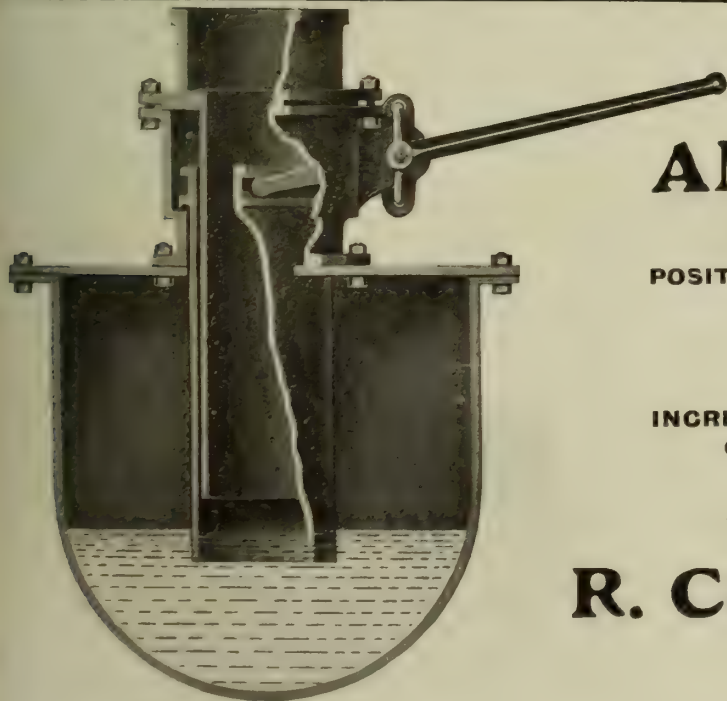
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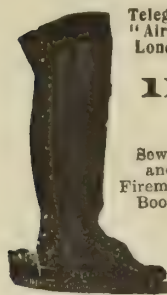
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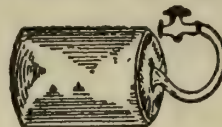


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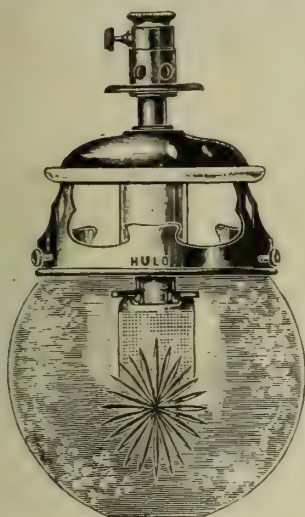
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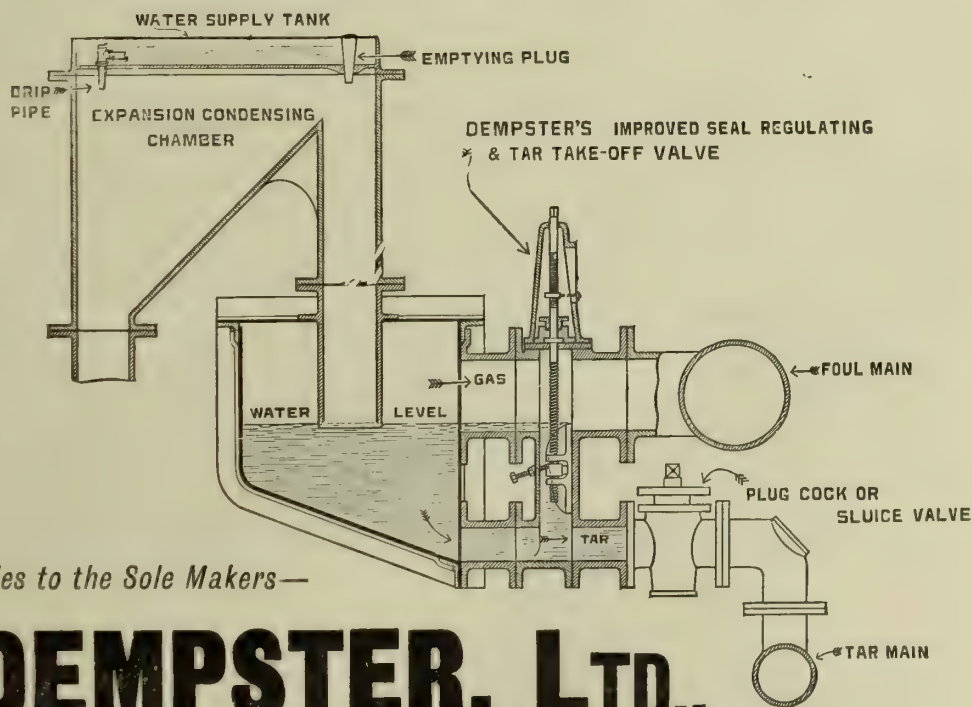
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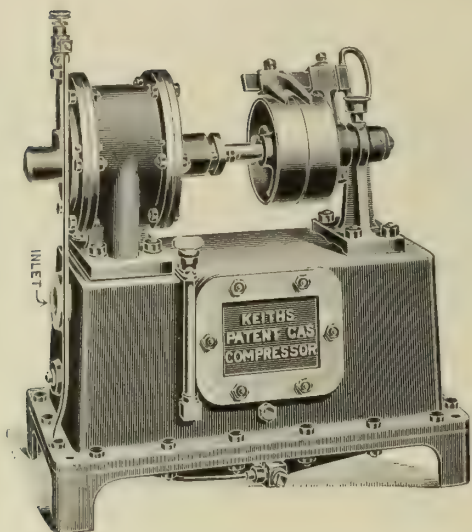
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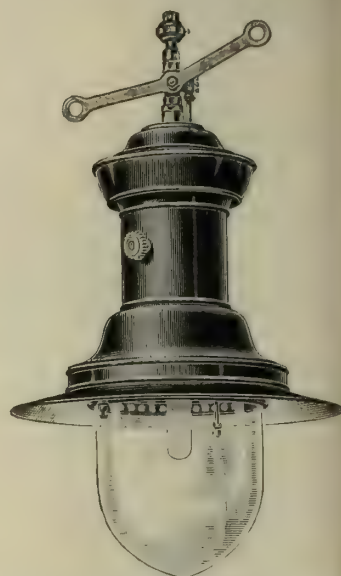
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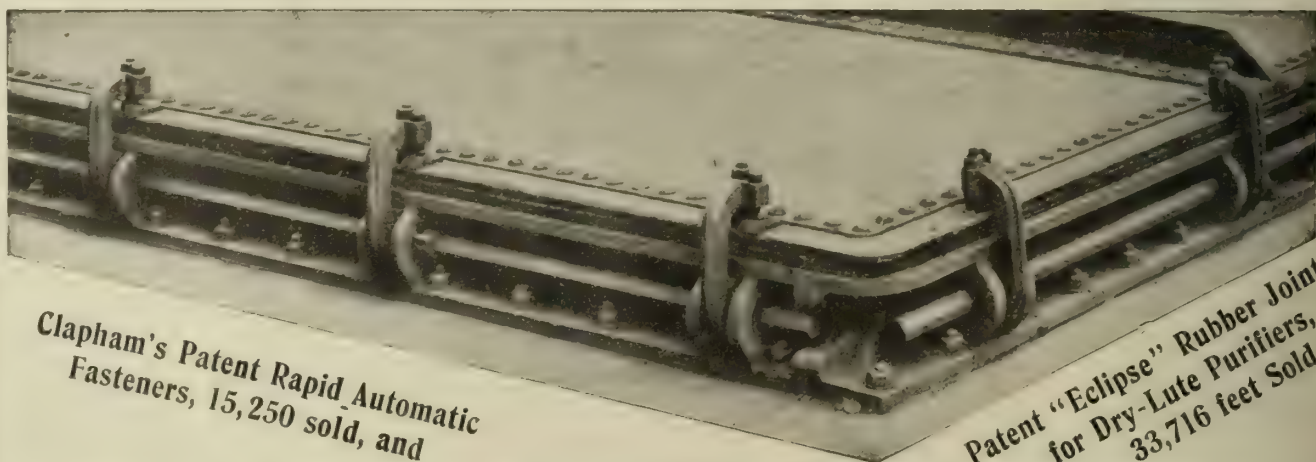
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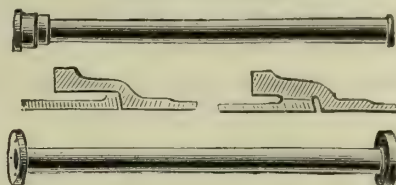
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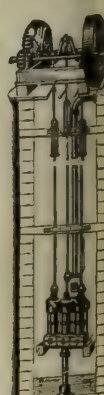
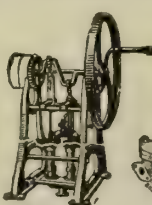
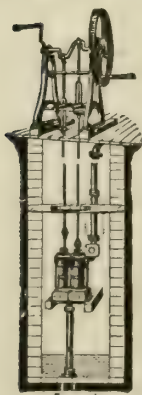
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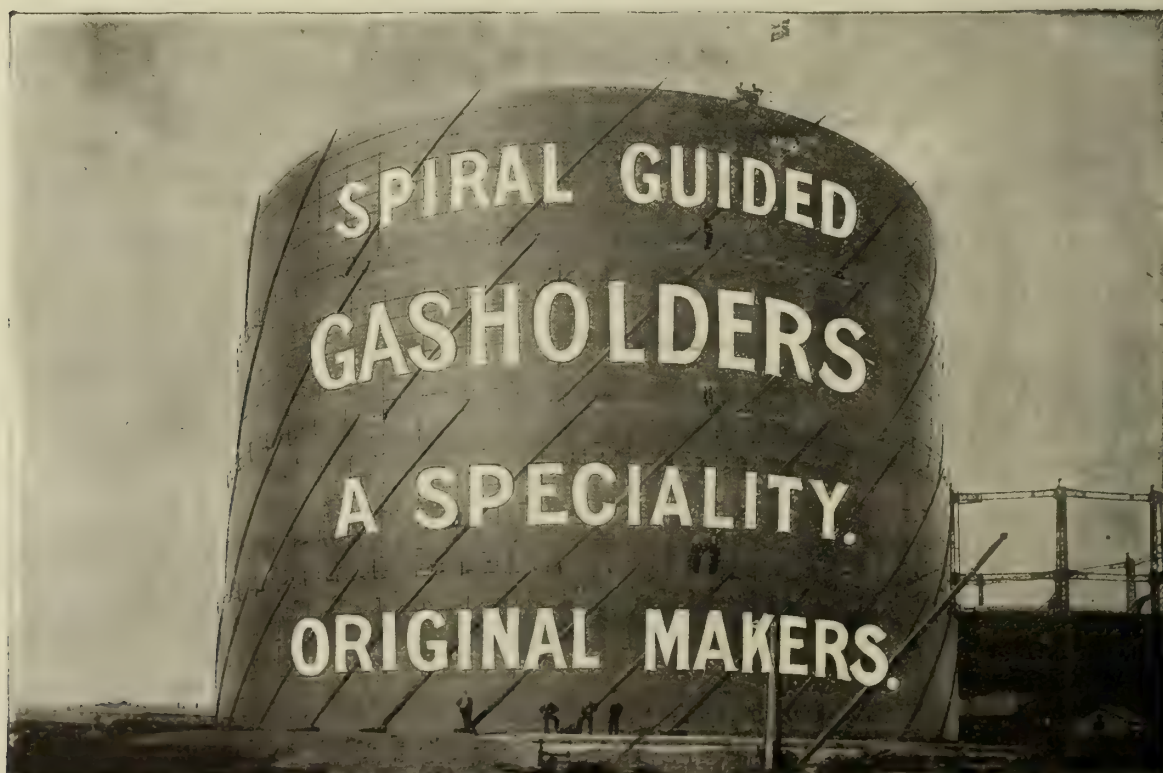
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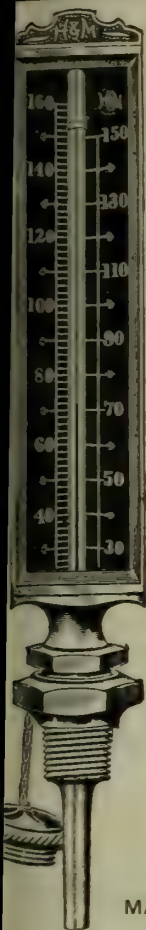
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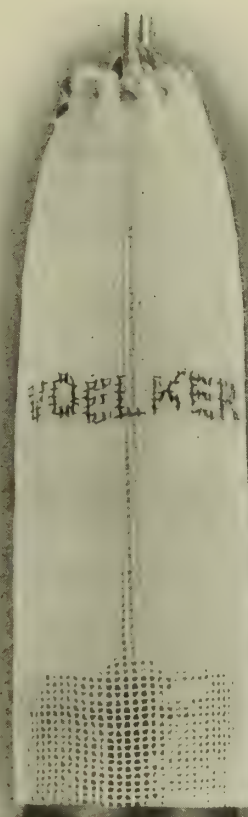
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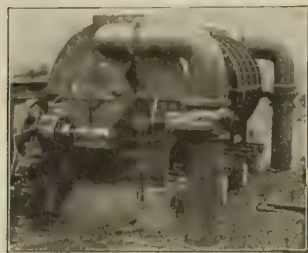
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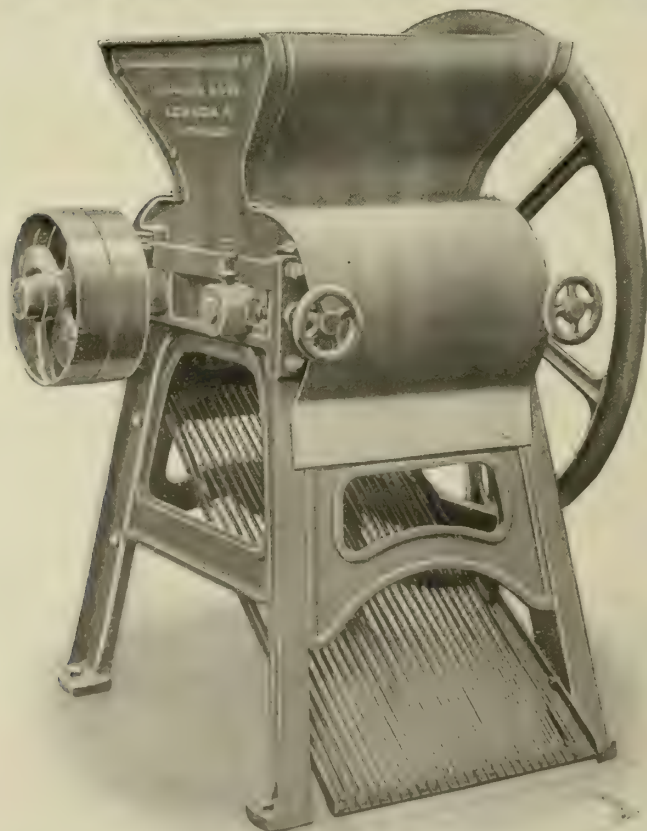
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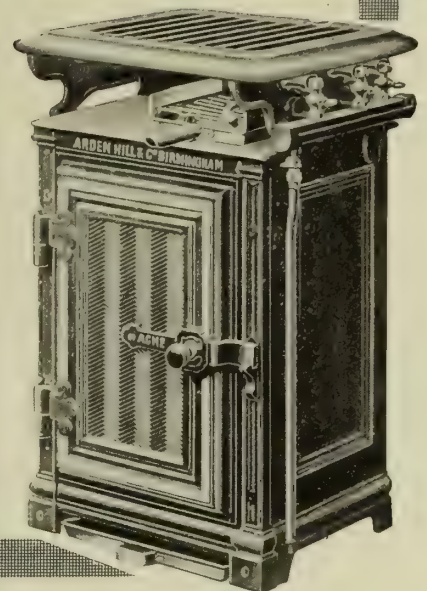
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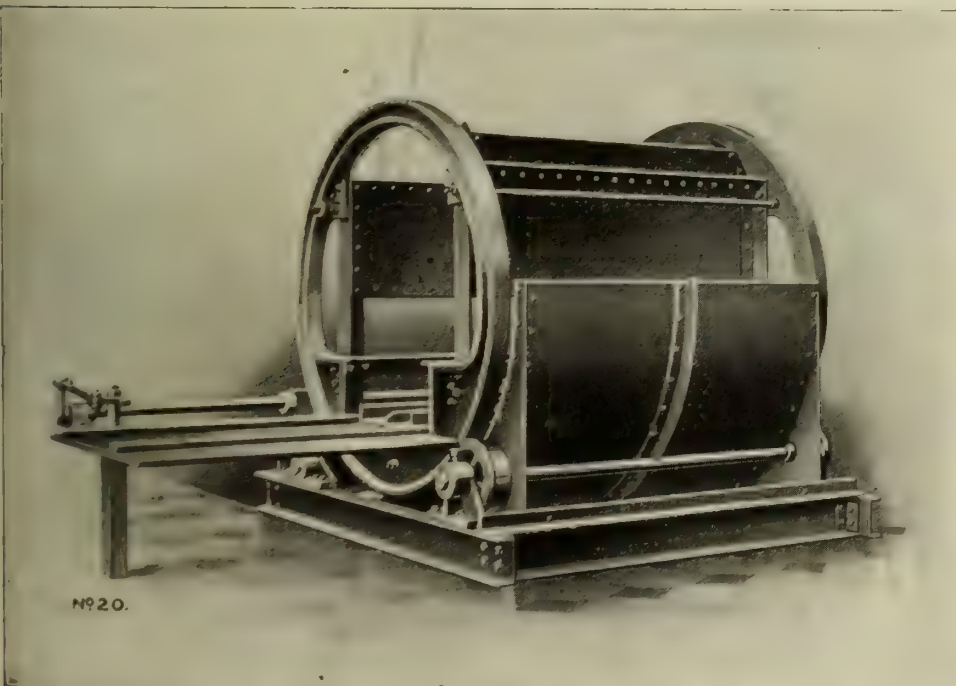
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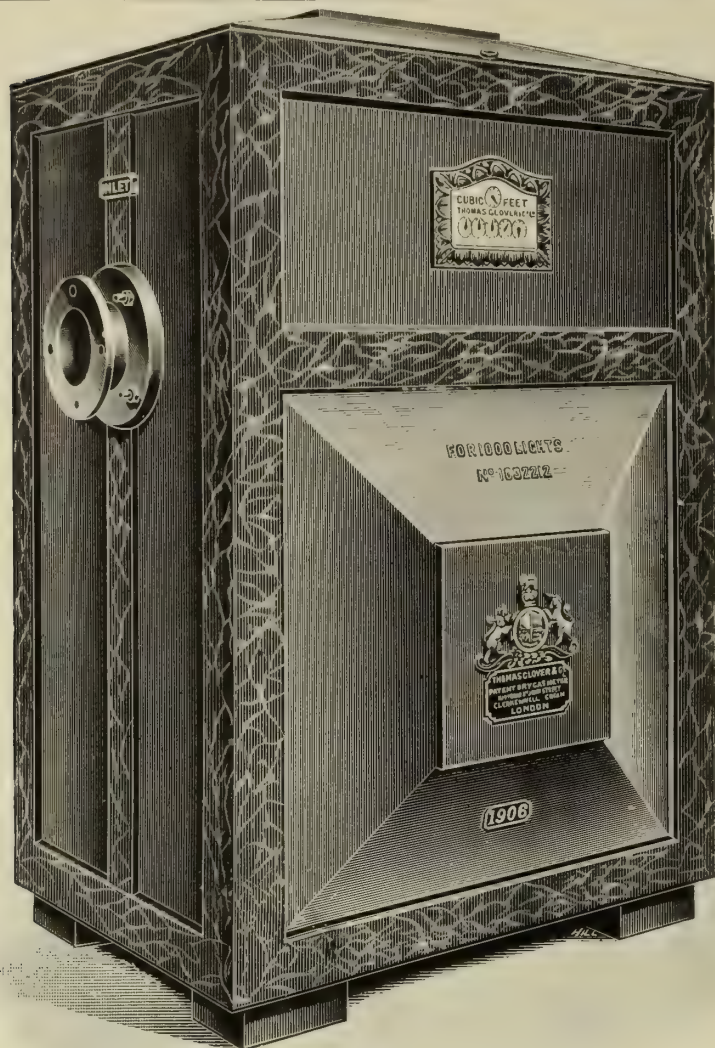
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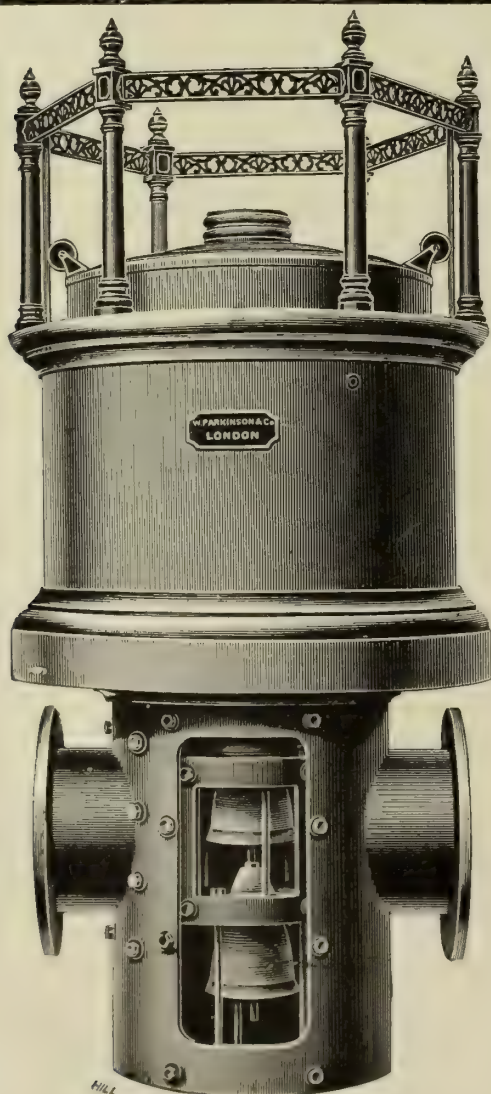
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VOL. CX., No. 2449.—TUESDAY, APRIL 19, 1910.

EDITORIAL NOTES—GAS, &c.

Ousting Arc Lighting in the West-End.

A SIGNAL victory has been scored by gas for public lighting purposes in the West-end of London; and we venture to say that—on the lines of an absolute equality in the matter of tendering, with illumination as the basis of the contract, and heavy penalties attaching to default in the supply of the stipulated illumination—nothing has ever been done before that shows in so conclusive a manner that gas applied under and by modern method and means is the most economical and efficient agent for street purposes. Electricians may rail against gas, may misapply the term “retrograde” to advance in gas lighting more modern even than the flame arc lamp, but all such railing and misrepresentation will not avail them when, as in this instance, preference rests solely on the business terms of efficiency and economy.

And not only in the matters of finance and efficiency do we regard the victory scored as of importance, but in that of locality. The streets from which electric arc lamps will be evicted are in the very heart of all West-end life and traffic—pedestrian and vehicular. In the scheme, Pall Mall (the first gas-lighted street in the country—1807) very appropriately returns to gas as now utilized in one of its most modern forms. But Piccadilly Circus is the centre of the area in question; and branching from it Piccadilly to St. James' Street is included in the adopted scheme, St. James' Street, Waterloo Place, Regent Street, Haymarket, Shaftesbury Avenue, and Coventry Street to Leicester Square. So that standing in the Circus, in addition to that centre, can be seen five streets branching from it which will before long be completely illuminated by high-pressure gas-lamps—in units varying between 1800 candles and 3000 candles. It must be admitted that this is, and will be still more so, one of the best advertisements for gas that it has had for many a year in connection with public lighting. It is a fine opportunity for showing what can be done, and for dispelling the ignorance that abounds as to the capabilities of gas through the invention of recent times. And the Gaslight and Coke Company may be depended upon, not only by the inducement of penalty-saving, but for their own credit and that of the gas industry at large, to do all that is necessary to make this an educational demonstration, and to give the satisfaction that will extend their contract long beyond the five years that is its present duration. But congratulations should not stop at the Company who in open competition convinced the Westminster City Council that they could supply illumination at a price that speakers in the Council last Thursday acknowledged had astonished them when compared with that for electric lighting. To Mr. J. W. Bradley (the City Engineer), to the Works Committee and their Chairman, Mr. Jacques Abady, thanks are due for their insistence in treating the matter (now the exception rather than the rule where public lighting is concerned) purely from the business standpoint—allowing no favour, no under-current of outside or inside influence to operate, and caring not which system of lighting succeeded, in entering into a contract that offered them the requisite illumination at the lowest cost, from installation to maintenance throughout, and with such penalties attached (5s. per lamp per day for deficiency in illumination) that habitual non-compliance with contract might mean that, at the end of a year, the ratepayers would find themselves in pocket over the bargain.

That there is a vast amount of ignorance on this matter of the capabilities of gas used in modern manner and types of lamps is evinced by the petition that was signed by tradesmen in the area that is the subject of the contract, asking for a postponement of decision. Postponement! What for? Very naturally the Works Committee who had made so complete an investigation of the matter, and had been very careful to frame the conditions of contract so that

there should be precise knowledge as to what was being tendered for and ultimately paid for, could see no advantage in postponing the matter; and the Council had such confidence in the Works Committee and the Chairman (who happens to know what he is talking about when the subject of illumination is being discussed) that a largely preponderating vote was given in favour of the report and against postponement. The Works Committee know more about the relative merits of gas and electricity for street lighting after their investigations than do the petitioning shopkeepers who have not investigated the matter. Men in the Westminster City Council, too, whose votes in the past have been in favour of electric lighting contracts—one of them much regretted now—are to-day in favour of the newer modes of gas lighting. Electric lighting is losing its novelty; and novelty and sentiment in this matter are fast going by the board. A year hence the shopkeepers of the locality will be wondering why a mere request for their signatures—a request with, possibly, an electrical origin—asking for postponement was complied with so readily and ignorantly. Even those members in the Council who spoke in favour of the granting of the request were sincere in their expressions of perfect satisfaction that no real good would come of it, in view of the progress of gas lighting, and the financial advantages of the gas project compared with the electrical. It is, as said, purely a business matter. The Works Committee and the Council had to look at it from the point of view of the interests of the ratepayers as a whole, and not from that of a section only as represented by the shopkeepers in the streets in question. They had indeed to protect these shopkeepers from themselves; for when the Council found that the illumination of certain streets would not be affected other than for the better by a change and at a lower cost, their duty was quite plain. There was no alternative; and therefore no necessity for delay. In the little historical sketch (p. 192) which shows the steps that have led to the present satisfactory success, in the succeeding report of the Works Committee, and in the speeches made in the Council chamber, there are many points which will be found of more than ordinary interest as bearing upon the superior position that gas occupies to-day in the contest for street lighting.

This contract is based upon illumination. That is what is going to be purchased, paid for, and had according to specification; and, if it is not had, then the penalties for deficiency will promptly come into force. This brings us to a question in street photometry. We have frequently mentioned the limitations of the use of the photometer in the streets. But there is an important distinction to be made in this connection, in considering candle power, if misleading conclusions are to be avoided. In looking at the report of the Works Committee of the Westminster City Council, the members appear to be conscious of this distinction, and to have avoided the misleading conclusions, because, while the report is based upon units of light of different candle power, it is apparent from it, and from the remarks made at the Council meeting, that it is recognized that the photometer as applied to the testing of one unit of light compared with another unit of light on exactly the same column will give relative results. It is, in fact, strictly accurate to say that, by taking a 53-candle power lamp from a 12-foot column, and replacing it by a 90-candle power lamp, one is increasing the light in exactly the proportion of 53 to 90 candles. Where a misleading use of street photometers is often made, is in comparing a light of one value on a column of a certain height with a light of another value on a standard of a different height. For instance, take an incandescent gas lamp, or a metallic filament lamp, of 90-candle power on a 12-foot column, and compare it with an 1800-candle power arc lamp on a 20-foot column. The 1800-candle power is nominally equal to twenty lamps of 90-candle power. But no one, with any knowledge of these matters, would suggest that twenty 90-candle power lamps could be replaced by one 1800-candle power lamp, and the same illumination be given

in the street. The system of separate units upon separate columns, each kept up to the mark by constant tests upon the photometer (with the photometer and the testing angles stereotyped), is one to which, we think, no objection can be taken, because such tests simply standardize each unit under its own conditions of use, and make no attempt to express a 90-candle power lamp on a 12-foot column with an 1800-candle power lamp on a 20-foot column. But it does compare a 90-candle power gas-lamp with a 90-candle power electric-lamp the same height from the ground; and it would be belittling the intelligence of readers to say that the value of the one form of illumination compared with the other shows any difference, under normal conditions, as regards illuminating power. To this extent we have an absolutely fair photometrical measurement; and if on this basis electricity had beaten gas, we should have been the first to admit that it had beaten it fairly.

The duty of local authorities is to keep down expenditure for public lighting as for other things consistently with efficiency. The Westminster City Council have recognized this; and they are determined to have what they pay for. It may be incidentally mentioned, too, that Mr. Bradley has decided to have nothing less than 90-candle power lamps in the streets within the jurisdiction of the Council. If they persevere with the policy they have now adopted, it may be predicted that their district will be a pattern in public lighting efficiency and economy that will have a marked influence on public lighting generally, and on transactions between the buyers and sellers of illumination for street purposes.

The Judgment of the Lords.

THE curtain has been rung-down on the first scene in the contest over the Standard Gas-Burner Bills; and in a manner that, after the unconditional, favourable decision of the Committee on preamble, and the ill-concealed signs of chagrin on the part of the opposition, was anticipated in our first editorial last week. The opposition appeared on Wednesday morning at the time appointed to consider clauses; but the appearance was only to ascertain definitely whether or not the Committee had absolutely disposed of the alternatives to rejection that had been placed before them. This the Committee made it clear they had done, and had in consequence declined to entertain them. Thereupon the opposition withdrew; and the act and statement of Mr. Ram, K.C., put the promoters in possession of the knowledge that the opposition threats of Monday in the corridor were not idle ones, and that there was merely to be a suspension of hostilities, until the Bill comes before a Committee of the Lower House. The success in the Upper House must not, however, be allowed to lessen or weaken effort in the Lower House; nor must there be any abandonment in any form or degree whatever, between now and then, on the part of any existing participant in the Bills. It must be a shoulder-to-shoulder fight in the House of Commons. Though, however, we counsel absolute firmness, there is no fear on our part that the Lower House will in any way depart from the precedent enshrined in the Gas Acts and Provisional Orders of the past five years, and adopted in the Model Clauses. But this, of course, does not imply certainty. There are Committees who are not always guided by precedent, and who create new ones. The hope of the opposition is that they may obtain a Committee who will lend a willing and friendly ear to the unjust and unnecessary claim for some *quid pro quo* as it is miscalled for placing the promoting companies in possession of a right accorded them by the long-sustained parliamentary principles applying to the testing of gas. They do not really look for the rejection of the Bills; but, if they can put some burden upon the companies which the latter will consent to bear, or which will force them to withdraw the Bills, their purpose will be served. It is a purpose upon which we cannot congratulate opponents or their supporters—supporters in part serving local authorities who may adopt the burner without having any actual restriction placed upon them. Manchester uses the "Metropolitan" No. 2 burner. What would the Manchester Corporation say (the Gas Committee and the Gas Engineer, we know, would be delighted) if, as the price of the application of that burner, Parliament decided that the profits of the Gas Department appropriated for the relief of the rates should be restricted to some small percentage. Profit limitation is right; it applies to statutory gas companies. But the Manchester, the Birmingham, and many other local authorities owning gas-works would look upon

the restriction suggested as a dear price to pay for the use of the No. 2 burner.

Assuming that the opponents of these Standard Burner Bills did, unfortunately, achieve their purpose, and cause the withdrawal of the Bills, it would be a grievous set-back for the gas industry; and the effects of the unhappy piece of work would take much time to obliterate. The gas industry would not thank anyone who had had part or lot in putting an obstacle in the path to the goal of the cheapest possible gas service, and of the greatest possible freedom in meeting the competition that assails on all hands. But paltry though the case and objects of the opposition are, the Select Committee who are the appointed parliamentary judges have to be reckoned with. Verily, however, we should not have much regard for any Committee who accepted such a disjointed case as that which was put before Lord Ritchie's Committee. From beginning to end it displayed a remarkable inconclusiveness and incoherence (as Mr. Honoratus Lloyd's masterly exposition showed) that must have impressed the Committee almost as much as the case of diametrically opposite qualities that was presented on behalf of the promoters of the measure. A good test-burner is the "Metropolitan" No. 2 admitted certain of the opposition witnesses; while another one of the little group of obstructionists characterized it as an unscientific thing. Dire results for the gas consumers were predicted as following its adoption; the trail of those results is not discoverable in Manchester either in the large territory supplied or in the financial position of the gas undertaking, nor in any other town or district where the burner has been adopted. While the illuminating power of the gas has been reduced in Manchester and elsewhere with excellent result for the numerous purposes in which atmospheric flames are required, and for which and in gas-engines the bulk of distributed gas is now used, an opposition witness, for whom we have the greatest respect, but whose gas experience is more academical than practical, says that the high illuminating power of gas should be maintained. Another opposition witness talked of gas-engines that are being worked, under existing circumstances, up to their maximum having to be scrapped in consequence of the adoption of the "Metropolitan" No. 2 test-burner; while another says, any change the burner effects means not scrapping, but quite a slight adjustment. But it is the flat-flame consumer (who to-day represents a very modest percentage of the gas output), the consumer who declines to use his gas so that he obtains ten times more light from the gas which he consumes, for whom there is this great show of protest, and weeping claim for some *quid pro quo*. There is a want of reality and sincerity about it all. The opposition, however, having had the weaknesses and contrarieties of their case pointed out with such damaging effect in the House of Lords, will doubtless try to produce a little more homogeneity before presenting it to the House of Commons. The case as presented to the House of Lords stands, and so will be at the service of the promoters in the Lower House. In the interests of the Bills, we could not wish for anything better than that the opposition case before us should be again presented when the curtain rises the second time on the meeting of the opposing parties. On the other hand, the case of the promoters as submitted in the Lords is now fully before the opposition; and they will, there is no doubt, submit it to the most critical examination to ascertain whether some of the deficiencies of their own case can be patched up by little extractions from the promoters' evidence. However, the unqualified success in the House of Lords, and the frailties disclosed in the ranks of the opponents and in the quality of their evidence, gives confidence.

One thing is certain, that this persistent fighting over the "Metropolitan" No. 2 burner, and over the testing question generally, is having the excellent effect of showing Parliament that illuminating power is a moribund quality for gas, and therefore a solecism as the foundation of a standard. It was rather expected that in the House of Lords the opposition would have made much of the infliction of a calorific power standard and test. But they thought better of it; and there was nothing more than passing reference to it. The question of a supplementary test does not, in fact, arise in connection with this Bill, which is merely for changing one of the instruments used in carrying out the present prescribed test. And to discuss the question of the adoption of the calorific standard and test, as an alternative to the present illuminating power standard and test, would hardly suit the cards of the local authorities, for more reasons than one.

There is, too, the want of precedent; and against present request stands the past refusal of Parliament to impose, where it has been asked for, a second penal test upon gas companies. So the opponents were well advised in not pushing calorific power very far in this case; but, of course, they may alter their tactics in the second House. It may, however, be taken by them as positive that, sooner than be made to bear the burden of a second standard and test for quality—a standard which has no real affinity with the existing standard—the promoters would withdraw the Bills, though fully knowing that calorific power as the standard quality will come, but it must come as a substitute and not as a supplement. Had the Wandsworth and Brentford Companies not withdrawn from the Standard Burner Bills, which act removed the opposition of the London County Council, it is just possible that more might have been heard of the calorific power standard and test, as it was to placate the Council in connection with their last Bill that the Gaslight and Coke Company agreed to the insertion in the Bill of a standard and test, subject to triennial revision. In this relation, it is of interest to note that Mr. W. J. A. Butterfield, in his evidence for the promoters, expressed the view that the Company would at times have some difficulty in maintaining their calorific standard if they worked down to their obligation in regard to illuminating power; and Mr. Corbet Woodall confirmed this when he said it has been found that, working even with an illuminating value of 15 candles, the Company are not always able to maintain the calorific value specified in their Act.

It is hardly likely that the Committee stage of the Bills will be taken in the Commons before the recess promised to the members by the Prime Minister. It is hoped that it will be possible for the House to adjourn some time next week; and to make the break extend over three weeks—thus covering the Whitsun holidays. But when the Committee stage of the Bills is reached, in the best interests of the gas industry, we look for (as will all who have those interests truly at heart) as complete success as a Committee of the House of Lords have considered the promoters' proposition merits.

Profits, Prices, and Parliament.

LAST session Parliament inaugurated the policy of the restriction of appropriation for the general rates of gas profits by municipalities owning gas undertakings who were applying for further powers. The instances were Salford and Oldham. The Salford Corporation, in view of the defence by Parliament of the interests of the gas consumers, and of the curtailment of the liberty of the Corporation in respect of profit appropriations, withdrew their Bill; but from what has happened in the case of Glasgow during the past week, it seems probable that the action of the Salford Corporation has only deferred the time when they will inevitably have to accept restriction. The Glasgow Corporation are on a different footing from most other municipal bodies. They have not abused the freedom that they possessed in regard to profits; but, as a matter of fact, they have, in what should be, though unfortunately it is not, the true spirit of municipal trading enterprise, devoted their profits to the benefit of gas undertaking and consumers alike, with the result that the price of gas in the area is to-day low—for lighting 2s., and for power 1s. 8d. In the Consolidation Gas Bill that the Corporation have before Parliament, they asked for the liberty as to profit transference for rate relief within the city to be preserved to them; and they also sought for differential prices as between the city supply area and the supplementary supply area, and between consumer and consumer, according to purpose and extent of custom. But the House of Commons Committee have practically disallowed both proposals. In regard to price, there may, under their decision, be differentiation as between gas used for lighting and gas used for all other purposes. But that is all. Thus the effect is that throughout the area a flat-rate for lighting and another flat-rate for all other purposes is to obtain, if the Bill is not abandoned. We cannot admit the justice of this. It is opposed, so far as the outer districts are concerned, to a very common practice of Parliament; and it certainly places the gas undertaking in an unfair position in competition with both electricity and producer gas. Under the decision, too, there is also to be equality throughout the area in the matter of the charges for public lamps.

As to appropriation of profits, in view of the record of the

Glasgow Corporation, we cannot help feeling some sympathy with them over the decision; but in furtherance of the principle for which we have ever contended in connection with municipal trading profits, we cannot confess to any particular sorrow that a Commons Committee have again supplied evidence that it is the intention of Parliament to prevent municipal trading undertakings, and the patrons of these undertakings, being made the victims of a form of indirect taxation for the greater benefit of those ratepayers who may not have contributed a penny towards the making of the appropriated profits. There is more reason for this strong attitude on the part of Parliament nowadays, in view of (in the case of gas undertakings) competition, of the large proportion of gas consumed by the poorest class of inhabitants, and of the growing tendencies in respect of the constitution of municipal bodies and of the principles—unsound, unjust, and uneconomic—of certain of the constituent members. But what we cannot really understand is why in one session a House of Lords Committee and a House of Commons Committee should have defined a limit to which appropriation could go; while in the very next session (in this Glasgow case) there should be a complete annihilation of all right to appropriation. Is it because of the fact that Glasgow has refrained (save once) from taking advantage of their powers in this respect in the past, that they are to be debarred by explicit rule in the future? However, in the cases of Salford and Oldham and now Glasgow, it has been the out-district authorities who have effectually waged war in Parliament against profit appropriation in aid of the rates of the district governed by the gas-works owning authority; and there is much to be said from their point of view. But if the out-districts are to have equality in the matter of prices with the inner area, then there is not (though we are strongly opposed to the practice) so much objection to a limited appropriation of profits in aid of the rates. We should, however, much prefer to see, as being altogether fairer, a small difference in the outside charges, and no profit appropriation in aid of the rates.

The decision, regarded in the whole, in this Glasgow case appears to be altogether too severe; and there is no doubt that it, and the Salford and Oldham cases, will have some retarding influence on municipal authorities in their applications to Parliament in respect of the revision and amplification of the powers affecting their gas undertakings, which, generally speaking, have suffered largely from the predatory policy for supplementing the revenues of local exchequers. But although the Glasgow Corporation have been (if the Bill proceeds) deprived of their power of profit appropriation, they are to be allowed to take from revenue, to a defined amount, for depreciation. Otherwise revenue and expenditure are to approximately balance; surpluses being carried forward until, as soon as practicable, they can be applied to a reduction of the charges throughout all the limits of supply. There is some talk in Glasgow of the Bill being withdrawn, in view of the sweeping effect of the decision of the Commons Committee—practically levelling financial interests in the gas undertaking throughout the area of supply. As to the wisdom of withdrawal, opinions are divided. What the Corporation have to consider is: Are they likely to get any more acceptable terms by postponing the realization of further parliamentary authorization? In the matter of profit appropriation, they have to accept the situation that what has been done in their case, or (if there is withdrawal of the measure) what may be done in the future, is the result of the unbridled indulgence of other authorities. That they have not themselves assisted to bring about this condition should be to them an emollient in bearing the result of the iniquities of local governing bodies in not a few, but many, other places.

Nuisance from Coalite Plant.

HYTHE is unhappy; and the cause of the unhappiness is that the gas-works is unfortunate enough to possess a coalite plant. We hinted as much in last week's issue. The plant is a nuisance to the town, through the emission of smoke and steam, and a smell (we refrain from any attempt to describe it) that is incompatible with the amenities of a holiday and health resort. The nuisance, it appears, has been going on for some time. Householders have sent a signed objection to the Council, complaining bitterly of the noisome fumes; lodging-house keepers have had sad visions of their business being injured in the coming season. Representatives of the Council have had an interview with the

Directors of the Company, the Town Clerk has written remonstrating letters, and there have been veiled threats of an application for an injunction. And this is all through the coalite plant. The Company have made promises to mitigate the nuisance; but the nuisance, according to statements at the last meeting of the Council, continues. The Company protest that everything possible is being done to produce a mitigation of the cause of complaint; but the fact that the complaints do not cease shows that the mitigating steps are insufficient, and that the trouble must be fairly serious, and not so easily conquerable as the Company would like it to be. A persistent nuisance of the sort is not a recommendation for the plant. But mitigation only will not satisfy the good people of Hythe; they want nothing short of absolute abatement. And what is more they mean to have it.

It is obvious that the Council do not intend to tolerate the nuisance any longer, nor to be satisfied with mere promises. The Company are to give an undertaking now not to manufacture coalite until the end of September, so as to preserve the reputation of the town unblemished in the eyes of its patrons; and they are to spend the time during which the plant is at rest in an effort to make effectual provision for putting an end to the nuisance. The alternative is litigation; and the Town Clerk declares possession of an abundance of evidence for the purpose. However that may be, there ought to be no trouble in letting-down the plant for six months, as, it would seem, business is not very flourishing in coalite in the locality; and there is sufficient in stock to meet the needs, until the end of September, of householders enthusiastic for this particular fuel. Judging from the nature of the complaints, it is patent that the nuisance is produced by the quenching of the coalite. What a pity the Company ever gave up that cumbrous mode of quenching in closed chambers—a mode to which original coalite thought and skill attributed so much of the marvellous virtues of coalite! The only course now open to the Company appears to be the provision for quenching of an enclosed structure, and a long shaft for carrying away the fumes well above the surrounding houses. But in view of the exposed situation of the gas-works, it is open to question whether this, in all states of the wind, would be wholly effective. We are afraid the Hythe experiences will not do anything towards helping the British Coalite Company to secure accommodation for their plant in other gas-works. The sum-total of their connections with gas-works at present is Plymouth and Hythe, although in December last, in the Company's report, we were told that further contracts were being negotiated with other gas undertakings, which, it was hoped, would be brought to a conclusion at an early date. Apparently they have been—and unsuccessfully. Another "nuisance" of a different character is that coalite tar, in the opinion of the Borough Surveyor, is not so suitable for road-surfacing purposes as ordinary gas-works tar.

Sulphate of Ammonia and Beet Cultivation.

In the course of a letter addressed to us by the Earl of Denbigh in regard to the article entitled as above in our issue of April 5, he remarks: "The question has become much more alive than it ever was before; and I do not think there is any likelihood of it relapsing into obscurity. Interest is being awakened all over the country. . . . A strong agitation is required to educate the people." His Lordship is doing his part in trying to obtain the encouragement from the Government that is required for the establishment here of the beet-sugar manufacturing industry. "The whole question," he asserts, "hangs on the matter of excise duty, and whether, as an infant industry, protection can be assured to home sugar manufacture for, at all events, a reasonable number of years." His Lordship has, in the House of Lords, endeavoured to obtain from the Government some expression of view on this point. But the utmost that he could extract from Lord Denman, representing the Government, was that they would give the matters raised their earnest consideration. That is all right so far as it goes; but it does not go far. It is to be hoped that the "earnest consideration" may be construed to also mean prompt consideration. Most other countries are growers of beet, and have their sugar manufactories; and this country is their customer to the extent of importations representing 20 millions sterling. Of those who have taken part in the renewed controversy on the subject, Sir Walter Gilbey is the only one who is

pessimistic; and the bogey that frightens him is a failure of some 30 or 40 years ago. But there have been many experiments since then, showing that the soil and climate of this country are as good as, and even better than, those of other countries for beet growing; and it only needs the favourable aid of Parliament to let this country participate in an industry in which other countries share, and with immense profit. Earl Denbigh has received revised figures from different countries as to their growth of beet per acre. The average is not higher than 12 tons; while in our Eastern counties, particularly Lincolnshire, the trials made place the productivity of the soil at about 16 tons per acre. Of course, it would be somewhat lower than this in less-favoured parts of the country; but Earl Denbigh sees no reason whatever why the farmer on good land should not clear a net profit of from £6 to £7 per acre. But unless the Government holds out a helping hand, the capital required for what should prove a large and lucrative industry will not be forthcoming. The obstacle at the moment is a fiscal, and not a practical, one.

The Gas Industry and Co-Partnership.

"The increase in the number of gas companies practising co-partnership principles is a striking one." This is a sentence from the report which was submitted at the annual meeting of the Labour Co-Partnership Association last week—some reference to the proceedings at which will be found in another portion of to-day's issue. The statement is a well-deserved recognition of the spread of the movement in the gas industry. In fact, at the meeting, one could not fail to be struck with the large extent to which "gas" figured in the proceedings. In the first place, there was the report, to which reference has already been made. This stated that concerns representing over one-half of the capital employed in the gas industry, apart from municipal undertakings, are now working on the co-partnership principle. Another good feature to which the Committee were able to draw attention was the obviously growing confidence of the employees in the opportunity these schemes offer for the investment of their savings. We agree with their expression of opinion, that "it is evident that co-partnership has at last 'caught-on' in the gas industry." But while doing so, we would venture to remark that there is still plenty of room for fresh adherents to the good cause, if only about one-half of the capital in the hands of gas companies is so far under the banner of co-partnership. How much has already been done was set forth in an interesting manner by Mr. L. W. Simpson Rostron, in the course of a paper which dealt with the subject of co-partnership generally, and its application to the gas supply business in particular. In moving a resolution expressing the meeting's deep sense of the value of the principle of co-partnership as a means of promoting industrial peace, progress, and efficiency, Mr. Corbet Woodall (the President-Elect of the Association) stated his main reasons for being a convinced co-partner and concluded by remarking that "in this faith he hoped to continue, even though progress were less rapid in the future than present indications encouraged them to hope." May present indications be even more than amply fulfilled!

Against the Eight-Hour Day.

The eight-hour day emerged for a brief space last week from the underground surroundings amid which it has of late been mostly heard, and appeared in the Manchester City Council, where its pretensions were subjected to a strong light of destructive criticism. The question was that of the establishment of an eight-hour day for all workmen employed by the Corporation; and the discussion took place upon a resolution to give effect to the decision of the Workmen Special Committee, arrived at after careful consideration, and the study of information obtained from various corporations and Government and other workshops, "that it was not desirable to establish an eight-hour day for the men employed by the Corporation." The Council were, of course, not unanimous in their adoption of the Committee's view; but after a long discussion, the recommendation that they should not resolve themselves into champions of the cause of the eight-hour day was agreed to. There is, obviously, a wide distinction between an eight-hour day willingly conceded by employers, and one forced on an industry by Act of Parliament. But, nevertheless, even in the case of a Corporation like Manchester, with various trading concerns, the conditions in the respective departments vary so much that a hard-and-fast rule for all would no doubt be

difficult of application. Apart from this, the men are not, apparently, all desirous of such a change; for it was pointed out by one member that an objection they have to an eight-hour day is that it obliges them to work so hard. There is good reason in this, if there was sound basis for the contention that the Corporation would have as much work done in eight hours as is at present performed in nine or more hours—or else, as one speaker remarked, “there must be considerable malingering at present.” Many people will agree with the argument that the Corporation, as a trading concern, cannot do more than the firms outside; and that what they were asked to sanction was municipal philanthropy. The true inwardness of the proposal was indicated by one of its supporters—evidently of a socialistic turn of mind—who remarked that somebody must lead the way in this matter; and Manchester should do this, and not “follow on.” “He supported the eight-hour day because he was hostile to this miserable conception of civic responsibility; and, again, because it was some step towards reducing the immense amount of poverty that surrounded every industrial area.”

Obituary.

The death is announced, at the age of 89, of Mr. J. M. H. CARDELL, who was one of the first Directors of the Bodmin Gas and Water Companies. He was appointed Chairman of the Water Company in 1878, and continued to hold that office till his death. Several years ago his co-Directors presented him with a testimonial, in recognition of his services. Mr. Cardell was also a Director of the Fowey Gas Company. He was associated with the municipal government of Bodmin, and in 1880 was Mayor of the town.

A painful sensation was caused at Dawlish on the morning of Monday last week by the news of the sudden death, during the previous night, of Mr. HENRY HARTWELL, the Secretary of the Gas Company, and a member of the Urban District Council. He had been in failing health for some time, but was about as usual the day before his death. On his way home he was seized with a fit of coughing, which resulted in the breaking of a blood vessel; and he expired shortly afterwards. He was highly respected by all who knew him.

We regret to record the death last Thursday, at his residence, The Manor House, Bishop's Down, Tunbridge Wells, in his 77th year, of Mr. FREDERICK TENDRON, Deputy-Chairman of the Continental Union Gas Company, and formerly Chairman of the Grand Junction Water-Works Company. Mr. Tendron was also Chairman of the Assam Company and of the St. John del Rey Mining Company. His connection with the latter Company lasted for thirty-three years, during eighteen of which he was Chairman. The Board, in notifying his death to the shareholders, observe that the present satisfactory position of the Company is largely due to his zeal and ability.

The death occurred last Tuesday of Sir ROBERT GIFFEN, K.C.B., the well-known statistician and economist. Deceased was born in 1837, and in early life was closely associated with journalism. In 1876, however, he was appointed Chief of the Statistical Department of the Board of Trade, and held the office for six years, when he was promoted to one of the assistant-secretaryships. He subsequently became Controller-General of the Commercial, Labour, and Statistical Departments of the Board. He was created a K.C.B. in 1895, and retired from the public service two years later. He was a Fellow of the Royal Society, and was President of the Statistical Society from 1882 to 1884. Sir Robert was the Official Auditor of the accounts of the Metropolitan Gas Companies.

Personal.

Mr. FRED E. PYE, son of Mr. T. Ebenezer Pye, Engineer and Manager of the Chichester Gas Company, has been appointed Manager of the Petersfield Gas-Works.

At a meeting of Directors of the Stone Gas Company held on Friday, Mr. T. W. SAVILLE, of the Thornliebank Gas-Works, Glasgow, was appointed Manager and Secretary, in succession to Mr. JOHN HOLMES, the present Manager, who is retiring on a pension after 31 years' faithful service.

Gas Companies' Exhibit at the Japan-British Exhibition.

In the “JOURNAL” for Feb. 22 (p. 487), attention was called to the action of the London and Suburban Gas Companies in arranging to hold a great demonstration of the applications of gas at the forthcoming Japan-British Exhibition, at Shepherd's Bush. The names of the members of the Committee (of which Mr. D. Milne Watson is Chairman) who are organizing the display were then given; and it was also mentioned that Mr. F. W. Goodenough, the Chief Inspector of the Gaslight and Coke Company, is acting as Hon. Secretary and Treasurer. The Committee have made a practical move in giving effect to their plans by having definitely secured space in the Decorative Arts Section on the principal gangway leading through it. This should be an excellent position. The actual building work has been commenced; and good progress has been made with the structure.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 199.)

BUSINESS last week in the old-fashioned markets of the Stock Exchange was fairly good on the whole, though at times a bit chequered, and in the later portion of the week overborne by the great pressure of the settlement. The young lions of speculation were as rampant as ever, with undiminished roaring in the Rubber den. Oil ventures (which are much more interesting to the gas industry) were highly excited before the close. The opening day was rather quiet, and generally inclined to dullness; but there was nothing to speak of in the way of a fall. Gilt-edged were flattish, and Consols gave way a small fraction, while Rails had a halt. On Tuesday, the more sedate departments were still quiet, but the tone improved. Government issues were steady; and Rails were stronger. Some improvement in Americans was distinguishable. On Wednesday, there was some anxiety as to how the heavy settlement was going to turn out, but apprehension abated. The tendency in some lines was good. Rails were strong, and showing further advances. Thursday was better all round. Consols rose, and other gilt-edged lines rose with them. Rails continued to pursue an upward course. Americans were firmer; and the Foreign Market had strong points. Rubber and Oil activity was immense. Friday's business was interfered with by the settlement; but the tone was quite cheerful, though there was some realizing. Rails were cheered by coal prospects. Saturday was much occupied with settlement matters, but the general tendency was firm. In the Money Market, rates moved downward until checked by a sharp demand. Discount was easier, but steadied before the close. Business in the Gas Market was a good average, and was more largely distributed than usual among all classes in the list. There was not much change in prices; but wherever quotations did vary, they improved. In Gaslight and Coke issues, the ordinary was active and steadily hardened, with prices rising from 103 $\frac{3}{8}$ on Monday to 104 $\frac{1}{2}$ on Friday and Saturday—a rise of $\frac{1}{2}$. The secured issues were quiet; the maximum realizing 88 $\frac{3}{4}$, the preference 104 $\frac{1}{2}$, the debenture from 82 to 82 $\frac{1}{2}$. South Metropolitan was active and firm at figures ranging from 120 $\frac{3}{4}$ to 122. Commercial 4 per cent. made 106, and the 3 $\frac{1}{2}$ per cent. 103. Among the Suburban and Provincial group, Alliance and Dublin was done at 85 (a rise of 1), Brentford old at 251, ditto debenture at 102, British at 44 and 44 $\frac{3}{4}$, Bournemouth preference at 15, Bromley “A” at 117 $\frac{3}{4}$, ditto “B” at 88 $\frac{1}{2}$, South Suburban at 121 and 122 $\frac{1}{2}$, ditto debenture at 122 $\frac{1}{2}$, and Tottenham “B” at 113 $\frac{1}{2}$ and 114—a rise of 1. On the local Exchange, Liverpool “B” marked 164 $\frac{1}{2}$. In the Continental companies, Imperial was very quiet but steady at 181 $\frac{1}{2}$ and 182 $\frac{1}{2}$, Union was done at 99 $\frac{3}{4}$, and European part-paid at 18 $\frac{1}{2}$. Among the undertakings of the remote world, Bombay changed hands at 6 $\frac{1}{16}$, Cape Town mortgage at 50 and 50 $\frac{1}{4}$ (a rise of $\frac{1}{4}$), Melbourne 5 per cent. at 100 $\frac{1}{4}$ and 101, Monte Video at 12 $\frac{3}{8}$, Primitiva at 7 $\frac{1}{16}$, ditto preference at 51 $\frac{1}{16}$, and San Paulo at 15 $\frac{3}{8}$ and 15 $\frac{1}{2}$ —a rise of $\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Maidstone and the Fixed Price per Lamp—Power of Charge and the Restrictions of Use—A Newmarket “Authority” on Combustion Products—Public Building Lighting—New Lamps.

THERE must be the deepest possible sympathy with those municipal electricity concerns who regard their position as so rickety that they feel there is nothing more to be done than to have recourse to that speculative system of business—a fixed price per lamp. The fixed price is the only thing that is “fixed” about it. The very foundation of the idea is loose and unsubstantial; the consumption per lamp is neither definite nor measured; and where the system is applied, there (unless a meter is put in for other purposes) the scope of business with the consumer is perforce limited. The Maidstone Corporation are giving the consumers the option of a fixed price per lamp in place of a flat-rate; but the Maidstone Corporation do not understand very much about the system, nor do the Electricity Committee, nor does the Chairman of the Committee (Alderman Vaughan). When the recommendation came before the Council the other day regarding the fixed price, a simple question was put to Alderman Vaughan; and his reply was that he would ask Mr. Hoadley, who was responsible for the arrangements, to explain. Now Mr. Hoadley is the Electrical Engineer; so that Maidstone is committed here to a sort of one-man scheme. The Chairman and members of the Electricity Committee do not know whether what they are adopting is a project worthy of their acceptance; and the other members of the Corporation know less. And this municipal administration of a trading undertaking! The Corporation and the Electricity Committee obviously believe in the simple life in the matter of local government; and suffice it for them that they can shift responsibility on to the shoulders of their paid officials. The Maidstone scheme is this: That in the case of old customers for business premises, a charge is to be made of 10s. per annum for each 32-watt lamp alight at one time, or a flat-rate of 4d. per unit; and in the case of new customers, 10s. per annum for each 32-watt lamp alight at one time, or a flat-rate of 8d. per unit. For private houses, the proposal is to charge 8s. per 32-watt lamp per annum alight at one time, or, if preferred by customers, 4d. per unit.

In the first place, it would be interesting to know whether the Corporation have the power to discriminate between old and new consumers, charging the one at the flat-rate 4d. and the other 8d. per unit. Why should next-door neighbours be dealt with in this way? The idea of differentiating between them is absurd; and the proposal is entirely opposed to the spirit of modern legislation, which recognizes the principle that (as provided in the model clauses in relation to section 13 of the Gas-Works Clauses Act, 1847) contracts should be "alike in terms and amount under like circumstances to all consumers." We are afraid, too, that the provisions of section 31 of the Electric Lighting Clauses Act, 1899, are often infringed in connection with electrical idiosyncrasies in respect of charges. But anyway the fixed price per lamp is a dear way of purchasing electricity. In his celebrated work on "Electricity for Everybody," Mr. R. Borlase Matthews quotes 7·7 units as the average annual consumption of an 8-candle carbon filament lamp; so that the same average would apply to a 25-candle power (or 32-watt) metallic lamp. If Mr. Matthews is correct, then the consumer who is paying 10s. or 8s. for such a lamp will be paying dearly per unit for his electricity; whereas "the prices to be charged by the undertakers for energy supplied by them shall not exceed those stated in that behalf in the Special Order, or, in the case of a method of charge approved by the Board of Trade, such price as the Board of Trade determine on approving the method." However, we are of opinion that the system, aided by restriction, will soon kill itself. As to restriction, it was pointed out by one Maidstone councillor that an ordinary tradesman would scarcely know how many lamps would be alight in his various departments at one time; and therefore he was curious as to what means the Committee would adopt in order to ascertain this.

The same councillor was also anxious as to the position of a tradesman who had a number of lamps which he did not use regularly. The tradesman has to fix upon his maximum requirement; and he will suffer if he exceeds it. Mr. Hoadley explained the deeply-laid scheme in this way: Supposing a person has 140 lamps installed on his premises; if he only uses 25 at one time, he will only have to pay for 25. If, however, he ventures to put the twenty-sixth lamp on, the whole of the lamps will show their resentment by flickering, and will refuse to give a proper light. Therefore for daring to put on the extra lamp beyond his maximum, the consumer has to suffer depreciation of the whole of the lighting in his premises. This is strange business. What, too, will the tradesman do if he wants extra lighting at Christmas time? There are not many tradesmen who will like to be manacled in this preposterous way; and we can see a reversion to meters (the installation of which the department hope to save) as soon as there has been a little experience of Mr. Hoadley's plan, which has been obediently swallowed by the Corporation and the Electricity Committee, without troubling to fully understand it. However, the Maidstone experience will probably be that of other towns—a seven days' wonder; and then it will find its ultimate resting-place in oblivion, with Mr. Hoadley remembering it as one of the mistakes of his (as it is that of most electrical engineers) strenuous professional life.

The controversy between the champions of gas and electricity at Newmarket continues—a matter upon which we commented on March 29. Mr. Troughton has had a tilt at some of the mis-statements made at the annual meeting of the Electric Supply Company; and Mr. Frank S. Simpson, the Electrical Engineer, who has gained a certain amount of local notoriety by the discovery of a *rara avis* who—through satisfaction with a less amount of illumination in his house, or fewer hours of consumption, or a previous prodigal use of gas by possibly old-fashioned methods—has actually had electricity accounts lower than the former gas accounts, has had a turn at Mr. Troughton. Mr. Simpson has the knack to perfection of the electrical man of airily disposing of scientific facts, which are as real as anything can be. He seems to assume that the rooms of a house are all air-tight compartments. We have not found them so. If they were, then those who complain now of the stagnation of the atmosphere in electric lighted rooms when closed on winter nights, and the contamination of the atmosphere by the excretions of human respiration, would have more cause of complaint than they have now. It is still quite a common thing to find gas used in theatres that are electrically lighted, for causing an updraft in a central roof-ventilator. Of course, the electrician will say that is superfluous. But we put a very practical question to Mr. Simpson, who writes only with the support of the old and crusted partizan statements that one has seen in print so frequently. He makes a point of the consumption of oxygen by gas-flames. Now if there were not a continual exchange of air going on in a gas-lighted room, the air would be depleted of the essential to the sustenance of the gas-lights, the lights themselves would fall off in illuminating power, and the rooms would be absolutely uninhabitable by human beings. But here we are at the present moment writing in a room, without any special means of ventilation, where the incandescent lights are as brilliant as they were when lighted a couple of hours previously. Will Mr. Simpson explain this (if he is correct) phenomenon? We cannot accept Mr. Simpson as an authority on the products of the combustion of gas. Where gas is burning, the natural tendency is for the heated air to rise; the occupants of a room do not live near the ceiling, but in the lower portion of the room where the circulation of the fresh incoming air is the greatest.

It would be well if electricians, instead of relying solely on the

historical utterances of electrical partizans, would look at this matter in a practical way. Here is Mr. Simpson speaking of the "sulphurous acid and sulphuric acid" produced by the combustion of the sulphur contained in coal gas; and of fearful injury to everything with which they come in contact. He speaks of the products of combustion as being extremely detrimental to health. He speaks of partially consumed gas escaping, when inverted burners are used, that is "highly charged" with carbon monoxide—"a very poisonous gas." Now to test Mr. Simpson's knowledge, again in a practical way, we ask him to assume the use in a room of a 50-candle power inverted burner, consuming $2\frac{1}{2}$ cubic feet of the local gas an hour, and tell us the volumes of "sulphurous acid and sulphuric acid" that are given off per hour. Also, taking the same burner, will he tell us how much "partially consumed gas" escapes into the room, and how much of this partially consumed gas is represented by carbon monoxide? He ought to have no difficulty in giving us this information, seeing that he says there are "considerable quantities" of this partially consumed gas escaping, and that the gas is "highly charged" with carbon monoxide. He will, we know, forgive these inquiries, as it is so difficult to argue on mere electrical platitudes and postulatory assertion. And as the mixing of "the products of combustion with the air we breathe is exceedingly detrimental to health," perhaps he will produce a few of the good people at Newmarket who have been afflicted in health by being gas consumers. They deserve our sympathy. Practically the whole of our lives have been spent in rooms lighted by gas during the hours of darkness, and for a great number of years heated when necessary by gas-fires. Here we are; but, electrically, and according to the learned Mr. Simpson, we ought not to be. One other statement that this self-constituted authority makes is that a "single gas-burner vitiate more air than four men." He does not say the size of the burner; if he is referring to an ordinary one, and not to one belching forth flames from a low-grade gas under a steam-boiler, we say that he is stating what is false. If he will be a little more explicit in his statement, and give somewhat more information on the point of the vitiation, we will reciprocate by telling him why his declaration is false. Now, Mr. Simpson, we shall look for an answer to our inquiries.

The interlinking of public bodies through multiple representation on the part of individuals, continues to produce an undue amount of favour for electricity where the supply is municipally controlled, in the lighting of public buildings. Gas has been used in divers old-fashioned ways in many of those buildings for decade upon decade, and rarely in them do we see gas lighting applied in its modern modes. During the succeeding decades, there has been no particular complaint as to bad lighting and vitiated atmosphere; but now that a light of 100-candle power can be obtained by the consumption of 5 cubic feet of gas as compared with nearly 50 cubic feet of gas with flat-flame burners, the light is worse than ever, so is the vitiation of the atmosphere, and the health of those who are compelled to occupy public buildings so illuminated is absolutely shattered, though the appearance of witnesses does not subscribe corroboration. That, however, is the sort of nonsense that is now put forward for the digestion of the Inspectors of the Local Government Board when holding inquiries into proposed loans for converting the system of lighting to electricity at the expense of the ratepayers, and in the sole interests of the municipal electricity concern. An example of this has been produced by an inquiry at Dublin into an application by the South Dublin Board of Guardians for sanction to a loan of £3000 for converting the lighting of the workhouse. Whether Mr. P. C. Cowan, the Inspector, will swallow all that was told him, or will be satisfied that all possible has been done, in a cheaper way, with modern gas lighting, remains to be seen. One of the possible horrors of electricity, it is noticed, did not come out in the evidence. There was illustration of it at the Battersea Anti-Vivisection Hospital last Wednesday evening. An electric wire fused in one of the upper corridors connecting the wards with the operating theatre and bath-rooms. The twenty-four in-patients were much alarmed; but fortunately mastery of the fire was quickly accomplished, through the prompt action of the staff and the fire brigade.

Of the making of metallic filament lamps in different ways, and under different titles, there appears to be no end; but the lighting efficiency does not improve. The advent has just been heralded of tungsten lamps with drawn-wire filaments; and the crimped and crookedly hung filaments are not by any means things of beauty. But perhaps they will be used for concealed lighting, or with obscured globes; so that the somewhat higgledy-piggledy appearance of the filaments will, under such circumstances, not matter much. The lamp is being made by Messrs. Siemens Bros.; and it is called the "Onewatt," which is a misnomer. It is made for 100 to 130 volt and 200 to 250 volt circuits; and the selling price is placed at 4s. 6d. The efficiency is stated to be 1·1 watt per Hefner unit; so that each 100 Hefner unit lamp will require 110 watts per hour, and produce a light (if the makers' figures are correct) of 90 British candles. Therefore the efficiency—1·22 watts per candle—is much about the same as that of the older type of metallic filament lamps. The advantages of the lamps are stated to be that a longer length of filament is brought into a spherical bulb of less length than the metallic predecessors, and that the vertical candle power is appreciably increased. Drawn-wire filament lamps are also being introduced by the British Thomson Houston Company; but about them not much is yet known.

NOTES FROM WESTMINSTER.

THE past week was one of far-reaching importance for the gas industry—in the first place, because the House of Lords Committee to whom the Standard Burner Bills were referred have sent them forward precisely as they came before them; but, as will be seen below, this does not end the fatuous hostility to the measures. In the second place, the principle initiated last session in parliamentary enactment, that the gas profits of municipal gas concerns shall be employed solely or largely in the interests of the undertaking and consumers who make them, has found further expression in the Glasgow Bill. Other interesting features are noticed below. The South Hants Water Bill also obtained one day's hearing by the Committee who are to adjudicate upon it. In regard to future possible happenings, Mr. Wardle, member for Stockport, has tabled a notice to the effect that an instruction be given to the Committee who will consider the Bishop's Stortford Gas and Electricity Bill to insert a clause limiting the interest on capital, and directing that the profits in excess of such interest be applied in reduction of the prices of both gas and electricity. The Brighton and Hove Corporations have definitely decided to oppose the local Gas Company's Bill when it reaches the House of Lords, as they are dissatisfied with the rd. taken from the standard price in the Commons, being of opinion that the lowering should be greater.

Standard Burner Bills. In view of the fact that last week we noticed the decision delivered by Lord Ritchie's Committee in regard to the Standard Burner Bills—a decision wholly in favour of the promoters—and in view also of the fact that further comment appears in an earlier column of this issue, it is unnecessary to do more than make a few remarks here in order to maintain the continuity of the story. On the Monday morning, there was an address by Mr. Talbot, on behalf of the Mersey Docks and Harbour Board, who were anxious that the Liverpool Gas Company should be ruled out of No. 1 Bill. Then Mr. Ram followed, and in lieu of rejection or curtailment of the standard price, he asked that the reduction of illuminating power produced by the "Metropolitan" No. 2 burner should be compensated by the raising of the illuminating power standard, and that the Bill (if it arrived at the status of an Act) should not take effect until such time as there had been inquiry in each case to ascertain whether the provisions applying to each individual company were duly regarded, and full weight given to them in the interests of the consumers. The absurdity and the worthlessness of this proposal were as apparent to the Committee as to the technical gas men assembled in the Committee room. As a matter of fact, it was in direct antagonism to the statutory principle which recognizes that gas suppliers have a right to the burner best adapted for developing the illuminating property of the gas they supply. The reply on the whole case by Mr. Honoratus Lloyd, on behalf of the promoters, was generally conceded among those who heard it (save by the opposition) to be a dialectical, logical, and analytical triumph. He did not spare his opponents in any one respect. He dragged the weaknesses and inconsistencies of their case into the full light with the remorselessness of one who felt that such a mass of incongruity deserved all the exposure that it was in his power to give it. He was listened to with almost breathless interest. Even the opposition Counsel and the witnesses whose evidence he was treating so mercilessly hung on his words, and attended intently to the story of the sorry mess that had been made of the opposition case by its construction of inharmonious parts. We publish a fairly full report of the speech in our "Parliamentary Intelligence;" and as it will be read, and that with more than passing interest, we will not trouble to even indicate its points here. Such an examination, however, is helpful to any Committee. It is easy for men versed in parliamentary warfare, and themselves possessing a fair share of intelligence, to discriminate between forensic superficiality and speciousness and sound criticism and the piecing together of parts in proper relation. The Committee's judgment delivered in favour of the Bill without any qualification, was a complete ratification of the estimate made by Mr. Lloyd of the character of the opposition case. On Wednesday, though Mr. Ram appeared to make doubly sure that the Committee had fully considered the clauses he had suggested for insertion in the measures, his stay was brief; but he announced what was obvious from his withdrawal, that the parties would meet again in the Lower House. There were applications on behalf of the Radcliffe and East Stonehouse District Councils for testing-places in their respective districts; but they were rejected by the Committee in common with all the other pleadings and requests of the opponents. The Standard Burner Bills Nos. 1, 2, and 3, therefore go to the Commons in the form in which they were brought before Lord Ritchie's Committee.

Glasgow Profits and Prices.

For length of discussion, the Glasgow Gas Consolidation and Further Powers Bill has the record for this session. It

monopolized the consideration of Mr. Mooney's Committee during the whole of their sittings the week before last, and up to Thursday morning last. As explained in the "Notes" last week, the conflict between the authorities in the outer area of supply and the Glasgow Corporation was mainly on the questions of the transfer of gas profits in relief of the city rates and of the making of differential charges as between the city supply and supplementary supply district, and as between consumer and consumer. The outer districts contended, *inter alia*, that the proposals of the

Corporation would be detrimental to the development of their areas; and their arguments (as did those of the out-districts in the cases of Oldham and Salford last session) prevailed, though Glasgow, it must be confessed, has in the past behaved rationally and even handsomely to the consumers throughout their area of supply, in respect both of prices and of keeping hands off the gas profits for the benefit of city ratepayers. The central interest of the long discussion is in the decision of the Committee itself. The only differentiation in the matter of charges that they thought fit to allow was as between lighting purposes and all other purposes—heating, cooking, and power; so that there is to be throughout the area of supply (inner and outer districts alike) a flat-rate for lighting, and a flat-rate for other purposes. This is a serious pronouncement not only for Glasgow, but, if the Bill proceeds, for other municipal gas undertakings as a precedent. Comment on the point appears earlier in this issue; so that, without further remark, it may be passed by here. As to the appropriation of profits in aid of the rates of the city, the Committee were totally averse to it. The attitude of Glasgow in this matter in the past was referred to last week. They have (with the exception of one year) applied, as is right and proper, profits entirely to the production of the best gas service at the lowest possible price; but the outer districts scented danger of a change of policy in this regard, and successfully opposed the perpetuation of the practically unexercised power. Mr. Balfour Browne tried hard to get the right for Glasgow to appropriate rd. per 1000 cubic feet (which would have equalled the 1 per cent. proposed by the House of Lords for Salford last year); but all his pleading was ineffectual to move the Committee from their decision, that any surpluses should be devoted to the common reduction of the price of gas throughout the area served by the gas undertaking. The verdict in this respect is one that is in agreement with the policy consistently advocated through long years in these columns; but, taking the decisions as to price and as to profits together, the outer districts are placed in a preferential position in view of the extra costs entailed in their supply. On the other hand, the Corporation are to be allowed to continue the appropriations for depreciation on the lines they have been following hitherto—viz., 1½ per cent. on works, 3 per cent. on chemical works, 2 per cent. on pipes, 6 per cent. on meters, and 10 per cent. on stoves. The Committee, too, declined to permit any special provision for working capital or reserve; and they decided that public lighting charges should be uniform throughout the district of supply. There was a proposal on the part of the Corporation to purchase the Baillieston Gas Company, and to include the area in the supplementary supply district. But the decision of the Committee brought the area into the city supply district, which has the effects of wiping out one of the conditions of purchase, and of exposing the Company to the competition of the Corporation. Glasgow promptly expressed a willingness to exclude the area altogether; but the Committee would not entertain this. It is a curious position. The outer districts are flushed with their success in obtaining such complete equality with the city in their gas supply; but whether their joy will be long sustained, cannot at the moment be said, as it is an open question whether the Corporation will not abandon the Bill, in view of the drastic decision, and the tight-lacing to which it commits them—much against their will—in the conduct of the gas business.

Irish Gas Bills.

It is a rare thing for an Irish Gas Bill to go through unopposed. The local authorities of Ireland have a peculiar propensity for fighting, and for finding fault with those who carry on businesses that are largely dependent on the good will of the local governing bodies. It cannot be expected that concerns of the size, and having the limited trading opportunities of the majority of the gas undertakings of Ireland, can do so well for the communities they serve as gas undertakings carried on under more propitious circumstances. The local authorities expect too much; and their requirements lead to friction. The Wicklow Gas Bill is an exception to an all too common rule in the matter of hostility. It is unopposed—up to the present stage; and it has passed the Unopposed Bills Committee of the Commons, with, under an agreement with the Council, the fresh money powers brought down from £6000 to £4000. But the Tipperary Gas Bill has not been so fortunate. The fight over it before Mr. Armitage's Committee has been a tough one, with the result that such onerous terms were put upon the Company as the price of securing a much-mangled Bill, that they have been compelled to withdraw it. The increased facilities that were asked for would undoubtedly have enabled the Company to do better for the consumers; but, to all intents and purposes, the essential ones were altered in a manner that rendered them either practically abortive or entirely crippling. There is an old-standing grievance about the site of the works, owing to their nearness to dwelling-houses. So strong is the objection that in 1903, for this, among other reasons, the Board of Trade refused a Provisional Order for which the Company had applied. But it comes to this, that the dimensions of the business and its potentiality are such that both the Company's and the consumers' interests would, on account of the cost, be absolutely wrecked by removal. Mr. R. B. Anderson, Mr. E. H. Stevenson, Mr. Frank Jones, and others supported the proposals of the promoters; while Mr. William Newbigging and certain local residents gave evidence in opposition. Mr. Pelham, of the Board of Trade, was also called for the purpose of informing the Committee as to the reasons that induced the Board to reject the application for an Order seven years ago. The decision of the Committee put the

Company in a singular position. They reduced the maximum price to 4s. 3d., considered the existing capital sufficient for the Company's needs, were of opinion that the capacity of the works ought not to be enlarged on the present site, reduced the dividend on the ordinary capital to 7 per cent., placed the dividend on the preference capital at 5 per cent., and cut out the proposed sanction to an application for electricity supply powers. A more crippling decision on an enterprise of this character, it would be hard to imagine; and so the measure has been withdrawn. Now that the Bill has gone, it is a question whether it would not have been to the interests of the consumers to have allowed the Bill to proceed on acceptable terms to the Company rather than for the latter to continue under the present unregulated conditions. The Council, though they gained what they sought, asked for costs; but the Committee would not go to that length, which would have been tantamount to saying that the Company had done wrong in making the attempt to place themselves under parliamentary control on reasonable conditions.

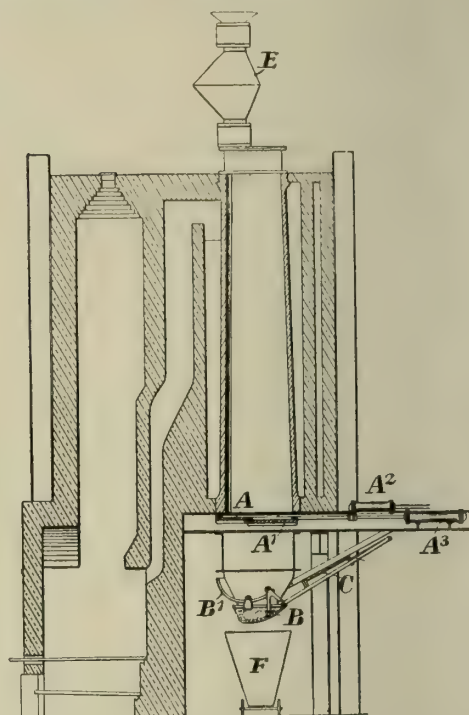
Cambridge Water. Consequent upon a report by the Local Government Board as to the quality of the water supplied by the Cambridge Water Company's wells at Cherryhinton and Fulbourn, the Company are asking the sanction of Parliament to the construction of certain new works and a reservoir at the former place, to be fed by a projected well some 1½ miles to the east of Fulbourn, at a spot where there is a sparse population. Powers were also sought to sterilize water, to make bye-laws, to raise £180,000 of additional capital and £60,000 by borrowing, and to increase the charges for water. The Bill has been before a Committee of the Lords, with Earl Kintore as Chairman. The Corporation of Cambridge objected to the sterilization of the water on the ground of potentiality of pollution, and asked for the abandonment of the existing sources of supply. They also gave the Committee to understand that they are contemplating the promotion of a Purchase Bill, but the matter is suspended for further consideration between the present and the Commons stages of the measure. The County Council were opposed to both the existing and proposed works; and generally from other quarters there was objection to the projected new pumping-station, on the grounds of injury to existing wells. In short, nothing that the Company are doing, or proposed to do, was right. But the purity of the Cambridge water was attested by several witnesses; and, on this and other points, the Company were supported by eminent authorities. On the second day's hearing, the Committee announced that they would only be prepared to pass the Bill on the conditions that there was prompt sinking of the proposed new well, and that the future supply was drawn wholly from this well. The decision delivered at their third sitting is interesting. The Committee were of opinion that the Company should be granted the capital powers asked for; that the contingency fund should stand, being kept at a reasonable amount; that five years should be the maximum period for the construction of the whole of the works, with the exception of the extension of adits; that twenty years should be the maximum period of borrowing for the extension of mains and the like; that the new scale of rates should be levied upon the rateable value; that the first water-closet should be in all houses free; and that the higher scale of charges should not be imposed until after the borrowing of the moneys required for works construction. The sterilization clause was not approved.

Report of the National Physical Laboratory.—We have received from the Director of the National Physical Laboratory (Dr. R. T. Glazebrook, F.R.S.) the report for the past year, which was submitted at the general meeting on the 18th ult., on the occasion of the annual reception. The work done and in progress at the Laboratory, in the departments of scientific research in which our readers are most interested, was dealt with in the account of the reception which appeared in the "JOURNAL" at the time; and it does not call for further notice. The report of the Director on the Physics Department is followed by reports made to him by the Superintendents of the Engineering, Metallurgy, and other Departments. Accompanying the report is Vol. VI. of the "Collected Researches," in which is a reprint from the "Proceedings" of the Physical Society of London of the paper by Mr. C. C. Paterson, a Principal Assistant in the Physics Department, on "The Proposed International Unit of Candle Power," which was given in the "JOURNAL" for Aug. 10 last (p. 383).

Algæ as a Result of Air-Lift Pumping.—That compressed air caused algæ growths in the water supply of Frankfort (Ind.), is the opinion expressed by Mr. J. B. Martin, in a paper read recently before the Indiana Sanitary and Water Supply Association, and noticed briefly in "Engineering Record." The supply for this city, Mr. Martin stated, is drawn from a 30-foot stratum of water-bearing sand and gravel lying between strata of impervious blue clay. In 1892, an air lift was used to aid the flow, for the ground-water level had been receding gradually for some time. At no time prior to the use of compressed air was the taste or odour of the water objectionable; but after its use growths of algæ were constant a source of trouble that the air-lift method was finally abandoned in 1907. While the air was used, the water was discharged into two covered brick storage reservoirs, water-proofed on the inside and cleaned regularly; so that, in Mr. Martin's opinion, the algæ could not be attributed to exposure of the water to sunlight. After the air-lift method had been superseded by pumps in the wells, no further trouble was caused.

WILSON'S VERTICAL RETORT.

On March 18 last year, Mr. Alex. Wilson, the Engineer of the Glasgow Corporation Gas Department, applied for a patent (No. 6449) for "Improvements in the Working of Vertical Coal-Gas Retorts;" and his specification, accepted on the 18th ult., was issued last week by the Patent Office.



It is accompanied by a sectional elevation of the retort (here reproduced). At the bottom of the vertical retort, and connected to it, is a coke-measuring chamber for withdrawing a measured quantity of coke from the retort at regular intervals—say, every three or four hours. To allow of the measuring chamber being filled with coke from the retort, and for the purpose of cutting off the supply from the retort, there are provided at the bottom two sliding doors A A', which recede and advance towards the vertical centre of the retort as shown. The doors work in guides, and are operated by power cylinders A² A³—the piston-rod of the upper cylinder being preferably connected to the slide A by means of a pair of side links (not shown) which are connected to a crosshead of the rod. The rod of the lower cylinder may be connected to the door A' as shown.

The measuring chamber is provided with a water-seal cup B to close its mouth while being filled, and also to prevent the escape of gas from the retort during this operation. The cup may be suspended from the race B', secured to the coke chamber by means of brackets with race rollers on wheels; and for actuating the cup, a rod or pair of rods may be pivoted thereto, and connected to the piston of the power cylinder C.

The method of working is as follows: The slides or doors A A' are opened so as to allow the coke from the retort to fill the chamber below; the doors being then closed. The closing cup B at the bottom of the coke-chamber is opened to allow the measured quantity of coke to be discharged, and then closed, and the retort-doors opened. This allows another quantity of coke to fall into the coke-chamber; and the remainder of the material having fallen, the space left above is filled up by a fresh quantity of coal dropped into the top of the retort from the coal-chamber E—these processes being repeated at suitable intervals.

An alternate form of working would consist in employing a measuring vessel, such as F, below the retort, but not connected with it; the measuring chamber being filled from a hopper or chamber at the bottom of the retort. In this case, the doors A A' and corresponding parts are not required; the charge being withdrawn from the chamber below the retort by opening the cup B provided at the bottom of the chamber. As soon as the coke-measuring vessel F is filled, the cup B is closed; and the remainder of the charge in the retort having fallen, a fresh quantity of coal is dropped into the top of the retort from the coal-chamber E as in the first arrangement.

Presentation to Mr. W. S. Morland.—A few days ago, the employees of the Gloucester Gas Company at the works at Hempsted, presented a handsome marble timepiece to Mr. W. S. Morland, the Company's Engineer and Manager, as a mark of their esteem and goodwill, on the occasion of his approaching marriage. Mr. F. Yates, who made the presentation, spoke in felicitous terms of the good feeling which had always existed between the workmen and Mr. Morland; and in asking his acceptance of the timepiece and an address, with the names of the subscribers, he expressed the good wishes of all the employees for Mr. Morland's future happiness. Mr. Morland suitably replied.

DESSAU SETTINGS OF EIGHTEEN VERTICAL RETORTS.

By Dr. R. GEIPERT, of Berlin.

THE following is an abstract translation of a lecture delivered by Dr. R. Geipert, one of the Engineers at the Berlin works of the Imperial Continental Gas Association, at the annual meeting at Magdeburg, on Friday last, of the Association of Gas Engineers of Saxony and Thuringia.

The most important part of the operations of a gas-works is undoubtedly that carried on in the retort-house; and it has the greatest influence on the economical efficiency of the working. The first problem in the carbonization of coal is how to obtain the greatest possible quantity of gas from the coal with the smallest expenditure on fuel and labour. Once the crude gas has been obtained, its handling and purification present no difficulties. The apparatus required therefor is simple and easily supervised. The same is true in regard to the physical and the chemical processes involved in the purification of gas. On the other hand, the formation of the gas is most intimately bound up with the conditions in which it takes place, which conditions determine its economy. The relations between the production and purification of the crude gas are also clearly expressed in the expenditure which is incurred in the different sections of the operations of the gas-works. For example, at Mariendorf about £300 is annually spent on new purifying material, but nearly a hundred times this sum—viz., £25,000—goes for the coke used as retort-house fuel. These facts emphasize the great importance of the manager of a gas-works devoting very special care to the retort-settings—on the one hand, by making judicious selection of the system of setting employed, and on the other hand, by working in the most rational manner. [The author here refers to a paper by himself, on the regulation of the primary and secondary air in retort-furnaces, of which an abstract translation is given on p. 169 of to-day's "JOURNAL."]

At the outset, the choice of the system of retort-setting presents difficulties. Our forefathers were better off in this respect. There were only horizontal retorts which were heated by direct or producer furnaces. Considerable advantage was achieved when the waste heat of the chimney gases was utilized according to the principles laid down by Siemens for heating the air used for combustion. To-day, however, choice has to be made from a large number of types of settings. This fact should be welcomed as an indication that the art of gas manufacture has not been left behind in the advance which is to be observed in the whole field of industry, and which is the result of the endeavours to attain efficiency and economy. These causes have produced the modern systems of retort-settings, the object of which is to secure the gasification of the coal in the most efficient manner with the smallest expenditure on fuel, labour, and plant. The endeavour has been made to attain this purpose by changing the position and size of the chambers in which carbonization takes place. In this way, the transition ensued from horizontal to inclined and vertical retorts, the chief result of which has been economy of labour. The carbonizing chambers are called (according to their size) either retorts or chambers. They are distinguished fundamentally by the ratio subsisting between the heating surface and the quantity of coal carbonized; and the question of the influence of this relation on the factors which determine the economy of gasification becomes of most particular importance. The knowledge gained on this point from experiences with horizontal and inclined retort-settings is inadequate; and what little there is is not free from objection, because the size of the free space above the layer of coal in the retort influences the composition of the gas and its bye-products. The decomposition of the products resulting from gasification takes place in the free space; so that it cannot be settled what has been formed in the first instance from the coal, and what must be ascribed to subsequent decomposition. Vertical retorts afford the opportunity for better observation, as a free space is entirely done away with in them. The most modern setting of this kind—namely, the setting of eighteen vertical retorts—is distinguished by the retorts being specially narrow, so that the heating surface is relatively very large. [See "JOURNAL," Vol. CIX., p. 96.] The effect of this condition on the evolution and quality of the gas, and on the duty of the setting in respect of gas making, consumption of fuel, and the cost of installation, is the subject of the investigations about to be reported.

Only a few years ago, such considerations scarcely passed beyond theoretical speculations, as investigations and experiences were wanting as a practical basis for them. Subsequently, however, a series of factors have been experimentally established which admit of trustworthy conclusions being drawn. It will be sufficient to direct attention to the figures which an impartial person—namely, Professor Bunte—has obtained with settings of twelve and eighteen vertical retorts. [See "JOURNAL," Vol. CIV., p. 256, and Vol. CIX., p. 27.] Further, the author may be allowed to give by way of comparison the values which were obtained in vertical retort settings at Zürich with Saar coal [see "JOURNAL," Vol. CIV., p. 256] and those obtained by him in his trials of the setting of eighteen retorts. The latter figures will be given in detail in the course of this lecture. The author's investigations were made with Saar coal from the two mines, Sulzbach and Maybach. The first coal, which contained 10·7 per cent. of ash, appears not up to average quality; and the author, therefore,

restricts his comparisons to the Maybach coal which, with 8·4 per cent. of ash, may be regarded as of normal quality. The following are the more important comparative data.

TABLE I.

| Description of coal | Silesian. | | Saar. | |
|---|------------------|---------|--------------|-----------|
| Authority | Professor Bunte. | | Dr. Geipert. | |
| Number of vertical retorts in setting | 12 | 18 | 10 | 18 |
| Coal carbonized per setting per 24 hours cwt. | 274·5 | 391·2 | (223·8) | (369·7) |
| Gas made per setting per 24 hours cub. ft.* | 189,465 | 262,213 | (154,573) | (255,327) |
| Gas made per ton of coal | 13,806 | 13,405 | 13,815 | 13,814 |
| Gross calorific power of gas, B.Th.U. per cubic foot* | 537 | 543 | 560 | 564 |
| Coke used in retort furnaces—Per cent. by weight of coal carbonized | 14·1 | 11·8 | 15·0 | 11·8 |
| Pounds per 1000 cubic feet of gas made | 22·8 | 19·8 | 24·3 | 19·2 |

* At 60° Fahr. and 30 inches barometér.

Thus with Silesian coal, less gas was obtained in the setting of eighteen retorts than in the setting of twelve retorts from a given weight of coal; but it had a higher calorific power. This point becomes of industrial importance to a gas-works, since the higher the calorific power of the gas, the greater is the quantity of cheap water gas which may be added; and it is in this direction that economy becomes possible. Having regard to this fact, the gasification in the two investigations may be regarded as almost equal from the economical standpoint. With Saar coal, the gas evolved from a given weight of coal is the same in both types of vertical retort-setting; but the gas from the setting of eighteen retorts has a higher calorific power. These experiences lead to the conclusion that the relative increase of the heating surface obtained in the setting of eighteen retorts has a favourable influence on the procedure of gasification.

A reduction of the fuel consumption for a given quantity of coal carbonized would be expected *à priori*, as the relative increase in the heating surface is favourable to the transmission of heat from the furnace gases to the charge in the retort. With a setting of eighteen retorts, an advantage is also secured through the radiating surfaces of the setting being smaller relatively to its coal-receiving capacity than those of a setting of twelve retorts which has the same dimensions. Both causes co-operate in producing the result established in the trials that were carried out by the Carlsruhe Instructional and Experimental Gas-Works—that the consumption of coke in the retort-furnaces is reduced to only 11·8 per cent. by weight of the coal carbonized or to 19·2 lbs. per 1000 cubic feet of gas made. It is important to regard both these figures together, in order to obtain a clear view of the heat consumed in gasification. In the Munich carbonizing chambers Professor Bunte obtained 11,518 cubic feet of gas at 60° Fahr., and 30 inches, having a gross calorific power of 615 B.Th.U. per cubic foot, per ton of Saar coal. The consumption of coke in heating the chambers amounted to 15·3 per cent. of the weight of coal carbonized or to 29·7 lbs. of coke per 1000 cubic feet of gas made. This figure may be compared with that for the setting of eighteen vertical retorts after correction has been made for the difference in the quality of the gas. If the calorific power of the Munich chamber gas is reduced to that of the gas made from Maybach coal in the settings of eighteen retorts—564 B.Th.U. per cubic foot, by admixture with water gas, the volume of mixed gas of 564 B.Th.U. so obtained per ton of coal would be 13,743 cubic feet. On increasing the consumption of coke from 15·3 to 17·6 per cent. to correspond to the production of the water gas added, it may be calculated that the coke consumed per 1000 cubic feet of gas made amounts to 28·7 lbs. per 1000 cubic feet. Since the working costs have to be booked not on the quantity of coal carbonized but on the volume of gas made, it will be seen that the amount of fuel in the setting of eighteen vertical retorts is only 19·2 lbs. per 1000 cubic feet as compared with 28·7 lbs. for the Munich carbonizing chambers, or only about two-thirds what it is with the latter.

It has been contended with reference to the high make of gas per ton of coal in vertical retorts when steam is admitted, that it is only necessary to increase the temperature of large carbonizing chambers in order to obtain a large make of gas from the coal in them also. This view cannot practically be sustained. It is put forward as a special advantage of the large chambers that the time required for working-off the charge is 24 hours, which admits of the chambers being charged only in the day-time. An increased temperature, however, would shorten the time required for working-off the charge; and if, notwithstanding the higher temperature, the charge were left in the chambers for 24 hours, the consumption of fuel for heating them would increase to so considerable an extent that the process would really become

at the Karlsruhe Instructional and Experimental Gas-Works already reported, the author has tested other descriptions of coal in the setting of eighteen vertical retorts, and obtained results which are recorded in detail in Table II. The make of gas shown in his table—both per setting and per ton of coal carbonized—must be regarded as highly satisfactory, as is also the quality of the gas as indicated by its calorific power. The yield of tar is normal, and that of ammonia is in all cases about 50 per cent. higher than with other systems of setting, even with Saar coal which, it is well known, produces very little ammonia.

There is very little to be said on the construction of the setting of eighteen retorts. It is exactly on the same lines as the setting of twelve vertical retorts, and has the same dimensions as the latter; but three retorts are placed in a row instead of only two as in the setting of twelve retorts, as may be seen from the illustrations accompanying Mr. Körting's paper and on p. 168.

Before concluding his observations, however, the author would briefly refer to two remarks on vertical retorts in general which were made at a meeting of English gas engineers. The reference is to Mr. Alfred T. Harris's paper read before the Midland Association of Gas Managers on March 3. [See "JOURNAL" for March 8, 1910, p. 659.] The remarks do not relate to the results of experience, but are conjectures which the author would like to correct. Mr. Harris is of opinion that the gas in vertical retorts is under a higher pressure than in retorts set otherwise than vertical, and that consequently the deposition of scurf is favoured in the former. Theoretically, however, this assumption is not enable, and practically is without support. A somewhat higher pressure than the normal exists only in the first hours of carbonization. At this period the inner wall of the retort is, however, greatly cooled by direct contact with the wet cold coal, and is least adapted at that time for decomposing the gas. The pressure in the retort soon diminishes, and falls to that which is shown by the dip or seal. Apart, however, from this fact, the pressures in question are relatively small, and at the most are only some hundredth part of an atmosphere, and are therefore not such as to affect the primary or secondary phenomena of gasification. Further also the gasification results obtained in England with vertical retorts (and quoted by Mr. Harris) expressly contradict his contention. The vertical retort gas is shown to have a higher calorific value and a higher illuminating power than gas from other retorts. If there were practically extensive formation of scurf in vertical retorts through the decomposition of the hydrocarbons, the gas made in these retorts would be much inferior. On tabulating the figures given by Mr. Harris in the cases in which he states the calorific value of the gas, and calculating therefrom the calorific valuation figure for the yield of gas per ton of coal (*i.e.*, the product of the make and the calorific power of the gas), comparative figures are obtained which are shown in Table III. Mr. Harris states in most cases the net calorific power of the gas, which is not usual in Germany. Consequently the author has worked on the gross calorific power—assumed to be 10 per cent. higher than the net calorific power given by Mr. Harris. These figures show that the coal is utilized to the best purpose in Dessau vertical retorts, which yield 7,667,470 B.Th.U. in the form of gas per ton of coal carbonized. The other systems are at least 4 per cent. behind this quantity.

Mr. Harris further contends that the vertical retorts are not adapted for frequent putting in and out of use. Practice, however, has proved the contrary—namely, that vertical retorts with judicious handling have a greater life than horizontal and inclined retorts. With the latter, a working life of 1000 days is regarded as quite satisfactory; but even this durability is found illusory, since it is not ordinarily taken into account that the retorts have been repaired many times, and finally consist only of patched pieces. The author's experiences with vertical retorts are far more favourable. At the Oberspree (Berlin) works, the vertical retort-settings have been at work since January, 1907, and some of them have had 1200 days under fire uninterruptedly without any patching. And their condition leads to the hope that they will stand 1500 days under fire. Some of the other vertical retort settings were frequently put out of use—one setting as many as sixty times—because the output of gas from the Oberspree works varies greatly and the holder accommodation is small. These settings are perfectly sound and are in need of no repair. Equally favourable experiences have been obtained at the Mariendorf works, where the first bench of vertical retort-settings has been in use for two-and-a-half years and so has been under fire for 900 days; and still no term can yet be fixed for their becoming unfit for further work.

The author would also observe that step-grates in place of simple grates have been adopted in the producers with advantage. The work at the producers has thereby been considerably relieved, as clinkering with temporary grate-bars is no longer necessary. An arrangement has also been hit upon which reduces to a minimum the accumulation of thick tar in the hydraulic main. The gas leaving the latter is cooled immediately over it, and the tar which condenses (as well as the liquor) flows back through the hydraulic main. The asphalt-like constituents are thus dissolved; and the hydraulic main only needs clearing at rare intervals—say once in three weeks.

The author hopes that his observations will lead to the conviction that the setting of eighteen vertical retorts is not a haphazard production. It came into being on the strength of the experience gained by failures in trials made with vertical chambers; and it has fulfilled all the requirements which were laid down as essential

prior to its construction. The bed of eighteen vertical retorts ought, therefore, to be acclaimed as marking a great step forward in the development of settings for the production of gas.

SIGNIFICANCE OF PRIMARY AND SECONDARY AIR SUPPLIES IN GAS-FIRED RETORT-SETTINGS.

The following is an abstract translation of an article by Dr. R. Geipert, one of the Engineers at the works of the Imperial Continental Gas Association in Berlin, published in a recent issue of the "Journal für Gasbeleuchtung."

Views on this subject are frequently expressed in conversation and in technical literature which do not accord with practical observations, and contribute to obscure a simple subject. The primary and secondary air supplies are introduced into a furnace through the draught of the chimney; and the heating is effected through a quantity of fuel gas, corresponding to the amount of primary air, being formed in the producer, which gas is burnt by means of the secondary air in the furnace chamber round the retorts. The theory of the process has been discussed by Dr. H. Bunte in 1878, and by him and others subsequently; and it has been shown that it is extremely important, for the sake of economy of fuel, that neither the fuel gas nor the secondary air should be in appreciable excess. Excess of fuel gas is specially disadvantageous. For instance, the author calculates that if the chimney gases contain 18 per cent. of carbonic acid and 3 per cent. of carbonic oxide, there will be a loss of heat equivalent to 14.3 per cent. of the fuel consumed. On the other hand, if the chimney gases contain 18 per cent. of carbonic acid and an excess of oxygen or air, the loss of heat is equivalent to only 4 per cent. of the fuel consumed. The technical problem is commonly to supply a constant quantity of heat in a furnace, or to increase or diminish the quantity of heat supplied according to the temperature required in the furnace. It is generally recommended, quite wrongly, that this object should be attained by keeping the position of the primary air damper unaltered, and controlling the heat supplied by regulation of the secondary air and the draught. As a fact, a constant supply of heat in unit time is attained by leaving the secondary air inlet and the draught unaltered. The draught and the composition of the fuel gas and the chimney gas remaining the same, the secondary air always passes through the furnace in the same conditions. It meets with the same resistance constantly, and its quantity depends solely on the size of the secondary air inlet. The primary air on the other hand meets with constantly varying conditions. The position of the primary air damper does not settle the quantity. The flow of primary air through the producer is affected by clinker and the size of the coke used as fuel, so that the greater the resistance the smaller is the quantity of primary air, and consequently of fuel gas produced, if the position of the damper remains unchanged.

Having regard to these facts, it may be stated that if the secondary air inlet and the draught are unaltered, the quantity of primary air will remain constant, provided that with uniform composition of the fuel gas the sum of the resistance in the producer and at the primary air inlet remains the same. This requirement can easily be satisfied in working by opening the primary air damper, as the amount of clinker on the grate increases to such an extent that the chimney gases have the theoretically correct composition. The ratio of secondary air to primary air will then remain as desired. It may appear difficult to carry this out; but in actual working it is very simple. It is well known that the blue flame of carbonic oxide, which is the most important constituent of producer gas, is observable even when traces of it only are present. If there is a little carbonic oxide in the flue gases, the admission of a little air through a sight-hole into the passages of the regenerator will result in the characteristic blue flame of this gas being produced. The primary air damper is then closed so far as is necessary to get rid of the blue colour of the flame. This will ensure the flue gases containing from 18 to 20 per cent. of carbonic acid. The simple working rule for obtaining the constant amount of heat, and uniform temperature of the setting in normal working, is, therefore, to keep the secondary air inlet unaltered and to set the primary air supply at frequent intervals, so as to obtain the proper composition of the flue gases. The draught, determined in the lowest passage of the regenerator shortly before the chimney-valve, should be kept constant.

If, on the other hand, the primary air inlet is kept constant, the heat introduced into the furnace must become smaller as the clinker in the producer increases in amount. The secondary air supply would then have to be checked in order to avoid a large excess of air in the flue gases. The draught would thereupon have to be increased to maintain the normal temperature of the setting. With the constantly varying resistance of the producer, a resetting of the dampers would be constantly required. It becomes practically impossible in this way to maintain a constant supply of heat to the setting. If, however, the secondary air and the draught are kept constant, a proper setting of the primary air supply in given conditions guarantees the required quantity of heat and uniform temperature in the setting. If the temperature in the setting, as determined by observations with Seger cones or a pyrometer, is found to vary through changes in the carbonizing conditions or other causes, it may be conveniently set right by altering the draught to correspond.

A USEFUL TRADE SHOW-ROOM.

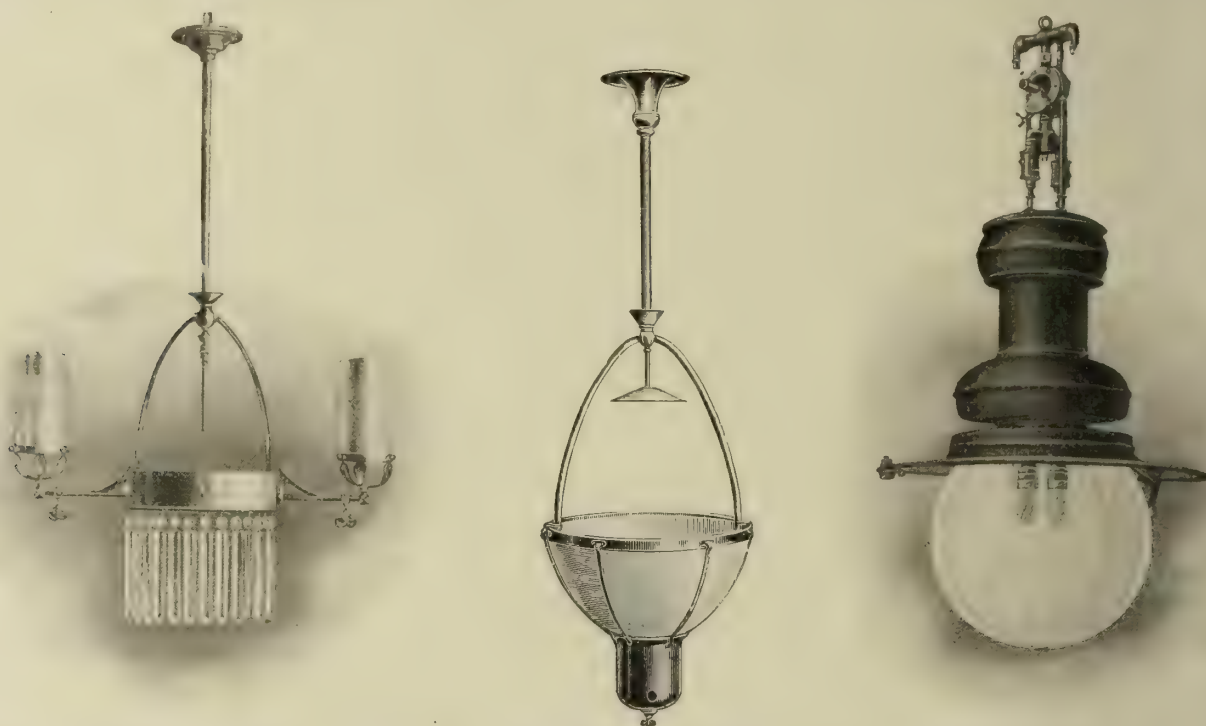
Gas-Lighting Appliances for all Purposes.

THOSE engaged in commerce in these highly competitive days find it increasingly necessary to shape their methods on novel lines, and to do all possible to meet the convenience of those who constitute the buyers of their particular commodities. Mr. Julius Norden, at the large show-room of his firm, at 45, Farringdon Street, E.C., is just now engaged carrying out a scheme which he terms a "permanent exhibition" of gas-lighting appliances. His arrangements are well under way; and, when completed, gas and illuminating engineers will be able to inspect, in actual working order, within the one large show-room, high-pressure and ordinary pressure gas lighting, acetylene and air-gas lighting, portable incandescent lamps using methylated spirit and petrol, and special and new designs of fittings for use with any one of the systems. Town gas, of course, will take precedence in the display; but, as Mr. Norden rightly says, there are in the country numerous places, and important houses, factories, and mills, to which the town-gas mains have not penetrated, and to which it would not pay to carry them. But the gas and illuminating engineer has to make provision for them. The self-generating gas-plants enable this to be done, though not so conveniently as by town gas, in a fairly economical way. This is Mr. Norden's reason for extending his firm's business to all branches of gas lighting, and for arranging for working installations of various systems in the one show-room, so that clients and prospective customers may have every opportunity of judging of their capabilities and efficiencies, in comfortable surroundings.

For high-pressure gas lighting, Mr. Norden has adopted in his

display the Pharos light. This light is well known to readers;* and it will be remembered that (though since improved in details) it rendered an excellent account of itself at the Earl's Court Exhibition. It will be recollected also that one method of working the system is by providing for the supply of air to the lamps at high pressure; the gas supply remaining at ordinary district pressure. The air is conveyed to the lamps in the show-room by pipes painted red, and the gas by pipes painted stone colour. Some of the lamps are arranged so that, when the compressor is not at work, they can be run simply on the ordinary low-pressure gas; others are fixed so that (with a pilot light running from the ordinary gas supply) the lamps are lighted and extinguished by the mere starting and stopping of the air-compressor. The statement indicates the large scope and conveniences of the system. Some people do not like the gas itself under high-pressure, entertaining a notion that, should there be any leakage, the danger is greater with high-pressure than with low-pressure gas. The Pharos light, with the air only under pressure—quite apart from the question of efficiency—meets the views of such people. The simple arrangement, too, whereby, through the high-pressure air supply, is effected the opening and closing of the main gas supply to lamps, at any distance and to any number of lamps, also has its attractions and conveniences, among which are the saving of labour and facility of immediately lighting and extinguishing at will to meet any requirement or emergency. The lamps are likewise made for lighting and extinguishing in the ordinary way.

In one corner of the show-room is the compact air-compressing plant, occupying but small space, and capable of much work. The motor used in this installation is a $\frac{1}{4}$ -horse power electric one; but any other form of motive power can be employed. In the basement-store under the show-room, one is shown where the



Interior Lamp for High-Pressure Lighting, with Two Ordinary Pressure Incandescent Gas-Burners at Sides.

Interior Lamp for "Half-Direct" High-Pressure Lighting.

Outdoor Lamp for Pharos High-Pressure Lighting, with Pressure Lighting and Extinguishing Arrangement at Top.

air is taken in through a filtering arrangement, in order that the compressed air supplied to the lamps may be absolutely free from extraneous matter. The pressure produced is equal to 51 to 55 inches of water. The compressed air and ordinary pressure gas mix in the burner or burners of the lamps. The burners and lamps are made for as low a light as 75-candle power up to three-burner lamps giving a light of 4500-candle power. The use of distance lighters with the high-power lamps is illustrated in the installation of three lamps outside the premises. There is a three-mantle (inverted) lamp of 4500-candle power, and two two-mantle (inverted) ones of 2000-candle power each; and the ease of lighting and extinguishing, by merely setting the compressor electric motor to work, is strikingly demonstrated. At night time these lamps make a brilliant display outside the premises. Inside the window are 1000 and 500 candle power lamps illustrating high-power interior lighting. One of these is surrounded by a screen of long crystals, and looks particularly effective; the other has the light enclosed in an ordinary opal globe, with wire protection. Inside the show-room is a 500-candle power lamp, containing an upright burner, with a large opal hemispherical globe at bottom, by means of which the light is largely reflected from the ceiling, and a soft and well-diffused illumination is obtained. This illustrates what is termed "half-direct lighting." Another lamp of more imposing characteristics, and with a long crystal screen around the high-power centre light, has attached to the gas-supply arms (for use with the ordinary pressure gas, and without the compressed air) two inverted lamps. The effect when all three are alight is exceedingly

pleasing; but the small lamps can be used independently of the high-power light, or *vice versa*, at will. A few words as to the efficiency of the Pharos light (which, it should be explained in passing, has merely been adopted by Mr. Norden as the system of high-pressure lighting that he, as a lighting engineer, specially advocates), the mixture of compressed air and ordinary pressure gas is in the proportions of $1\frac{1}{2}$ to 1; and it may be noted that any increase of the pressure of the compressed air does not cause any change in the pressure of the gas. The highest efficiency that has been obtained with the light is 84 Hefner units per cubic foot of gas; but the guarantee is 70 candles. Of course, it will be understood that the system is equally adaptable to the compression of gas as of air.

Connected with this plant, there is also illustrated the burning-off of the uncollodionized mantles, the use of which is preferred for the Pharos lights, owing to their increased durability. The soft stockings are first tied to special metal rings, which are supplied with the burners; and are then attached by bayonet joint (as in the lamps themselves) to the burning-off burners. The first process is to burn off the stockings with a bunsen flame by a hand burner. Then the air-compressing machine is started; and, by the aid of the flame formed by the mixed ordinary pressure gas and compressed air, the mantle is shaped precisely to the form required for use on the burners in the lamps. The whole operation only takes a few minutes. From this description, it

* In the "JOURNAL" for July 6 last year (p. 32), some views were given of this arrangement as applied to outdoor purposes.

It will be seen that this installation of the Pharos system is very complete for demonstration purposes, and that here the intending purchaser can see precisely what he is going to buy, the simple work entailed, and the efficiency of the lamps.

Next we are introduced to a very simple form of distance lighter—the invention of two German Engineers, Herr von Ahlborn and Herr Schnorrenberg. The name given to this new distance lighter—"Gascho"—has been concocted from the first letters in the names of the joint inventors. The object of the apparatus is to enable street lamps, or any other large installation of lamps, to be lighted and extinguished from a central station, by a momentary increase of pressure, which need not (as demonstrated) exceed $\frac{1}{8}$ inch. The simplicity of the mechanism, its outstanding commendation; and, as in almost all things mechanical, practical simplicity is a sure way to efficiency in operation. A very brief examination shows the ingenuity and the modest character of the apparatus. In the show-room, arrangements are provided, even to pressure-gauge, so that there can be an immediate testing of the operation of the mechanism, its efficiency, and its applicability to single or cluster burners, and to partial lighting or extinction. The invention, in fact, is amenable to all requirements in this last-named respect. Below the burner we have a flexible diaphragm valve, connected with the upper part of which is a small arm which engages with a cog-wheel. The teeth of it are cut to meet the requirements connected with the lighting and extinguishing of the lamps. But taking the lighting and extinguishing of single burners, the teeth of the cog-wheel are cut quite distinct. On the pressure of the gas being increased to the extent already mentioned, the valve rises, the arm engaging with the cog-wheel moves it, and the gas supply is opened—the gas at the burner being ignited by a pilot light, fed with gas by a ranch pipe from below the operating mechanism. When the lights have to be extinguished, similar slight increase of pressure moves the cog-wheel another movement, and shuts off the gas supply. Any necessary regulation of the diaphragm valve, in the event of a higher pressure being required, is obtained by the use of small discs, each representing $\frac{1}{4}$ -inch pressure. Over the apparatus a white enamelled cap is placed, which serves the dual purpose of protector and reflector. The whole mechanism is outside the path of the gas supply; and thus no trouble can arise from the effects of gas on the operating parts. The system can be applied to either inverted or upright burners; the apparatus being supplied ready for screwing on to a $\frac{3}{4}$ or $\frac{1}{2}$ inch supply-pipe. Reverting to the point as to the pressure required, supposing the ordinary pressure is 2 inches, all that is needed at dusk for lighting up is a temporary pressure of $2\frac{1}{8}$ inches. This extra pressure from the gas-works is only needed for one to three minutes, according to the distance of the extreme lamps; and merely the same extra pressure is requisite for extinguishing the lamps at the end of the lighting hours. Neither a lower nor a higher pressure will hinder the operation of the mechanism in any way. It is necessary that the burners and bye-pass should be fitted with a gas-regulating screw for adjustment purposes.

Another novelty on view is a patent method for rapidly glazing and cleaning lamps; and there are two forms of doing the work. The lamps are circular; and the glasses used are semi-circular. In one lamp, there are two vertical ribs opposite each other; and these are grooved for the reception of the glasses. The bottom of the lamp is made with two flaps hinged to a central bar below the two uprights. These flaps are also grooved near their periphery. They are each held up in position, and let down, by a small lever. By letting down the flaps, the glasses can be slid into position, and the closing of the flaps completely secures them. There is no necessity to point the several conveniences of this simple means of maintaining lamps with an economy of labour. In the other form, the bottom of the lamp is, instead of being hinged, completely raised and lowered by means of a support with spiral movement.

The acetylene and air-gas plants have yet to be installed; but there are on view a 60-candle methylated spirit incandescent lamp, and a 50-candle petrol incandescent one. The former is a little more expensive than the latter; but it is certainly more efficient. Some beautiful pendant fittings of French design are on view, as well as reading and desk lamps. Arrangements have also been made for a display of other modern and novel types of fitting, together with mantles for all purposes. Altogether, it may already be said that the firm's "permanent exhibition" of gas-lighting systems and goods will be worth inspection; and it will be, as is intended, a convenience to those who are investigating merits for the purpose of purchasing that which will best suit their requirements.

The London and Southern District Junior Gas Association will hold a meeting next Friday, at the Cripple Gate Institute, Golden Lane, E.C., when Mr. J. G. Clark, of the Gaslight and Coke Company, will read a paper entitled "Some Practical Aspects of Radiation, having Reference to Gas Lighting and Heating."

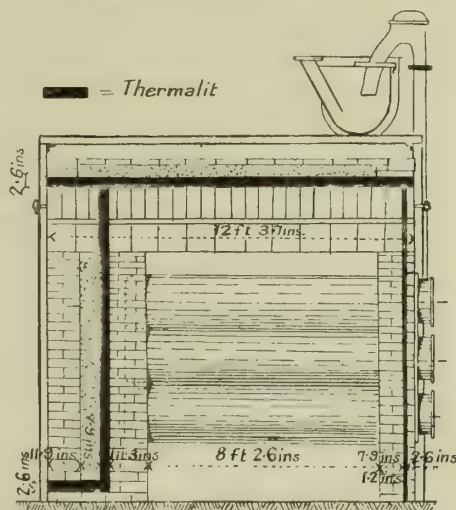
Eastern Counties Gas Managers' Association.—We learn from the Hon. Secretary (Mr. T. A. Guyatt, of Ely) that, as decided last September, the spring meeting of the Association will take place at Yarmouth, and that it will be held on Friday and Saturday, the 29th and 30th inst. The technical portion of the proceedings will comprise discussions on "Purification" and "Free Maintenance;" and on the second day of the meeting there will be a drive to the Yarmouth Water-Works.

PRICES OF ELECTRIC LAMPS.

It was at one time thought that the depression of metallic filament lamp prices by the German makers would not affect prices in this country, and that the manufacturers and wholesale dealers here would be able to continue for some time yet without lowering their rates of charge. But it is not so. Prices have been reduced. As to the cause, we care nothing. But it is solemnly averred that the reduction at this particular time by the leading makers in this country is in pursuance of a long-formed policy. The coincidence is striking. But after all, the reductions have not got attractively low enough; and, such as they are, they have not been made in the case of all lamps. Various, 3d. and 6d. is the extent of the reduction; and low-voltage lamps are now priced at about 2s. 9d. and thereabouts, while high-voltage ones are marked at 3s. 9d. and 4s. The General Electric Company, the makers of the Osram lamp, led the way in this price-cutting business. Premeditation on the subject—a long while before the German break in prices—has (readers may believe this or not as they will) brought this about; and the sole and only object of this profit-sacrificing Company has been to assist the electrical industry "in its fight against gas." This recognition of the difficulties of the electricity-supply industry in this fight and the voluntary leg-up on the part of the lamp manufacturers, deserve reward. These good Samaritans have, however, made a bold advertisement of their altruistic proceeding; and, on cool examination, some little doubt is raised as to whether the pressure of competitors should not take precedence of self-sacrifice among the animating causes of the degradation of prices. The smaller competitors who have been operating against the larger ones, and whose number is sufficient to make itself seriously felt by the larger makers, have not been lowering their prices so hastily. Before Mr. Asquith, galled by his tormentors in the House, trotted out the now famous phrase "wait and see," these smaller competitors had adopted it as their policy in respect of this price-cutting. But prices are moving down very cautiously, as a metallic filament lamp cannot be made so cheaply as a carbon filament one; and the margin between cost and retail price, with middlemen to have a profitable look-in, will not stand much paring down. Still such as the reductions are, there must be a song as to their helpfulness in the fight with gas.

HEAT INSULATION OF RETORT-SETTINGS.

THE use of "Thermalit"—a fire-resisting preparation of kieselguhr—for the insulation of retort-settings, has already been referred to in the "JOURNAL" (Vol. CIX., p. 789). The method of applying it to an ordinary setting adopted by Herr Arnold, the Superintendent of the Gaudenzdorf Gas-Works, Vienna, is shown by the accompanying cross sectional view of a setting.



The layer of "Thermalit" which covers the crown of the arch is 65 mm., or about 2.6 inches, thick, as is also the layer at the back of the setting. The layer of "Thermalit" by which the face of the setting is insulated is only 30 mm. (1.2 inches) thick. The dimensions of the walls of the setting are stated on the figure. The insulation of the crown of the arch is said to be beneficial in protecting the hydraulic main and dip-pipes from the heat of the setting, while the insulation of the face not only protects the stokers but also greatly diminishes stoppages of the ascension pipes.

It was mentioned in the "JOURNAL" a few weeks ago that Mr. P. C. Holmes Hunt, the Engineer of the Melbourne Metropolitan Gas Company, would pay a visit to England this summer. We learn that he left Melbourne on Monday last week, will travel *via* Canada, and is due in London towards the end of May.

A DYNAMITED GASHOLDER ABLAZE.

By WILLIAM KEY,

Formerly Manager of the Tradeston Gas-Works, Glasgow.

NEVER before had happened so singular an occurrence as that which is the subject of the present article, which, while destroying a gasholder, caused little danger to anyone, though afterwards there were great possibilities, which might have resulted in something more in keeping with the original intention, of bringing about great devastation and loss of many lives. The incident was so full of interesting, beautiful, and rarely-seen phenomena, that the author is tempted to place it on record, affording as it does another illustration of the fact, and further establishing the contention that, so far as gas stored within a gasholder—even under exceptional and violently destructive conditions—is concerned, there is no cause for alarm to those living or working in its proximity.

At the time of the occurrence in question, day and night shifts, each of twelve hours' duration, were in vogue; and the writer accustomed himself to spending some time on the works during the night—finding this to be an advantage, as he was frequently able to observe things which might escape notice during the busier hours of the day. On such visits, among other details, tests for illuminating power were carried out and recorded in the book kept for the purpose within the photometer-room, together with the date and hour of so doing; and in consequence of these tests the working conditions were often altered to meet requirements. The room was in the same yard as the gasholder mentioned in my former article (see *ante*, p. 30). The yard level was probably 40 feet above that of the general works, and was separated from them by the property of a Railway Company having numerous sidings occupying a width of probably 150 yards; but at the narrower portion communication was provided by bridge for cart and other traffic to the higher yard.

On this particular and eventful night, the author, after leaving the works, made tests in the photometer-room—the hour recorded being 9.50 p.m. He afterwards walked home, a distance of fully three-quarters of a mile. At 10.10 p.m., while he was sitting at the fireside, a concentrated, loud, and sharp detonation and concussion shook the house. Rushing to the door, he beheld 500,000 or 600,000 cubic feet of gas, forming an immense, gorgeous, and brilliantly illuminated cloud, gracefully and harmlessly rising in the atmosphere on a night otherwise very dark. Portions seemed to be boiling outwards from the mass in bright yellow exuberance of flame, like great masses of soft white steam as seen during sunlight.

Hurrying to a cab, the author was soon being swiftly carried back to the gas-works, only stopping to take up the Manager of the pipe-laying department. But as he seemed to be completely petrified, the author drove on without him. Arriving at the collapsed holder, he at once sent the night attendant to open the inlets and outlets of other holders; giving him four minutes for the first valve to be opened, telling him that he (the writer) would then shut the 24-inch inlet of the damaged holder, and immediately afterwards its outlet. Finding that immense flames still rose in the air from holes in the crown of the holder, the author decided to flood the inlet and outlet pipes by fire hose-pipe, placing the director into holes through the covers from which the thermometers had been withdrawn. These operations were over in a few minutes. Being anxious to learn in what condition the general works were lower down, the author hurried thither, but was intercepted by Mr. B., the then Deputy Town Clerk, who, leaving the crowd, desired to learn where the author was going, thinking all was not yet safe with the holder. But on being assured on this point, he took the author's arm, and accompanied him to the purifier-house, which had to be passed through in order to ascertain how the valves of the holders beyond had been left by the messenger. Suddenly leaving Mr. B., the author ran to the nearest holder and opened the inlet-valve—and not a moment too soon. On approaching the purifiers, he was horrified to find that his instructions as to opening the holder valves had not been carried out, and that the water in the lutes of all the purifiers was about to overflow—in fact, in some positions it was already overflowing. There were 500 retorts in active operation; and the conclusion came to was that the attendant had lost his head by fright, and had disappeared without carrying out his instructions. In a few seconds more the pressure of gas would have blown the seals of every purifier cover. Had another minute elapsed ere the author reached the purifiers, the atmosphere between the retort-house and the gasholders would have been charged with a highly explosive mixture of gas and air, which would have been fired at the lights of the exhauster-house or at the furnaces of the steam-boilers; and probably no one would have survived who could have told exactly how this second explosion had occurred, while the whole of the remaining works and gasholders would have been utterly destroyed.

Returning to the wrecked gasholder, the rise of the crown of which extended to about 11 or 12 feet above the ground level, the author and others witnessed the unusual sight of great roaring flames, 9 or 10 feet long, burning in an atmosphere of pure gas within the crown of the holder without igniting more of it than the volume of entering air sufficed to keep in the flame. The flames clung to the under side of the rising sheeting in the direction of the crown plates, rendering these brilliantly red hot; but they

were extinguished by the gas at that length of flame for want of air. The holes would probably be 2 feet long by 10 inches in line lengthwise from the centre of the crown to the curb. Thus it was clearly demonstrated that even a powerful flame could not exist among the gas left in the crown of the holder, except for so far as the supply of sufficient air to support combustion allowed it to do so. The inlet and outlet having been properly sealed by water, huge flames still continued to burn to a considerable height from holes near the crown plate of the roof of the holder—probably caused by gas produced from spirit on the surface of the water in the gasholder by heat from the flames already mentioned and burning within the holder.

Experts declared that 5 lbs. of dynamite had been detonated on this occasion, whereby an opening 40 ft. by 30 ft. was made in the side of the holder; and through the sudden removal of this amount of surface of the side sheeting, the whole of the gaseous contents of the holder had escaped. About twelve months afterwards, the authors of this destruction were discovered in council within an enclosed railway arch; and from them it was learned that they had expected that on their charge being detonated the contents also of the holder would explode as if it were dynamite, and thus level all the houses south of the river, and kill most of their inhabitants. But no person was hurt. The damage done was simply loss of gas and the cost of replacing broken ties, purlins, and sheeting.

ANOTHER INCLINED CHAMBER SETTING.

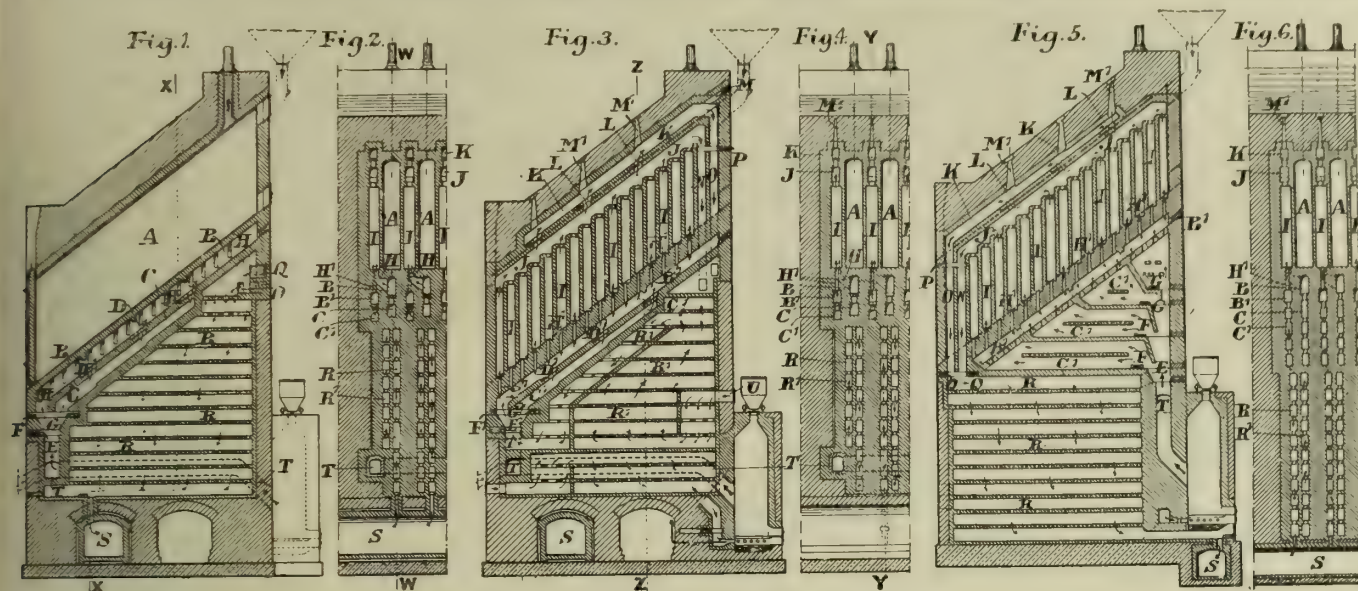
In the "JOURNAL" for the 29th ult. (p. 874), we gave an illustrated description of two chamber settings patented in France by the Ofenbau Gesellschaft. Another setting of similar character has been devised by Herr Wilhelm Müller, who has also obtained a patent for it in that country. The following are its principal features.

The object of the inventor is the production of an arrangement susceptible of being regulated for the introduction and distribution of the gases and air in gas-furnaces and coke-ovens, particularly in inclined chamber settings directly in front of which the coke generator is constructed. The invention consists substantially in introducing the gases and air in proportions exactly determined for four or five heating channels, and in conveying separately to the outside the same quantities of discharge gas, so that in all parts of the walls an even heat (which can be regulated), and consequently a more rapid production of coke, are ensured. In the methods and constructions known up to now, the heating gases and the air are introduced from only one passage serving for all the channels, and the products of combustion are likewise discharged by a single channel only, so that the working of the setting is rather uncertain. It is claimed for the invention that by it these disadvantages are remedied.

The accompanying illustrations (p. 173) show an inclined chamber setting constructed in accordance with the patent. Fig. 1 is a longitudinal section of the coke chamber on the line W of fig. 2, which is a corresponding transverse section on the line X of fig. 1; figs. 3 and 5 are longitudinal sections of the heating surface on the line Y of fig. 4; and figs. 4 and 6 are corresponding transverse sections on the line Z of fig. 3.

The coal is charged into the setting by means of the funnel-shaped shoot shown at the top, from which it falls by its own weight into the chamber A. Below this and the heating wall is the principal distributing channel B B¹, having a regulating channel C C¹ beneath. The latter channel communicates with the others by means of the openings D D¹, which may be regulated from the outside of the setting by means of slides. At the entrance to the two channels B and C, there is the principal slide E E¹; so that the passage of the gases or the air may be entirely or partially cut off. The slides F F¹ or G G¹, which are situated above, serve to contract, in accordance with requirements, the entrance to the principal channel B B¹ on the regulating channel C C¹. From the former, openings H H¹ lead to the passages I, which end above in the channel J, above which there is a second channel K in communication with the lower one by means of openings L, capable of regulation by means of slides accessible through the side opening M, as well as from above through M¹. At their upper extremity, the two channels J and K are connected with the vertical channels N and O, which may in turn be regulated by the slides P Q. The conduits N and O end in the regenerator R, connected at its lower part with the flue S. The regenerator is divided in the well-known manner into two halves, one of which, R, is intended for the discharge gases, and the other, R¹, serves for the re-heating of the air.

The action of the setting is as follows: The heating gases coming from the generator enter at T, and are regulated by the slides E; they then pass into the principal channel B and the regulating channel C, separated by a partition, after having been equally regulated with respect to quantity by the slides F G before their entrance into the channels. The other openings D, governed by slides, are intended to distribute the ingoing gases in a group of four or five heating flues; the principal channel B serving as a compensator. The air required for combustion is introduced at U, passes through the regenerator R¹, and is there re-heated, accumulates at the lower part at T¹, and then takes the same course as the heating gases. The regulation of the quantity sent



in is effected in the manner described. It is therefore possible at all times to regulate the quantity of gas and air necessary for a group of four or five flues. From the channel B the heating gas passes into the flue I through the openings H, and the air arrives there from the channel B¹ through the openings H¹. This inflow of gas and air takes place at the floor level of the furnace, and both are consumed with an upward draught, and escape in the channel J through the openings which are contracted in the upper part of the heating channel. Just as the inflow of the gas and air is regulated, so must the discharge gases be regulated in equal quantities, in order that no obstruction may take place in the channel J. With this object, there is arranged in the upper part a similar system of channels to that below, so that the quantities of gas and air introduced at the bottom of a group of four or five channels may be regulated and conveyed away at the top by means of slides, without interfering with the draught of the neighbouring parts by an accumulation of discharge gases in the channel J. From the channels J and K the gases pass through the vertical conduits N O (which can be regulated by the slides P Q) into the regenerator R, where the heat inherent in these gases is transmitted to the fire-bars, and heats again the air conveyed into the compartment R¹. The waste heat passes by the channel S into the chimney, and escapes into the air.

A NEW UNIVERSAL GAS ANALYSIS APPARATUS.

THE frequent introduction of a new pattern of apparatus for the analysis of manufactured gas and of waste gases is doubtless an indication of the wider use which is being made of analytical methods of control in works manufacturing gas for lighting and heating purposes. The "Chemiker Zeitung," in expressing this opinion in a recent issue, gave a description of a new form of apparatus answering all the requirements of the works' analyst, and of very great simplicity in use. The following is an abridged translation: The apparatus is the patent in Germany of Herren Fieber and Rohrbeck; and its special advantages consist in the fact that all rubber connections are dispensed with, and that the treatment and collection of the gas are controlled by a single

Calorific Value of Gas in Wisconsin Cities.

Our readers may remember that a calorific power standard for gas has been adopted in Wisconsin, to the exclusion of one for illuminating value. At the recent meeting of the Illinois Gas Association, particulars of a number of tests in various cities were given in a short paper by Messrs. C. F. Burgess and W. J. Huddle; and one of the speakers in the discussion (Mr. W. E. Steinwedell) stated that the adoption of the new system was a "decided step in advance." He gave the following figures as the averages of the results (B.Th.U.) tabulated in the paper:—

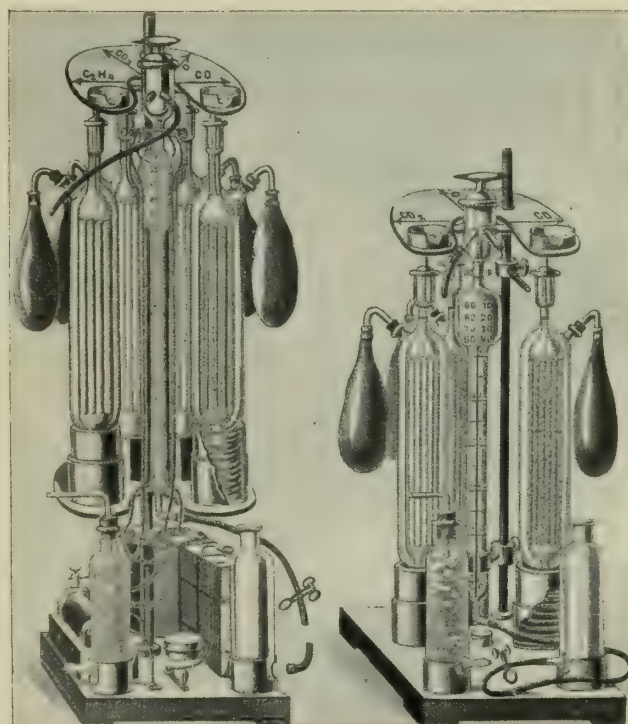
| | Coal Gas. | Water Gas. |
|---|-----------|------------|
| Highest average heat value in any one place | 666 | 673 |
| Lowest | 549 | 545 |
| Average heat value in all plants | 619 | 623 |

Mr. Steinwedell added that the ruling of the Railroad Commission as to the adoption of the calorific standard was most fitting and just, and ensured the public the best of service.

Manchester and District Junior Gas Association.—On Saturday, the 30th inst., at the Victoria University, Professor Harold B. Dixon, M.A., F.R.S., will deliver a second lecture to the Manchester and District Junior Gas Association on the subject of "The Explosion Wave in Gases." A report of the first lecture appeared in last week's "JOURNAL," p. 99.

Gas Undertakings Returns.—In the House of Commons, on Monday last week, the usual returns relating to the authorized gas undertakings of the United Kingdom were ordered; those relating to the Companies for the year ended Dec. 31, 1909, and in the case of the Local Authorities for the year ended the 31st ult. Last year the returns for 1908 and 1908-9 respectively were not ordered till the 4th of November; and they were issued just a month later.

Association of Water Engineers.—The Council of the Association of Water Engineers have awarded the following premiums (to take the form of books or instruments) for papers submitted last year: The President's premium, value £10, to Mr. S. R. Lowcock, M.Inst.C.E., for his paper on "Evaporation from Water Surfaces;" and Association premiums of £5 each to Mr. Alfred Towler, M.I.Mech.E., and Mr. Bruce McGregor Gray, Assoc.M.Inst.C.E., for their papers on "Steam-Driven Pumping Plant for Deep Wells and Boreholes" and "The Selby New Water-Works" respectively.



cock. This permits of the measuring burette being connected with the various absorption vessels and with the aspirator for drawing off the gas. Instead of using a rubber tube, each absorption vessel is provided with a capillary tube, which is ground to fit that of the cock; an air-tight junction being obtained by means of a spring which presses the two together. Another feature is that a separate explosion pipette is not employed; the hydrogen and light hydrocarbons being burnt in the measuring burette. The burette is provided with a pair of metallic terminals, connected to a small dry battery so that an explosive mixture of hydrogen and oxygen in the combining proportions can be generated in the burette when required, while a second pair of terminals in conjunction with an induction coil serves for the ignition of such explosive mixtures. Owing to the absence of rubber connections, the results are of a higher degree of accuracy; while the form of the apparatus renders it suitable for transport to any part of a works or system of mains. The apparatus is made in four patterns, the two simplest being for use where it is desired to make estimations only of oxygen and carbon dioxide, a third for the estimation of these two gases and of carbon monoxide and a fourth for a complete analysis.

PLANTINGA'S PRODUCER GAS SYSTEM.

A recent number of the "American Gaslight Journal" abstracts the specification of a United States patent (No. 522,700) granted in February last to Mr. Pierre Plantinga, of Cleveland, Ohio.

The invention relates to apparatus for use in the manufacture of gas—particularly the part which includes means for making producer gas, to be burned for the purpose of producing the heat required for further steps in the process. The object of the inventor is "to obtain a predetermined temperature resulting from the combustion of the producer gas, whereby such temperature may be made constant and the next step in the operation thereby rendered definite."

In the apparatus heretofore used, he points out, the supply of primary and secondary air has been more or less dependent upon weather and other extraneous conditions, which have caused the temperature of the burning producer gas to vary, and so vary the resultant gas product in a deleterious manner. This variation has heretofore been partly overcome by the employment of a high stack for taking off the gases of combustion; and one of the results of the present invention is to eliminate the necessity for a high stack—a material economic advantage.

Fig. 1 is a diagrammatic view of the apparatus suggested—showing a muffle-furnace and a gas-producer in vertical axial section. Fig. 2 is a similar view illustrating a modified form of the invention.

The gas-producer (of the usual form) is provided with two ducts A, for leading the primary air under the grate A¹, thence passing upwardly through the coal bed, and out of the top aperture A².

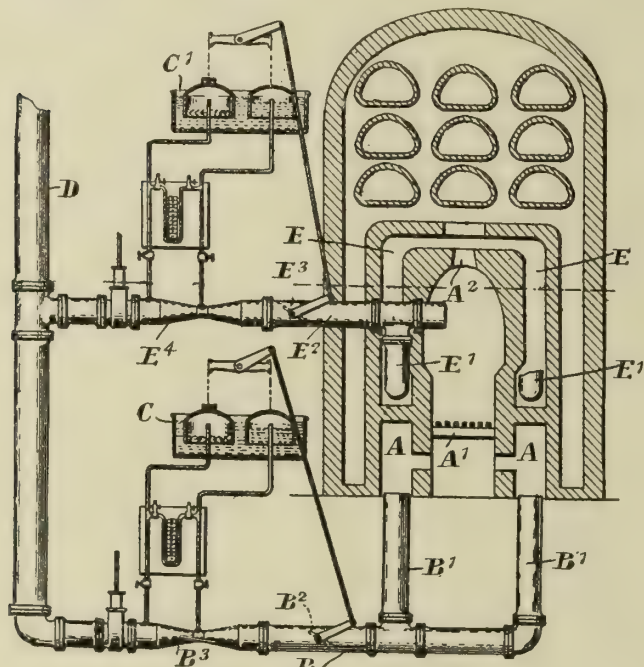


Fig. 1.

structure for conducting away the products of the combustion of the gas. By adjusting the valves B² E³, it will be seen that, "after the quality of the gas and the quantity of air have been predetermined to produce the most economical combustion of the gas, these predetermined conditions may be maintained so as to maintain a constant temperature to which the retorts are subjected."

In the modified form of the apparatus, shown in fig. 2, the automatic feature is omitted, and the device arranged so that it may be manipulated by hand. In this case, the pressure-operated devices are omitted, as well as the automatically operated valves B² E³. In place of these latter, two hand-operated valves are supplied. The Venturi tubes are connected with pressure-gauges, by means of which the flow of air through the pipes B and E² may be read. By operating the valves, therefore, the predetermined quantity of air may be supplied to the producer and to the tubes B¹ E¹, so as to bring about the conditions above noted. In this case, however, an attendant is required to operate the valves when the corresponding gauge indicates a diminution or increase of the flow.

The patentee claims: (1) In apparatus for use in the manufacture of gas the combination of a gas-producer; means for supplying the primary air to the producer; means for supplying the secondary air to the apparatus; and means for automatically regulating the flow of such secondary air—so as to maintain a flow of constant volume per unit of time past a given point in the secondary air duct. (2) The combination of a gas-producer; means for supplying the primary air to the latter; means for supplying the secondary air to the apparatus; and means for automatically regulating the flow of such primary and secondary air—so as to maintain a flow of a constant volume of air per unit of time past a given point in their respective ducts. (3) The combination of a muffle-furnace; a gas-producer; means for

supplying the primary air to the latter; means for supplying the secondary air to the apparatus; means for regulating the flow of such primary and secondary air; and means for measuring such flow—whereby the flow of air through the primary and secondary air-ducts may be made of a predetermined volume per unit of time past a given point in such ducts respectively.

Two branch air-pipes B¹ are connected with these ducts, and are themselves connected with an air-pipe B, affording a common source of supply for the branch pipes. A diaphragm or valve B² consisting of a transversely placed movable plate, is placed in the pipe B, connected with a pressure device C; the latter being operated by means of a Venturi tube B³ interposed in the pipe B, connected with the pressure-operated device C by tubes. A main D supplies the air to the pipe B. The pressure-operated device is so arranged that a decrease in the volume of air-flow past a given point per unit of time in the pipe B will cause the valve B² to open and permit a larger quantity of air to pass. In this manner, by adjusting the valve B², a constant rate of flow of a predetermined quantity of air through the duct B may be obtained, and therefore supplied to the producer. The latter is furthermore supplied with two ducts E, for leading the secondary air to the point where the producer gas is burned—such air being necessary for proper combustion at this point. The two branch pipes E¹ connect with the ducts E, and are themselves connected with a pipe E², affording a common source of air for both ducts. A valve E³ is provided in the pipe E², and is connected with a second pressure device C¹, operating in the same manner as does the device C; a Venturi tube E⁴ and tubes being provided for this purpose, as will be readily understood. The pipe E² is connected with the common main D. It will therefore be noted that a constant flow of air through the pipe E² may be maintained, and a constant supply of air be delivered at the point where the producer gas is burnt.

Above the producer (and enclosed) are the retorts which are heated by the flame produced by the combustion of the producer gas below. An opening (not shown) is provided in the enclosing

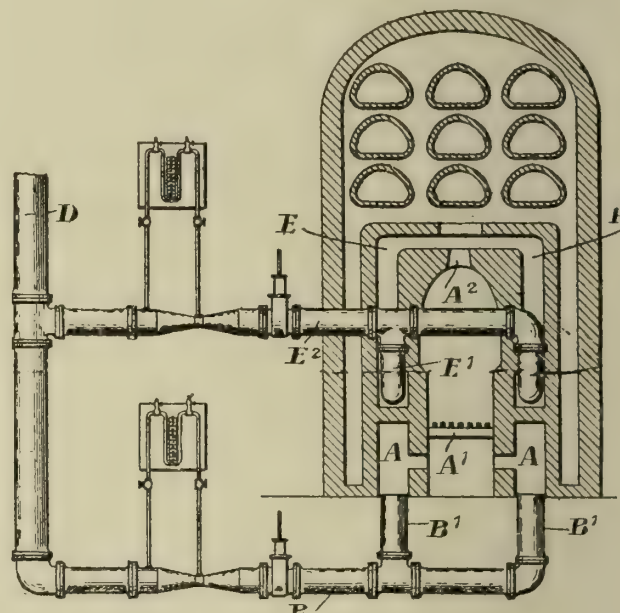


Fig. 2.

supplying the primary air to the latter; means for supplying the secondary air to the apparatus; means for regulating the flow of such primary and secondary air; and means for measuring such flow—whereby the flow of air through the primary and secondary air-ducts may be made of a predetermined volume per unit of time past a given point in such ducts respectively.

Power Transmission by Belts.—At the last meeting of the Junior Institution of Engineers, Mr. R. F. Krall read a paper on this subject. After offering a few observations on belt driving in general, the author proceeded to describe a system of driving by a thin steel belt (the material being specially manufactured and of very high temper) which is being extended in Germany and Belgium. The method of making the joint was illustrated, and an interesting table of results of experiments conducted by Professor Kammerer, of Berlin, at the Charlottenburg University, was given, as also one containing comparative figures relating to power transmission by ropes, leather belts, and steel belts. In considering the advantages of the last named, it was pointed out that, as they do not stretch, the trouble of taking-up is eliminated, and no tension is required to allow for stretching. As compared with leather and fabrics, very much narrower belts can be employed, varying between a third and a tenth of the ordinary width, saving much in cost of installation. Speeds up to 10,000 feet per minute can be employed. Another form of belt driving, in which belts in common use are employed, the invention of Captain Leneveu, a French artillery officer, and known as the "Lenix" system, was also described. Its essential feature was a pulley freely floating on the belt; the pulley being mounted on an arm with adjustable counterweight, this pulley being placed near the belt pulley, and the arm capable of moving about the centre of the belt pulley, or as nearly so as might be conveniently arranged.

MEASUREMENT OF LIGHT AND ILLUMINATION.

At the Meeting of the Illuminating Engineering Society last Thursday—the PRESIDENT (Professor Silvanus Thompson) in the chair—discussion on the above subject was continued; the aspect of the question on this occasion being practically limited to the measurement of illumination. The first part of the discussion was reported in our issue for March 22 (p. 809).

At the outset a communication was presented, but not read, from Dr. W. E. Sumpner on the direct measurement of mean spherical candle power by diffusion methods. In the introduction to the paper, he remarked that the quantity of light emitted by any form of lamp is measured by its spherical candle-power. The determination of this quantity is of commercial importance; and a simple method of making the test is much wanted. The best known direct test is by the use of the Ulbricht globe. This globe no doubt yields good results in practice; but it has some defects which prevent its action from being quite accurate. The author alluded to these sources of error, and then discussed at length whether it is possible to obtain equally good or better results by using, in place of the globe, merely a rectangular box. Concluding the paper he had a few words to say about units. It will, he said, be a pity if the Illuminating Engineering Society help to perpetuate the use of such a cumbersome artificial expression as "mean spherical candle-power." This quantity no doubt represents the output of light from the source; but its value can only be obtained by first of all measuring the output itself. In connection with electrical theory, Oliver Heaviside has declaimed at the irrationality of estimating the output of a source by the flux it produces at a distance. It is still more irrational when the source, as in the case of light, is of such a nature that we have to imagine an artificial mathematical concept styled a "mean spherical" flux, existing no one knows where. In the case of electricity, the rationalizing of the units is now difficult, if not impossible. The international units are already fixed. In regard to light, this is not yet the case, in spite of all the congresses whose deliberations have contributed to leave the subject in its present unsatisfactory state. It is to be hoped, in respect of light, that "rational" units will in the end be adopted; and that the unit of light will refer to the total output of the source, and not to its candle-power in any real or imaginary direction.

Mr. A. P. TROTTER thought the questions that had been circulated gave an excellent lead to the discussion of this subject. The sixth query was, "What are the main qualifications of an illumination photometer for practical work? With what degree of accuracy can the illumination in streets and buildings be measured, and what limits of accuracy should at present be permissible?" The very first qualification one came to had been a matter of keen dispute for certainly eighteen years; and there were still differences of opinion about it. The point was as to whether the surface by which measurement was made should be horizontal or inclined. He claimed that it should be horizontal; the reason being that it enabled one to sum up all the lights under observation. The illumination received must be on something which would take it all, and give it all an equal chance. Therefore, one of the first essentials in illumination was a horizontal test plate or screen, and one which had no obstruction. The second point he thought was that the illumination photometer should be free from glaze and angle errors. The third qualification was that, in an illumination photometer, the portable standard of light should be a good one. There were in use a number of different lamps. The Germans frequently used a benzene lamp. The pentane lamp, too, could be adapted for carrying about. But nowadays most people would take an electric glow lamp. With a benzene lamp, they could only hope it would remain steady throughout an evening. With an electric lamp it was only necessary to light up for twenty or thirty seconds at a time; and the sum of all the work that one had to do in a long evening would not amount to more than half or three-quarters of an hour. But the lamp should be checked before and after, as he had had one or two evenings' work thrown away, on finding a difference of about 15 per cent. between the time he went out and reached home, owing possibly to a loose contact somewhere. The next thing was the range. A great many excellent photometers would work with a range of about 1 to 10; but that really was not enough for most purposes. A range of 4 foot-candles would be; and if one came across a brighter light, a photometer should have some means of increasing the range. But it was necessary to come down to about 200ths of a foot-candle. One of the most important things in street illumination was the minimum, because that was where the dispute would arise in any question as to a contract. A photometer had to be almost at its best at the critical point. Therefore, he thought the instrument should come down to 200ths of a foot-candle; if one could get lower, all the better. But when one came to 100ths of a foot-candle, one could not depend on any great accuracy. The fifth qualification was capability of dealing with coloured lights; and he must confess that he thought the admirable principle of a gradually moving adjustment was about the best. The President in his address referred to the bunsen as a time-honoured and over-rated thing; and he (Mr. Trotter) might apply that to the flicker photometer. The next qualification was portability. Those who had had to do with street illumination, would recognize the advantages of this. He was rather sorry that, in the publication of street illumination

tests, the observers did not give the means. With a bunsen photometer, carefully set up in a street, one could get a reading to 2 per cent., and that, in his opinion, was all it was worth while to do, for street purposes. Gas pressures and voltages varied; and to go to anything below 2 per cent. in street lighting was out of the question. Even in measurements taken every quarter or half hour, variations were obtained. If on repeating a number of tests under the same conditions, in the same position, and with the same lamp, results could be obtained within a range of 5 or 6 per cent.—2½ or 3 per cent. from the mean—the result might be said to be a very good one. Supposing a contract had been made for street lighting with a minimum of 0·1 candle-foot, and a minimum was found of (say) 0·0958, what was to be done? He thought it reasonable to take a fair view of error for street lighting.

Mr. LANCELOT W. WILD spoke of the sensitiveness of photometers. The practice he preferred was to take a series of measurements, first moving the carriage from the left until one ceased to see there was any out-of-balance, then to move the carriage to the right until one again failed to find any out-of-balance, and then to take the difference between the two. These pairs of settings should be repeated again and again at least a dozen times, and the average taken of the different pairs. In this way, he had tested a good many photometers; and he had picked out some of the most notable examples. The results he put under the heading "Insensitiveness of Photometers." There were two columns—one for the equality of brightness, and the other for the flicker principle. Starting with the Joly prism, the equality of brightness was 2·5 per cent.—that was to say, there was 2·5 per cent. between the average of two settings from left to right, and the probable error of any setting would be 1¼ per cent. The fault of the Joly prism was the separation between the two surfaces; if the greatest sensitiveness was to be obtained, the surfaces must be contiguous. As to the Simmance-Abady flicker photometer, the equality of brightness came out to 2·4 per cent. There was the same trouble as with the Joly prism, that the two surfaces were separated by the black line edge of the wheel. When used as a flicker, the sensitiveness was much better—about ½ per cent.; and the black line between the two surfaces was of much less consequence when used as a flicker. Turning to the Whitman sector photometer, used stationary. It was simply one card in front of the other; the observer looking past the one edge to the other. But the fault was that there was a certain amount of raggedness at the edge of the card. The equality of brightness obtained was 2 per cent.; and as a flicker, 1 per cent. With inclined cards, he got the equality of insensitiveness down to 1·2 per cent., using only one eye; when he used two eyes, then he found that one surface would dart out brighter than the other. When he came to the common bunsen, he found the equality of brightness was better viewed one side than when viewed on both sides. Viewed one side, it was 1·2 per cent.; viewed both sides, 1·5 per cent. Then with a special bunsen (38 lb. Ford), viewed one side, the equality of brightness was 0·4 per cent.; used as a flicker, 0·8 per cent. Viewed both sides, the equality of brightness was 0·8 per cent.; used as a flicker, 0·2 per cent. With another special bunsen (60 lb. Ford) viewed one side, the equality of brightness was 0·8 per cent.; viewed both sides 1·2 per cent.; and used as a flicker 0·4 per cent. With the Lummer, the equality of brightness was 0·7 per cent., which was not so good as with the bunsen.

Mr. J. G. CLARK (Gaslight and Coke Company) said he could not share the bad opinion that some members had expressed with regard to the bunsen disc. It was part of his duty to keep an eye on the quality of mantles for the Company whom he had the pleasure to serve; and for this purpose he found the bunsen disc a very useful piece of apparatus. In the first place, one could work for long periods without fatigue, which one could not quite say in the case of appliances which had optical fittings, such as small telescopes. Another thing, it would permit adjustment being made while one was looking on the screen, which was rather an important matter. Then in regard to testing lamps he very much preferred testing a lamp to ascertain its lower hemispherical value. A good deal of interest had lately been taken in integrating photometers; and, of course, it was very nice to be able to ascertain such an important value by one observation. But he must say that, after very careful thought on these questions, he could not really see they could do with anything less than a complete distribution curve of a lamp, to know not only how much light was coming from it, but where it was going. It was fairly well recognized that a source of light was a sort of raw material of the lighting business; and it was necessary, having got an efficient source of light, to consider the best method of distributing it by means of reflection. If one only knew the total flux of light—the spherical value—one was not much better off. One had no data on which to base calculations for the design of reflectors and refracting apparatus. So that one could not do anything until one knew the total hemispherical value; and one must have a complete distribution curve. He was not at the last meeting of the Society; but he had the pleasure of reading Dr. Sumpner's remarks on spherical values. He stated that the subject divided itself into two parts—first, in regard to glow lamps; and, secondly, in regard to arc lamps. He presumed Dr. Sumpner had not yet heard of gas-lamps. [Laughter.] If spherical values had to be considered as a commercial method of evaluating a source of light, they must not forget that gas-light was with us, and doing useful service. This question it was his business to examine; and he had to do it with quite a large number of lighting units—not

merely a large number of lighting units of the same kind, but of different kinds; and it took up a fair amount of time. He had therefore considered whether he should adopt the integrating method. But he must confess he should not be any better off. Although it took some little time to get a complete distribution curve, yet the value of the curve was very much too important to overlook, and the time necessary was well spent. Therefore he did not think he had much to gain by adopting the integrating method. When one had an illumination curve, one could calculate the spherical or hemispherical value just as required. For testing lamps, and obtaining a distribution curve, he always used the Simmance-Abady flicker photometer. In his experience, it was eminently adapted for the work. It had very precise methods for measuring angles; it was easy to manipulate; and, as a matter of fact, one could get a distribution curve of a lamp in about an hour, which was not a long time. There were one or two important points with regard to the flicker photometer. In the first place, there was the speed at which the flicker wheel should rotate. That depended upon the illumination that had to be measured—for instance, in practical use, there should be a slow speed for low illuminations. With regard to the public lighting of London, there were many installations of various sorts; and it was very necessary they should be maintained at their proper value. He found it was convenient to conduct the work on the basis of candle power illumination. That was highly important: and it was the thing to be desired. When an installation was once fitted up, and the candle power of the lamps and the height were adjusted to give the desired illumination, a knowledge of the candle power which produced the illumination could be taken as an index of the value of the illumination from time to time—that was to say, if a particular lamp, giving 900 to 1000 candles, was found to produce the desired illumination, then the measurement of this candle power at periodical intervals would ensure the illumination always being up to the mark. He used the Simmance-Abady flicker photometer for street-lamp candle-power measurements; it was a very handy instrument for outdoor work, which had to be conducted under fairly rough-and-ready conditions—conditions rather different from the laboratory. The photometer was handy; and it could be set up quite firmly, which was sometimes an important matter in thoroughfares subject to heavy traffic.

Mr. HAYDN HARRISON did not think spherical candle power would help them in any way. As to the question of the main qualifications for a photometer for practical purposes, it depended on what were called "practical purposes." He had had to test upwards of 150 gas-lamps in one evening, averaging 80 yards apart; and if he had used a photometer that required five operations to make one measurement, he could not have got through them. What was wanted was simplicity. He could not agree with Mr. Trotter as to neglect of small percentage differences in the testing of street-lamps. For practical work, he objected to a horizontal screen because of the difficulty of measuring low illuminations. As to the permanency of the standard, he used a small tungsten lamp, because the variation was less than in the case of any other. Respecting the point of accuracy, he never tried in street tests to get within a greater accuracy than 5 per cent. For indoor work (it depended upon how much time one had to spare), one could work to within 1 per cent. For rapid work, he preferred to use the flicker.

Mr. P. J. WALDRAM thought the architect required to be better educated not only with regard to the artificial illumination of buildings, but as to their daylight illumination. He went on to speak of the measurement of the latter.

Mr. P. E. EDGUMBE joined issue with those who advocated the calculation of illumination from the measurement of the candle power. Reflection from houses and the conditions of the street generally had an important bearing on the horizontal illumination; and in measuring the candle power in streets and parks, one found an enormous difference. Therefore he did not think it was quite sufficient to measure candle power, and then to calculate the horizontal illumination. If a flicker was used, the screen should be at right angles to the rays; and his experience was that the flicker was very insensitive at low illumination.

The PRESIDENT, in closing the discussion, asked whether it would not be possible, if they were going to add up illuminations, to take the measurements in two halves, and then add together. That ought to be very correct. He was not sure they were taking into account all the elements that should be dealt with when they took separate illuminations in different directions, and then added them together. The reflection from bright and dull surfaces around, had never been taken sufficiently into account. The discussion that night had been a fruitful one, and certainly more practical than any that had preceded it.

YORKSHIRE JUNIOR GAS ASSOCIATION.

The last ordinary meeting of the present session was held on Saturday, at the Bradford Technical College. In the enforced absence of the President (Mr. S. W. Shepherd), the SENIOR VICE-PRESIDENT (Mr. F. Scholefield) occupied the chair.

OUTSIDE EXTENSIONS FOR A SMALL GAS UNDERTAKING.

Mr. J. DEMAIN (Garforth) read the following paper:

This short paper is intended to serve a double purpose. First, to give particulars of what has been done at the writer's works; and, secondly, to raise a discussion on what has been done, and is being done, in other works.

When I was appointed in the early part of last year to my present post, I found a considerable amount of work in the distribution department ready for a start as soon as the weather and other circumstances would permit. Owing to the adoption of public lighting by the District Council, and applications for a supply of gas from out-districts, considerable extensions to mains were found to be necessary to enable us to be in a position to give a supply to the lamps, &c., in the rather scattered area. This, coupled with the fact that some of the other out-districts were rather short of pressure owing to the nature of the district, decided my Directors on the extensions; and, at the same time, it enabled us to connect two or three dead-ends of existing mains, and so make several complete circuits on the system.

Work was started the latter end of April, in the laying of mains only, and finished the first week in August. During this time, 2½ miles of 3, 4, and 6 inch pipes were laid, all on the main roads under the footpaths; the District Council having given their consent to them being placed there. This work was done in addition to our ordinary work, repairs, &c. Besides this, services were laid to about 50 public lamps (70 had been erected the year before) and upwards of 170 new consumers. The total length of pipe required amounted to about 1900 yards, varying in size from ½ to 1½ inch.

The work was done by our own men, excepting the digging, the whole of which was carried out by contract, to which I shall refer later. Our own men did the pipe laying and jointing, with the help of a labourer; and these two men, along with the digger and mate—four men—did all the work of laying the mains. The average number of lengths of 3-inch pipe laid in one day was about 30; the highest number laid in a day was 43 lengths—i.e., 129 yards. This, I venture to think, is rather quick work. Of course, it must be taken into consideration that very few connections were taken off, or otherwise this length of pipe could not have been laid. The mode of working was for the digger to start about 6 a.m., and commence getting out the trench until about 2 o'clock; our man in the meantime getting the pipes knocked-up in lengths, three pipes to a length, ready for lowering into the trench first thing after dinner. About the middle of the total length, another hole was drilled for bladdering, so that when one-half of the pipes were laid and jointed, they could be tested, and the men start to fill in; the digger electing to fill in each night in preference to employing a watchman. In the service laying, only three men were employed—i.e., fitter, labourer, and digger; the labourer pointing all holes after the pipe was put through the walls.

One reason why we proceeded so quickly was undoubtedly on account of our not having to wait for any digging getting out. This work, as I have already mentioned, was done by contract; the price being 6d. per yard for mains and 4d. per yard for services. These prices included excavating and refilling and employing a watchman when necessary, and taking all risks. The price undoubtedly paid the men well, and at the same time enabled us to proceed very quickly with the work. I think that, had we employed our own men in excavating, the work would certainly have cost more; and I doubt whether we should have got on so quickly. I might mention that part of the main-laying work consisted of replacing our trunk main with a 6-inch pipe.

We originally intended to do all the house-fitting ourselves; but owing to the number waiting to be fitted, we decided to let about ninety by contract to the local plumber—the Gas Company finding all material, the plumber supplying the labour only, and the work being paid for at the rate of 1s. 9d. per point. Three or four points were fitted to each house—i.e., three lights and separate connections (where necessary) for small stove—the contractor making good all holes, &c., and leaving everything in good condition. We found that by doing our own fitting work we could save quite 5s. per house, when compared with the usual charges made for slot-installation fitting; and future work of this description, I should have no hesitation in carrying out by our own labour. We supply the consumer with one pendant, two brackets, and stove connection; the stove being either a boiling-ring or oblong griller. Cookers are out of the question, as our district is principally a colliery district, and the men are allowed a load of coal every month at a very low price.

The type of lantern employed for the public lighting is the ordinary square lantern made of copper throughout, and fitted with opal glass in the top to serve as a reflector. All the lanterns are fitted to iron pillars; no brackets being used in any part of the district.

The No. 3 Kern burner was chosen as the most suitable one; and this, in conjunction with a governor (which is fitted to every lamp), gives complete satisfaction. The lighting is by means of Messrs. Alexander Wright and Co.'s flash-light sticks.

Crude oil was applied to the earth embankments of a reservoir recently constructed at Los Angeles (Cal.). When the banks had been dressed to the finished slope, according to the "Municipal Journal and Engineer," they were swept down lightly to remove surplus loose earth, and sprinkled with light crude oil brought to the boiling-point. This was allowed to sink in and dry for a week, and then a second coat of oil was applied; no other form of lining being used. The first coat required 10 barrels of oil for an area of 80 ft. by 30 ft., and the second coat about half this quantity. The oil cost 95 c. per barrel, and the labour for applying it was four men four hours each—costing \$475.

Now, as to the result. Though the bulk of these extensions were not completed before the end of September, our output increased by no less than 22 per cent.; and this year we anticipate our output to be over 9 million cubic feet.

Discussion.

Mr. ROBERTS inquired how much of the fittings for public lighting was supplied by the Company; in other words, did they or the Council provide the lanterns and columns? Had Mr. Demain really found it necessary to use governors in conjunction with No. 3 Kern burners? He knew cases where a small check-cock was used instead of a governor, set after testing each lamp *in situ*; and the arrangement seemed cheap and satisfactory.

Mr. M'NAB asked whether it was simply an assumption that the increased leakage was due to ungoverned burners, whether they instituted any tests or had measured typical lamps.

Mr. FLIGG inquired as to the size of trench excavated at 6d. per yard. He said he could not let contracts at any such figure. Was the soil specially easy of removal?

Mr. DEMAIN replied that the Council provided the columns, lanterns, &c.—in fact, everything except governors; but as they had no men accustomed to such work, the Gas Company fitted up the lanterns for them free of charge. He certainly was inclined to insist on governors even for No. 3 Kern burners. Their previous batch of street lights had been installed without governors, and a great increase in unaccounted-for gas promptly followed. The adoption of governors had corrected this, and secured better lighting. At his previous works, he had had much the same experience; and on testing ungoverned burners, taken at random, he had found their consumption excessive—amounting in a few cases to even 7 and 8 cubic feet per hour instead of $3\frac{1}{4}$ cubic feet as stipulated. They had no meters on any street lamps, but charged on a consumption of $3\frac{1}{4}$ cubic feet per hour, and endeavoured to keep to this rate of burning by means of governors. He preferred them to check-cocks, which would not get over the difficulty of varying pressures, while the individual testing of lamps would be almost impossible over a large district. Their trenches were about 15 inches wide and 2 feet deep; and the soil found was of all kinds, including even rock that needed blasting. Clay was, however, the main thing met with. The man who did the work was a reliable and quick worker, who averaged 30 lengths a day and actually accomplished 129 yards on some days. He had been concerned in another rural district with the laying of 720 yards of Mannesmann pipe across fields, &c., to supply a mansion, and a trench 18 inches deep was done for 2½d. per yard.

Mr. SCHOLEFIELD asked what proportion of the new installations was supplied with slot meters, and whether any agreement was signed; what did the author do with grillers and boiling-rings when tenants left?

Mr. FLIGG and Mr. M'NAB asked further questions as to the average consumption of gas per slot-meter, and as to what was done with very small consumptions.

Mr. DEMAIN replied that he did not like agreements with slot-meters, which were mainly what they put in. They supplied 18 cubic feet of gas for 1d., and were soon going to give 20 cubic feet. They provided a cheap griller and a boiling-ring and a length of flexible tubing, and fitted these free. They practically gave them to the tenants, and were repaid by the gas consumed and the rate charged. They did not ask for their return, and, in general, considered themselves amply repaid even if they were never sent back. They did not even take them out in cases of very small gas consumption. The fittings had been put in, and they would rather leave them and hope for increased business or new tenants. They had not yet had a full year with the bulk of their recent additions; but their previous slot-meters averaged 6500 to 7000 cubic feet per annum. If this seemed low, it was to be explained by the fact that theirs was a mining district, and that the miners had a monthly allowance of cheap coal, which was always duly burnt. There was therefore small inducement, and still less inclination, to use gas for cooking.

Mr. HALKETT paid tribute to the interest of the paper, more especially in its showing how cheaply the work described could be carried out. He did not think it a wise policy to lay pipes in lengths of three, especially with only two men. [Mr. DEMAIN: The 6-inch pipes are laid in lengths of two only.] There must inevitably be some strain, and this would show itself in the future. It was unwise to save a little money at the outset by methods which would soon mean loss from leakage and a further heavy charge in baring and repairing the mains. He could substantiate what had been said about fitting charges. A gas undertaking ought to do this work by its own men whenever possible. Better work was likely, more supervision would be employed, and a greater interest taken in the work in making a good job of it. It was cheaper to use direct employment in this way, as consumers' wishes and needs would be more likely to be ascertained and met, and future developments more likely to follow. He was surprised to hear that no agreements were demanded. What claim had they on landlords or tenants who might eventually claim the gas accessories as fixtures? It was certainly more usual to have a signed permission from landlords and tenants for the installation of fittings, &c., and an undertaking by the tenant to keep them in order.

Mr. FURNESS (Slaithwaite), the representative of the Manchester District Institution, wished to bear emphatic testimony to the advisability of laying mains one length at a time. The important matter was not so much the saving of a little time or money at the outset, as making so good a job that it should remain in sound

condition for a long term of years. In laying two or three lengths at a time, there was the serious disadvantage of not knowing what kind of ground support was under the intermediate joints, as it had not been disturbed. It might consequently be of a nature that would lead to subsidence and drawn or fractured joints, or it might be thinly covered stone. With single lengths, each joint rested on examined and disturbed soil. In some recent extensions, he had let the trenching by contract; but he found he had to pay from 10d. to 1s. 3d. per yard.

Other questions by Mr. TAVERNER, Mr. FLIGG, and Mr. M'NAB dealt with the percentage of unaccounted-for gas, the kind of joints made, branch-services, &c. Many remarks were made about the extremely low charges for digging, and repeated queries about the character of the soil.

Mr. ROBERTS, speaking from his personal knowledge of Mr. Demain's district, quite realized that these low charges were fair payment for the work done. The soil encountered admitted of no comparison with that found in most of the districts represented at the meeting. Many of the pipes would be under foot-paths, which were simply ashes laid upon, and embedded into, the natural soil.

Mr. DEMAIN assured the meeting that the trench-digger whose exploits aroused so much admiration and wonder, almost amounting to incredulity, was a quick worker; but he was really well paid, and had even earned £3 in a day. The mains were mostly laid under footpaths, and no joint was filled in until he himself had tested it under gas pressure; and he had taken particular pains to satisfy himself as to their soundness, as many lengths of the pipe would not, in all probability, need to be disturbed for thirty years, so long as they were sound. They did not take each service off separately from the main, and in some cases were able to branch-off four services from a single connection. Their unaccounted-for gas was 10 per cent. for the last half year; but it was a colliery district, with workings as near as 110 yards below the surface, and a 4 to 4½ foot seam there. Only lately he had had a brand new main broken clean across, from subsidences of the ground. The joints were all the old-fashioned lead ones. Only the 3-inch pipe was laid in three-length instalments, and four men were utilized for lowering it into the trench.

Mr. W. CRANFIELD then gave an address on "Modern Developments of Carbonization Methods, with Special Reference to Vertical Retorts." The Yorkshire and the Manchester Junior Associations are paying a joint visit to the installation of Woodall-Duckham retorts at Burnley on the 7th prox. This address was therefore designed to prepare the way, and, by familiarizing members with the design of the plant and the details of its construction, to secure a more intelligent inspection of the actual setting. Two very large diagrams, kindly furnished by Messrs. Woodall and Duckham, Limited, were on view; and a large selection of lantern slides (mostly prepared for the occasion) not only made this type of carbonizing plant clear, but the other vertical retort systems, the various chamber settings, 45° inclines, &c. The details of their construction, the results of their working, and the explanation of these results were dealt with.

A deputation of the Bradford Gas Committee have, as has been recorded in the "JOURNAL," lately visited the chief Continental examples of chambers and vertical settings, and have reported in favour of verticals. The full Committee are now about to visit the chief English installations before coming to a final decision. There was consequently special timeliness and appropriateness in holding the meeting at Bradford, where also Mr. Cranfield is lecturer in Gas Technology at the Municipal Technical College. The Bradford members of the Association were well represented. Several of the Works Superintendents were present, and much interest was shown in the address and its illustrations, in the comparison of the systems, and in their relative advantages.

The two speakers were cordially thanked on the motion of Mr. H. SMITH, seconded by Mr. G. W. FLIGG.

Garcke's "Manual of Electrical Undertakings and Directory."

—We have received from the Electrical Press, Limited, of 37 and 38, Strand, W.C., the new edition (the fourteenth) of this work, which contains many new features in comparison with its predecessors. The book is a bulky one, as may be supposed when it is stated that as many as 3000 electrical undertakings are dealt with in its pages. The contents are grouped in six divisions; the first being devoted to electric lighting, power, and traction undertakings, and the fifth containing directories of officials, members of electric lighting and tramway committees, and electrical contractors. This division has been considerably amplified, and will consequently prove more valuable than before. It contains 12,000 names, but they are only those of gentlemen holding responsible positions. The main body of the "Manual" is made up of particulars relating to all the joint-stock electrical companies and municipal electrical undertakings at home and in the Colonies; and the other features of the book include a general survey of the past year (introduced for the first time in the preceding volume) and some interesting comments upon financial, legislative, and other matters connected with the industry. The text is given of the Electric Lighting Act, 1909, and also of the London Electric Supply Bill of the present session. The "Manual" has been compiled under the direction of Mr. Emile Garcke, M.I.E.E., and every effort made to render it a complete and thoroughly reliable work of reference for the electrical industry. The price is 21s. net.

REGISTER OF PATENTS.

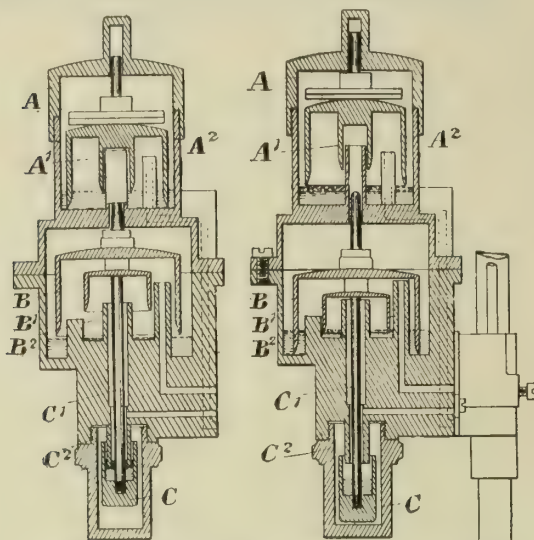
Actuating Lighting and Extinguishing Gas-Lights.

ROSIE, J., and M'KELVIE, J., of Edinburgh.

No. 4283; Feb. 22, 1909.

This invention relates to means for automatically lighting and putting out gas-lights by varying the pressure in the mains, and particularly to methods which include an illuminating and a pilot light. By it, any number of lighting waves may be sent in succession until all the lights are lighted, and the lights are put out by a wave of regulated higher pressure than that used for lighting.

The device employed is similar to that shown in patent No. 5793 of 1908, in which the lighting is effected by a pressure wave acting on a bell valve so as to admit the gas to the burner—the "lighting bell." In addition to the lighting bell, another bell—the "putting-out bell," is loaded to open on a determined higher pressure than the lighting bell. The opening of the putting-out bell admits the gas to the outside of the lighting bell, which is thereby balanced and falls by gravitation, cutting off the gas from the burner. A port from the chamber in which the lighting valve is placed connects with the pilot light and permits the exhaust of the gas pressure above atmospheric pressure.



Rosie and M'Kelvie's Lamp Lighter and Extinguisher.

The illustration shows a longitudinal section of the appliance, with the lighting bell open, and the putting-out bell open, respectively.

The chamber A (the "auxiliary chamber") has within it a central stand-pipe covered by bell A¹, upon which is formed the bell A² guided to have an up-and-down motion. The bell A¹ is arranged so as to lift clear of its seal, while the bell A² remains sealed. Also within the chamber A is a pipe with a port communicating with the gas-supply pipe—shown dotted. The central stand pipe in A communicates by a port with the central chamber; and the bell A² of the auxiliary chamber is so weighted that it takes more pressure of gas to lift this bell than it does to lift the bell which admits the gas to the burner-pipe.

Within the central chamber is the bell B supported by a vertical rod so guided as to have a rising and falling action, and having within it, and attached to it, a bell B¹. This bell lifts clear of its seal, while the bell B remains sealed; and the latter bell must be of such area that at normal pressure the gas will lift it. But the bell B¹ must be of such area that at normal pressure the gas will not lift it. Within the chamber is the central stand-pipe B², having a port communicating with the gas-supply pipe. The bottom of the central chamber is provided with another chamber, having within it a bell C supported by a rod C¹, employed for the purpose of effecting the lighting and extinguishing of the pilot light.

The action of the appliance is as follows: Gas entering through the main passes up the port of the stand-pipe B² inside the bell B¹. At normal pressure the gas does not lift the bell; but when a pressure wave is sent, the gas lifts both the bell B¹ and the bell B sufficiently far to clear its seal. The cup B¹, by reason of it being clear of its liquid seal, admits the gas to the bell B; the gas thence passing down to the burner-pipe. Owing to the larger area of the bell B, the normal pressure of the gas is sufficient to keep the valve open and admit gas to the burner. When the gas is admitted to the bell B¹, it is also admitted to the bell A²; but it does not lift it, because A² is weighted so that it takes more pressure of gas to lift it than it does to lift B¹.

The apparatus for actuating the pilot light consists of the cup C (with liquid seal) suspended from the bell B¹ by means of the rod C¹, and is so adjusted that when the bell B¹ is lifted clear of its seal the cup is closed into its seal, and *vice versa*. The upper portion of the casing is formed with the depending tube C²; and there is sufficient room for the gas to pass into the lowest chamber when the cup is lowered, and under the cup when it is lifted. From the lower chamber the gas passes to the pilot light.

The pilot light being lifted and normal pressure being maintained in the mains, in order to light the lamps a wave is sent along the mains at a pressure capable of raising the bell B¹, but not of sufficient pressure to raise the bell A². When the bell B¹ is raised, the gas passes under the bell B and at the same time passes on to the burner. Owing to the area of the bell B, as has been explained, it is supported by the normal pressure of the gas, and does not fall when the pressure wave is withdrawn. At the same time, the cup C is lifted and the pilot light put

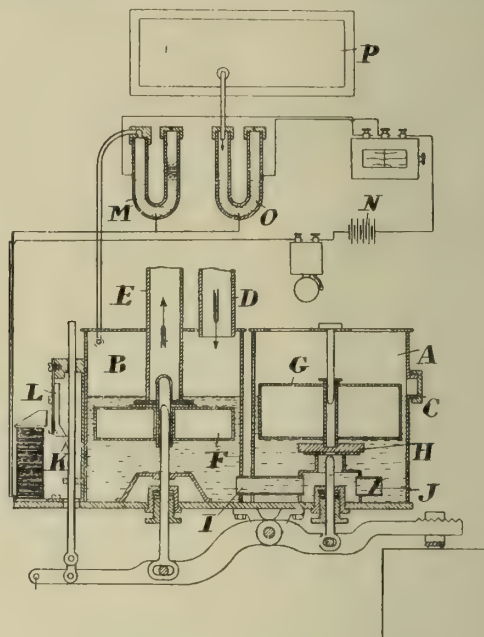
out. In order to put out the lamps and relight the pilot-lights, a wave is sent along the main at a pressure sufficient to lift the bell A². This pressure wave lifts the bells A¹ and A² so that the former is clear of its seal. The pressure above and below the bells B and B¹ being thereby rendered equal, the bells fall by gravity and cut off the gas. At the same time, the cup C being lowered, the gas flows to the pilot-light.

Indicating and Stopping Leakage from Gas-Pipes.

SCHMIDT, L. & H., of Dusseldorf, Germany.

No. 5301; March 4, 1909.

This invention relates to apparatus by means of which, when the pressure in a gas-pipe is reduced and the flame consequently extinguished, or gas collects in a space so as to cause danger, the gas supply is shut off.



Schmidt's Gas-Leakage Indicator.

The apparatus as illustrated consists of two receptacles A B, capable of being filled with fluid up to the feed-pipe C and closed—B by an air-tight cover and A by a cover which allows air to pass through. In communication with B is a pipe D for the gas, and a pipe E through which the gas flows out again.

In B is a float F, with a central opening, which carries a valve; and the weight of the float and valve is so great that the float is immersed up to the top in the fluid. In A, a float G is provided, having a central opening through which runs a flanged pipe, to the lower end of which the weight H, acting as a valve, is fixed. The receptacles A and B are connected by a pipe I, opening freely into B, whereas it opens in A into a special chamber provided at the top with an open tubular extension, which can be closed by means of the valve H, and with a laterally projecting tube J, in which is a non-return valve, which opens towards the interior of the chamber. Passing through stuffing boxes in the bottoms of the two receptacles are pins, the lower ends of which are pivotally connected with a lever, which carries on one arm a weight, while to the other arm a rod, provided with a projection K, is pivotally connected. Above the projection a flexibly mounted arm L is arranged, and adjoining this is an electro-magnet.

The receptacle B communicates with a pipe M, which is bent U shape, and consists of non-conducting material, and is filled to a certain height with mercury. This pipe is conductively connected with a source of electric current N. In the vessel, above the mercury, is a contact-piece, connected through a conductor with the electro-magnet and the source of current. Adjoining the pipe M is a second pipe O (containing mercury) formed in the same manner as M, and connected with the electro-magnets and source of current. Into the pipe O a pipe runs which leads to a so-called diffusion chamber P made of porous material—for example, clay.

The action of the device is as follows: The gas flowing through the pipe D into the receptacle B has a tendency to force back a portion of the fluid corresponding to its pressure. The passage to the pipe E is, however, closed against this fluid through the valved float F, and the passage to the receptacle A shut off through the valves H and J. In order to set the device in operation, it is necessary to make the passage for the fluid to B free. For this purpose the arm of the main lever is pulled down so that the pin of the lever arm comes below the valve H and lifts it. The fluid can now pass into A and ascend, in connection therewith the ascending float G holds the valve suspended. Under the influence of the gas entering through the pipe D the fluid now sinks in the receptacle B, so that the float F and its valve again open the outlet pipe E for the passage of the gas to the places where it is to be used. If the pressure of gas be now considerably reduced (or cease at all), the fluid flows back out of A to B until the valve H (which is so arranged that it closes the inlet pipe before the level of the fluid has reached the same height in both receptacles) shuts off the supply. The remainder of the fluid then flows only to B until equality of level is established. The float F ascends with the ascending fluid, and its valve lies again in front of the opening of the outlet pipe E and interrupts the passage of the gas until the main lever again raises the valve H.

In consequence of the reduction or the ceasing of the gas pressure, the mercury rises in the one arm of the pipe M, having been previously

forced downwards through the gas. When the mercury has risen as high as the contact and thereby closed the circuit, the arm L is attracted by the electro-magnet, and the rod that is locked by means of this arm is released. In consequence of this, the main lever arm is turned under the influence of its weight with the left part upwards, and presses the valve Z on to its seat; so that the left part E is closed independently of the rising of the fluid in the receptacle B. At the same time the ringing mechanism is actuated, and danger signalled on the board through the dropping of a flap or the like.

If in the space in which the diffusion chamber P is arranged gas should collect—for example, in consequence of the breakage of a pipe or a cock being left open—the gas collecting in the chamber flows into the one arm of the pipe O and presses the mercury contained in it downwards, and in the other arm upwards. If, now, the mercury rises to the contact, the circuit is closed in the manner already described, the arm L is attracted and the valve closed, and the board and the bell mechanism actuated.

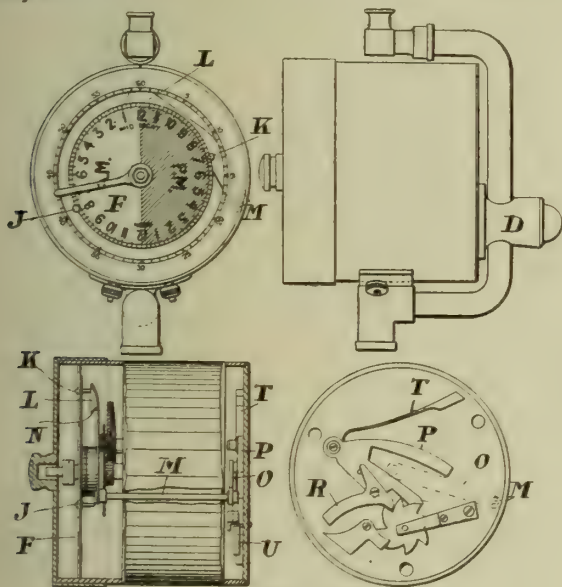
Controlling the Lighting and Extinguishing of Gas.

HARRIS, H. W., of St. John's, S.E.

No. 5997; March 12, 1909.

This is a modification of the apparatus described in patent No. 18,172 of 1908—being especially adapted for mechanically controlling, at predetermined times, the supply of gas to a street-lamp or a group of lamps.

In apparatus of the type referred to, it has heretofore been found difficult, the patentee states, to operate the valve controlling the supply of gas so that the gas is both turned "on" and "off" quickly; and it is the object of his present invention to provide means whereby this operation may be effected in an efficient and certain manner. He describes the present modification of his No. 18,172 of 1908 patent in connection with a well-known type of rotary disc-valve; the time mechanism, through its rotating dial and operating pins, imparting angular movement to a pair of levers in such manner as to raise into operative position a weighted or spring-controlled valve-operating lever adapted to co-act with the valve so as to impart angular or reciprocatory movement thereto (according to the type of valve employed), and so instantaneously to set the valve to the "on" or "off" position as the case may be.



Harris's Lamp Lighter and Extinguisher.

The operation of the device shown is as follows: When one of the operating pins J or K has travelled with the dial F during its angular movement until the pin engages the nose N of the resilient lever L, the continued angular movement of the dial causes the free extremity of the lever to be raised, and thereby imparts angular movement to its spindle M, and therefore also to the latch-lever O secured on it. During its upward or outward travel, this latch-lever encounters and raises one of the limbs of the spring-controlled bifurcated valve-operating lever P and raises it, at the same time disengaging the detent R and extremity S of the second limb of the lever P from the ratchet-wheel U, and raises the detent clear of the wheel and over the point of the next succeeding tooth on it.

While the movement of the latch-lever is in progress, the operating pin is passing over the nose at the head of the lever L, from which the pin suddenly becomes disengaged and enters the offset portion in the rear of the nose—thus permitting the lever to suddenly resume its normal position (by gravity or by spring pressure if required) and simultaneously removing the support of the lever O from the lever P, which latter, under the influence of the spring T, quickly resumes its normal position, and, by the engagement of the nose of the detent R with the next succeeding tooth on the ratchet-wheel U, imparts rapid angular movement to the ratchet-wheel U, and, consequently, also to the controlling valve contained in the valve chest D; the forward extremity S of the lower limb of the lever P preventing over-running of the ratchet-wheel. In this way, the controlling valve is instantaneously operated from the "off" to the "on" position, or vice versa.

In cases where the apparatus is employed in connection with burners which are provided with pilot lights, and it may not be expedient to operate the valve instantaneously, in order to render the operation more gradual, the lever O may be extended and connected to the lever P through intermediate multiplying levers, one of which may be weighted or spring-controlled so as to reduce the load on the time mechanism. By this arrangement not only is the controlling valve

operated gradually (yet quickly), but the time mechanism is relieved of a considerable amount of work.

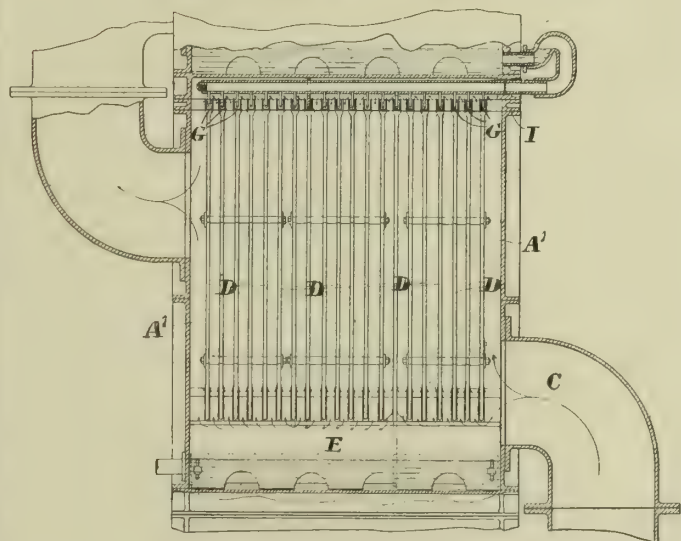
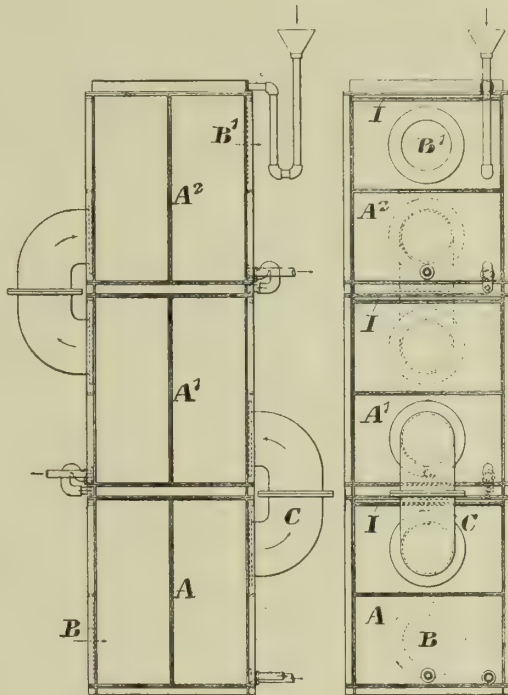
In cases where the apparatus controls a group of burners, and where it may be desired that the gas to one or to several shall be turned off before the remainder—say, one group at twelve p.m., and a second group at three a.m.—a third operating pin would be attached to the rotary dial F in the manner referred to in the 1908 patent, and the number of teeth on the ratchet-wheel U would be varied accordingly—say, from eight to six. The valve in this case would be so constructed as to regulate the supply of gas as desired at every sixth-of-a-revolution.

Cooling and Condensing Gases.

KIRKHAM, HULETT, AND CHANDLER, LIMITED, of Palace Chambers, Westminster, and BLAKE, E. W., of South Croydon.

No. 6557; March 18, 1909.

This invention relates to apparatus "for inducing a natural settlement of the heavy condensable vapours," wherein the gases to be treated pass with a slow movement in contact with a series of surfaces which are cooled with water on the inner or opposite faces to those with which the gases come into contact. The hollow cooling plates have troughs arranged at the upper end into which water is delivered from a duct, and from which it overflows down the inner faces of the plates, and the water escapes from the insides of the plates at their lower ends and falls into a tank. Above the tank are collecting plates arranged in conjunction with a channel, in which collect the products condensed upon, and which drip from, the exterior surfaces of the cooling plates. The several plates are preferably connected together in groups; and baffles are arranged for compelling the gases to traverse the plates of each group in the direction of their length.



A "Standard" Cooler and Condenser.

The illustration shows elevations (at right angles to each other) of an apparatus provided with three condensing chambers or compartments arranged one above the other, and a section of one of the chambers.

A, A', and A'' are the three compartments of which the apparatus is composed; the gas being introduced into the lower compartment through the pipe B, whence it flows into the middle compartment through the pipe C, and thence into the upper compartment through the pipe C'—the gas escaping from the upper part of the compartment through B'.

Each compartment has arranged in it a series of hollow plates D, each with two walls formed of plates either plain or corrugated. In the drawing the two walls are shown as being formed of a single plate folded in the centre of its length, so that the space between the two faces is closed at the bottom, while the edges which form the upper edge of the folded plate are bent outwards to increase the width of the plates. These hollow plates at their lower ends rest upon supporting bars E, arranged in the bottom of the chamber and forming a tank for collecting the cooling water which passes through the hollow plates and escapes through the open sides. The several plates are preferably fixed together in groups by ordinary bolts, with distance-pieces between each pair of plates; so that they can be readily withdrawn from the apparatus for cleaning purposes. At the upper end of each plate is arranged a trough G, into which water can be delivered through a duct provided with a series of branch pipes dipping into the several troughs; the water flowing into the troughs and then overflowing and passing down between the troughs and the inner surfaces of the hollow plates, "whereby the latter are cooled—the water escaping at the lower end of the plates into the base of the compartment."

In constructing the apparatus, the troughs G are formed upon, or carried by, a frame I, which can be lifted bodily away from the plates, together with the troughs, when the cover of the chamber is removed. One of the division plates D (or more than one, if desired) is extended so that it will dip into the water in the bottom of the chamber, and the cover of the chamber is provided with a rib which depends into one of the water troughs and forms a baffle; so that the gas will be caused to flow through the plates in alternately opposite directions. The gas flows in the direction of the arrows; a plate compelling the gases which enter through the pipe C to move upwards between one series of plates, and a baffle compelling it to move downwards between the next series of plates, when it again passes in an upward direction through the third series of plates to the outlet pipe.

In the bottom of the chamber is arranged a collecting channel, on the edge of which a series of plates rest at one edge; the plates also resting at the other edge upon the bars E. These plates serve for collecting the products which are condensed out of the gases during the time they are travelling over the condensing area; the collecting channel acting as a conductor for taking the products to a seal-pipe outside the apparatus.

Vertical Coal-Gas Retorts.

WILSON, A., of Glasgow.

No. 6449; March 18, 1909.

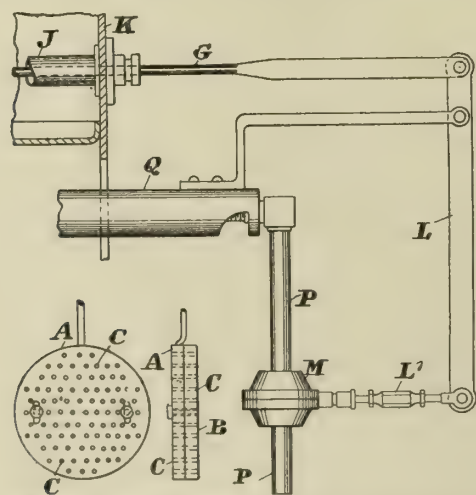
This invention relates to improved means for working vertical coal-gas retorts wherein a quantity of fuel is charged into the top of the retort and a measured quantity of coke withdrawn from the bottom of the retort, at regular intervals, whereby the discharge of coke from the retort is regulated. With these means for working a vertical coal-gas retort a better quality of coke is said to be produced and the working cost is greatly reduced. An illustrated description of the arrangement appears on p. 166 of to-day's issue of the "JOURNAL."

Regulating the Supply of Gas.

FLETCHER, RUSSELL, AND COMPANY, LIMITED, NEIL, A., and
FLETCHER, T. W., of Warrington.

No. 6911; March 23, 1909.

This invention relates to disc valves such as are employed for regulating the supply of gas in apparatus where the gas-flame is reduced or increased by the automatic action of disc valves.



Fletcher, Russell, and Co.'s Gas-Stove Regulator.

The illustration shows a face view, and an edge view (enlarged) of discs forming the feature of the invention, and the application of the discs.

There are two discs, A and B, in which rows of small holes C are formed in the same positions in each disc; so that when one disc is placed over the other with the holes in both discs in the same or open position, a clear passage equal to the area in cross section of the supply tube through both discs is obtained. The discs are connected by studs passed through slots in them, so that by sliding them over each other the holes are partially or wholly covered.

The adaptation of the invention will be governed by the apparatus to which it is required to be applied. If it is employed in combination with a rod as G—i.e., passed through a tube J in a vessel K containing

water heated by gas—when the water reaches a certain temperature and heats the rod, causing the length of it to be increased, a lever L, which is pivotally connected to a bracket fitted on the gas-burner Q and at one end to the rod G and the opposite end of the lever L to the adjustable rod L¹—that is, connected to the disc A, which, with the disc B, is enclosed in a casing as M on the gas-inlet tube P—the disc A will be moved so as to close the holes by the rod G extending and operating the levers L and L¹ connected with the disc, and shutting off the gas, with the exception of a pilot light, by sliding one of the discs over the other in the case M, thereby wholly or partially covering the apertures therein and preventing the gas from the inlet pipe P passing through. When the water cools and the rod G contracts, the holes C will revert to their open position, and the gas will be ignited by the pilot light.

Gas-Regulators.

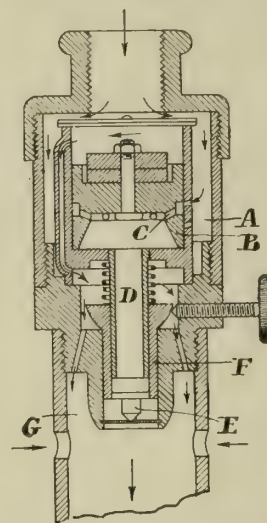
EHRICH AND GRAETZ, of Berlin.

No. 7399; March 27, 1909. Date claimed under International Convention, April 3, 1908.

This invention relates to gas-regulators by means of which it is possible to "automatically control gas pressure so that changes of pressure in the gas-mains do not affect the burner or interfere with its normal efficient working."

The form illustrated represents a burner-tube in cross section with a regulator (also in cross section) arranged in it.

Gas enters the tube by the opening at top; and within the tube is a casing provided with ports, which lead from the annular space A to the interior. The casing is circular in form, and a regulating device B is arranged therein, in the form of a piston movable within the cylinder. The piston has a groove in it which, in the normal position (illustrated), leaves the ports in the casing open. From the groove there lead ports C to the under side of the piston. The gas passing through these ports to the under side of the piston flows through the tubes D to the burner nozzle, which is adapted to be regulated by a pin E attached to a cross-piece carried by the tube F, which is slidable over the tube D, and is provided at its upper end with a head. A screw is adapted to engage the head so as to move the tube F and pin E upwards against the action of a spring. From the upper end of the casing above the piston B there leads a conduit to the space below the casing, which is further connected to the mixing-tube G of the burner by a conduit.



A Graetzin Burner Regulator.

It will be seen that the upper end of the casing above the piston B is in this way connected to a point of lower pressure than that which exists below the piston B and within the tube D. This difference in pressure is the pressure required to press gas through the burner-nozzle. In order to get efficient automatic control, the pressure difference on opposite sides of the nozzle should remain constant. If the pressure exceeds a certain required amount the piston rises; so that the lower wall of the groove partly covers the ports in the casing.

APPLICATIONS FOR LETTERS PATENT.

- 8034.—ROOFF, E. P., "Air-gas production." April 4.
- 8174.—BENNINGHOFF, C., and KLÖNNE, A., "Gas-fired ovens." April 5.
- 8178.—SLICK, E. E., "Producing gas." April 5.
- 8223.—NOAD, A. C., "Gas-burners." April 5.
- 8244.—JEFFERY, F. W. J., "Gas-economizer." April 6.
- 8250.—GADD, W., "Spirally-guided and spirally-supported gas-holders." April 6.
- 8254.—RICHMOND GAS STOVE AND METER COMPANY, RANSOME, J. A., and SHERBURN, W. H., "Gas fires or stoves." April 6.
- 8307.—DRUMGOLD, C. T., "Boxes for mantles." April 6.
- 8320.—KENT, W. G., and HODGSON, J. L., "Fluid meters." April 6.
- 8328.—BOWLEY, J. W., "Measuring the flow of liquids." April 6.
- 8367.—DUTTON, F. & C., "Safety gas extinguisher." April 7.
- 8369.—BENNINGHOFF, O., and KLÖNNE, A., "Supporting furnaces for the manufacture of gas." April 7.
- 8379.—LLOYD, E., and SIMON-CARVES BYE-PRODUCT COKE-OVEN CONSTRUCTION AND WORKING COMPANY, LTD., "Treatment of coke-oven and like gases." April 7.
- 8396.—ROTHERHAM, K., and JOHNSON, W., "Stopcocks." April 7.
- 8404.—ORNSTEIN, I. R., RATZERSDORFER, F., DEUTSCH, S., STERN, C., and ORNSTEIN, M., "Artificial fuel for heating and lighting purposes." April 7.
- 8436.—AUBERT, A. M. & J. M., "Distance kindling and extinction of gas-lamps." April 7.
- 8474.—HARRISON, R., and MELMORE, W. M., "Compressing air or gas." April 8.
- 8512.—WATTS, C. J., "Mantles." April 8.
- 8521.—IONIDES, A. C., JUN., "Air-gas apparatus." April 8.
- 8525.—GLOVER, T., "Dry meters." April 8.
- 8526.—GLOVER, T., "Radiators." April 8.
- 8543.—WRIGHT, H. F., "Spirally-guided gas-holders." April 8.
- 8544.—WRIGHT, H. F., "Gas-holders." April 8.
- 8557.—SCHWABACHER, H., "Gas-lighter." April 8.
- 8564.—YATES, H. J., "Gas-fires." April 8.
- 8596.—COWAN, R., "Gas-heaters." April 9.
- 8654.—LENNOX, A. B., "Spraying water in flues or chimneys for washing smoke or other gases." April 9.

LEGAL INTELLIGENCE.

WATER SUPPLY TO A "SEPARATE" TENEMENT.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Tuesday, April 12.

(Before Justices DARLING and BUCKNILL.)

Metropolitan Water Board v. G. P. & J. Baker, Limited.

This was an appeal by the plaintiffs from the decision of his Honour Deputy Judge Lush, sitting at the Westminster County Court, in an action brought to recover five quarters' water-rate; and it raised an important question of law on the construction of section 8 of the Metropolitan Water Board (Charges) Act, 1907.

Defendants carry on business as carpet manufacturers in two blocks of buildings in Warwick Square, E.C., and one block in Newgate Street; there being intercommunication between the whole of the premises. For many years water was supplied to only one block—No. 9, Warwick Square—which was separately rated at about £100 per annum; but now that the premises were connected, the plaintiffs sought to charge upon the whole assessment, on the ground that the buildings were occupied as a "separate" tenement. Section 8 of the Act provided that the Water Board shall, at the request of any occupier or owner of any house or building, or part of a house or building, occupied as a separate tenement, furnish a sufficient supply of water for domestic purposes at a rate not exceeding 5 per cent. on the rateable value. The learned County Court Judge held that the actual fittings were confined to one house (No. 9), and that the charge could be levied upon that only.

Mr. A. B. SHAW, for the plaintiffs, argued that when several rooms were converted into one tenement this was the house or building in respect of which the supply was required, and that the rate must be levied on the whole.

Mr. DRUCQUER, for the defendants, contended that the Judge in the Court below was justified in finding as a fact that the water was only furnished to No. 9, as it was proved that the other premises were supplied with water from a well.

Justice DARLING, in giving judgment, said the question to be determined was whether a certain building was occupied as a separate tenement in respect of which the supply was required, or whether No. 9, into which the pipe went which gave the supply, was occupied as a separate tenement apart from the rest of the building. That No. 9 was once a separate tenement was beyond dispute. Communication had been made between it and the other houses; but the fact that there was a doorway leading from it into the next house, and from that into the adjoining one, did not necessarily make the whole a house or building occupied as a separate tenement. The question was really one of fact; and it was quite possible that upon certain facts the County Court Judge ought to find that two houses which had been thrown into one had ceased to be separate tenements. But here there was a finding of fact that No. 9 was a separate tenement; and with that finding he was not prepared to differ.

Justice BUCKNILL agreed, though with some hesitation.

The appeal was dismissed, with costs; but leave to appeal further was given.

Manufacture of Sulphuric Acid—Patent Litigation.

An action in which we have a slight interest, and which had been at proof before Lord Salvesen in the Court of Session for ten days, reached its termination on Tuesday of last week. The pursuers, the Badische Anilin und Soda Fabrik, of Ludwigshafen-on-Rhine, are the owners of five patents for processes used in the manufacture of sulphuric acid. In the process sulphuric anhydride was formed by bringing gases purified from arsenic, phosphorous, and mercury into contact with platinum. It was averred by the pursuers that defenders, Nobel's Explosives Company, Limited, of Glasgow, were infringing the patents in their works at Ardeer, in Ayrshire. This was denied by the defenders, who maintained that the pursuers' patents were anticipated by prior use at Silvertown, near London. The proof disclosed, in the course of the examination of the defenders' first witness, that at Ardeer the gas was preferably used unpurified. Counsel for the pursuers stated last Tuesday morning that they were satisfied that they could not succeed on the purification part of their patent, and that as this was an exceptionally important part of their case, they had to abandon it. This was allowed by the Court; and the pursuers were found liable in expenses.

A Hairdresser's Water-Rate.

At the West Ham Police Court, last Wednesday, before Mr. Gillespie, Richard Hall, hairdresser, of Windmill Lane, Stratford, appeared to an adjourned summons by the Metropolitan Water Board for 1s., their assessment of a quarter's water-rate due. Defendant disputed his liability. Mr. D. Collins, the Assistant-Solicitor to the Metropolitan Water Board, called several witnesses to prove that numbers of barbers in West Ham paid for water for trade purposes, and that a former occupier of Mr. Hall's shop had paid 5s. a year for the water he used in his hairdressing business. An inspector of the Board said that on the previous Monday he saw the defendant's rain-water tank. It was 32 in. by 16 in. and 15 in. deep, and would hold about 25 gallons. The day he went he found 12 inches of water in the tank, and he took from it about a pint of water. The defendant said that in addition to using the tank he collected rain water in baths, and put it in bottles and other receptacles. Mr. George Kebell submitted some points of law, and argued that water for other than domestic purposes could only be supplied by meter and under contract. His Worship said defendant had a misapprehension of his legal rights, and he should make an order for the rate of 1s. per quarter. Defendant was ordered to pay £1 1s. solicitor's fee, and 5s. 6d. Court costs.

Falsifying Accounts of the Metropolitan Water Board.

At the Surrey Sessions a few days ago, before Sir Charles Walpole and other Justices, Edward Sproson Alderton (51), engineer's clerk at the Surbiton works of the Metropolitan Water Board, was indicted for falsifying the accounts of the Board, and obtaining by means of false pretences sums of £2 10s., £5, £3, and £3 respectively, with intent to defraud. A further indictment was preferred for having on July 3 last obtained from Mr. Hugh Wrinch, the Resident Engineer, the sum of £24 11s. 6d., with intent to defraud. Mr. E. A. Jelf prosecuted; Mr. H. Lynn defended the prisoner. Mr. Jelf outlined the case in his opening address, and said the Water Board did not wish in any way to press the charge; but, being a public body, they thought it a duty to lay the facts before the Jury. If there was any satisfactory explanation on behalf of the prisoner, the Board would be only too happy to see him acquitted, as he was an old servant to them and to their predecessors. At the close of the hearing, which included evidence by the prisoner himself, the Jury returned a verdict of "Guilty." The Chairman said the prisoner had been found guilty of the offence of falsifying the accounts of the Water Board; and, after the evidence, he did not see how the Jury could have come to any other conclusion. It was a very serious offence, for which he might have been sent to penal servitude for seven years. They had heard a strong appeal on behalf of the prisoner, not only from his own Counsel but from the Counsel representing his employers, who were anxious, under the circumstances, that he should be dealt with in as lenient a manner as possible. It had been pointed out that he had lost his employment, his character, and his pension and other advantages through what he had done, and that it would be difficult for him in future to earn his own living. The fact that he had been found guilty of this offence was far more serious to him than such a verdict would be in the case of many men. The Court had taken all this into consideration, and had come to the conclusion that they might venture to follow a course that would give the prisoner another chance of regaining an honest name. They would bind him over in the sum of £100 to come up for judgment if called upon. This meant that he might go free; but he must remember that if at any time he misbehaved himself, he would be called upon to come up and receive sentence for the present offence.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: East Grinstead Gas and Water Bill.

Bill read a second time and committed: Brighton and Hove Gas Bill.

Bills reported, with amendments: Gas Companies Standard Burner (No. 1) Bill, Gas Companies Standard Burner (No. 2) Bill, Gas Companies Standard Burner (No. 3) Bill, Garnant Gas Bill, Matlock Bath and Scarthin Nick Urban District Council Bill, South Lincolnshire Water Bill, Thorne and District Water Bill.

The Earl of Camperdown has replaced Lord Gorell as a member and as Chairman of the Select Committee on the Aberdeen Corporation Water Bill.

The Water Supplies Protection Bill has been referred to a Joint Committee of the two Houses, consisting of the Earl of Liverpool, the Earl of Verulam, Lord Clinton, Lord Desborough, Lord MacDonnell, Lord Henry Cavendish-Bentinck, Sir William Crossley, Sir John Rolleston, Mr. Holt, and Mr. H. Lewis; to commence sitting to-day.

Petitions against the Brighton and Hove Gas Bill have been presented by the Brighton and Hove Corporations, and by the East and West Sussex County Councils.

The opposition to the Havant Gas Bill has been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill, Southend Water Bill.

Bills reported, with amendments: Glasgow Gas Consolidation Bill, Tipperary Gas Bill [parties do not proceed], Wicklow Gas Bill, Workop Urban District Council Bill.

Bill read the third time and passed: Pontypridd Water Bill.

The Fylde Water Board Bill, Mountain Ash Water Bill, Pontypridd and Rhondda Joint Water Board Bill, Southend Water Bill, and Staffordshire Potteries Water Bill have been referred to a Select Committee, consisting of Sir Luke White (Chairman), Mr. Worthington-Evans, Mr. Mills, and Mr. Barton; to sit on Thursday next.

Petitions against the Southend Water Bill [Lords] have been presented by the Southend Corporation and the Leigh-on-Sea Urban District Council; and one against the Staffordshire Potteries Water Bill, by the Stoke-upon-Trent Corporation.

The petitions presented against the following Bills have been withdrawn: Bristol Gas Bill, by the Bristol Corporation; Slough Water Bill, by the Conservators of the River Thames, the Buckinghamshire County Council, and the Rickmansworth and Uxbridge Valley Water Company.

Mr. Wardle (Stockport) put a notice on the paper last Friday of his intention to move, at the time of private business yesterday—"That it be an instruction to the Committee on the Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill to insert a clause limiting the interest on capital, and directing that the profits in excess of such interest shall be applied to a reduction in the price of gas and electricity." Mr. Hudson (Newcastle-on-Tyne) will also move that the Committee be instructed to omit clause 84 of the Bill, relating to the laying of mains for the supply of electricity in certain streets.

GAS COMPANIES (STANDARD BURNER) (No. 1) BILL.

House of Lords Committee.—Monday, April 11.

(Before Lord RITCHIE, Chairman, Lord WILLOUGHBY DE BROKE, Lord TEMPLEMORE, Lord SANDYS, and Lord VIVIAN.)

Mr. J. D. FITZGERALD, K.C., Mr. HONORATUS LLOYD, K.C., Mr. HUTCHINSON, and Mr. A. M. PADDON appeared for the promoters. Various local authorities, who were petitioners in opposition, were represented by Mr. RAM, K.C., Mr. J. G. TALBOT, K.C., and Mr. COURTHOPE MUNROE.

As briefly reported in the "JOURNAL" last Tuesday (p. 121), their Lordships concluded the consideration of the above-named Bill on the previous day, and passed the preamble. The following is an extended report of the day's proceedings.

Mr. TALBOT, in addressing the Committee in support of the case of the Mersey Docks and Harbour Board, explained that the Board were very large consumers of gas both by themselves and by their tenants (a great variety of industrial undertakings), for the purposes of lighting, heating, and power. So far as concerned the supply given to them by the Liverpool Gas Company, they opposed the Bill altogether. There was no case to be made for altering the existing state of things. Before the promotion of the Bill, which, it could not be denied, affected the Board in the very serious way, the Gas Company did not consult either the Board or the Corporation. The Act of Parliament under which the Board obtained their supply specified that the Company were bound to provide gas tested with a burner which gave a flame of 20-candle power; and the result of what they were proposing by the Bill would be to enable them to supply gas of less value than that to which they were entitled. No one suggested that it was the same gas. If they had come to Parliament and asked to reduce the illuminating power of their gas to 15 candles, there was no question whatever that they would have had to offer some *quid pro quo*. All the London Gas Companies had had to reduce their standard price. As to the Liverpool Company being a maximum-price Company—their maximum price being 4s. 6d. and their selling price 2s. 6d. per 1000 cubic feet—it was quite obvious that no compensation in money could be applied in lieu of the reduction of illuminating power. Supposing the Company gave the whole of the saving to the consumers, it would not go anywhere near compensating them, particularly the flat-flame consumers, for the loss which they undoubtedly would sustain. The evidence showed that the saving to the Company would be 3'85d.; but the loss to the flat-flame consumers would be 7½d. The burner now in use was perfectly satisfactory for their purposes. What case, therefore, was there for making any alteration whatever?

The following evidence was then given for the Board.

Mr. A. G. Lyster, the Chief Engineer to the Board, said the amount paid by them for gas was over £28,000 per annum—£23,000 for lighting and £5400 for power. The flat-flame burners used numbered 17,000. If the Bill were allowed to pass, the gas supplied would be of an inferior quality, both for heating and power; and if the price remained unaltered, he thought they might have to pay £3000 or £4000 more for their gas, though it was difficult to arrive at an exact figure. In the past six or seven years, they had spent £5710 in improving the lighting; and existing arrangements would have to be entirely readjusted, because they would have to consume a great deal more gas. In order to get the same efficiency, they would have to alter their burners or introduce more lamps. In connection with the undertaking of the Board, there were two sets of large pumping-engines which were driven by gas-engines of from 500 to 600 H.P.; and they had had expert opinion of what would have to be done with these engines in order to make them capable of fulfilling their work. If the inferior gas as proposed under the Bill was supplied through the engines as they stood, they would fail entirely to do their duty. Therefore it would mean an alteration of the valves, pipes, &c., in order to allow a larger volume of gas to go into the cylinders; and it had been roughly estimated that the cost involved would be £1000, or even more.

Replying to Mr. HUTCHINSON, witness agreed that if the Board were to lose £3000 a year because of the proposals in the Bill, the Gas Company might get it; but he did not agree that any additional revenue received by the Company would go to the consumers in the reduction of the price of gas.

Mr. HUTCHINSON pointed out that the Cardiff Dock Company carried on a system similar to that of the Mersey Docks and Harbour Board, and they did not complain.

The CHAIRMAN asked what the change in the burner was in that case. Mr. HUTCHINSON replied that it was from the No. 1 to the No. 2 burner. With the former, they used 16-candle gas; with the latter, 14-candle gas.

Mr. Richard Holt said it was of the highest importance to keep down the cost of working the docks, because a very small thing would determine the success or failure of an undertaking such as that of the Board. It was looked upon as the best-lighted dock in England; but this was largely due to the fact that they had 20-candle gas. As a matter of business, if the Gas Company wanted an alteration in the illuminating power, they should have gone to the Board and discussed the matter with them.

Replying to Mr. HUTCHINSON, witness said the annual income of the Board was from £1,250,000 to £1,500,000; and the extra payment of £3000 was a matter of considerable importance to them.

Mr. RAM, who did not call any evidence, then addressed the Committee. He said it was not denied that the new burner would give advantages to the companies. It would enable them to supply gas of lower quality, by which they would save money, as they would give an article that was not so good for heating and lighting. If the saving was to the extent of 1d. per candle, it would amount to £100,000 per annum. Apart from the question of whether the burner was good or bad in itself, to apply it to a varying number of companies where the circumstances were different, would be a gross injustice. The gas companies had attempted to make the answer that, though the consumer got less illuminating power, it was not proposed to alter the price or to

confer any corresponding benefit, because he would get an advantage by reason of the companies producing more cheaply. But unless the consumer were protected, he would get no benefit at all; for there were many ways of diverting the money that would be saved—so many channels for conveying it into the pockets of the shareholders. On behalf of the consumers, the local authorities had very carefully considered the matter; and he asked the Committee to reject the Bill. But he also ventured to make a suggestion, which was embodied in the following clause, which he asked the Committee to accept:

(1) The provisions of this Act shall, as regards each of the promoting companies (in this section called "the company") come into operation on such date as shall be prescribed in each case by Order of the Board of Trade; and each such Order shall provide for such an increase in the statutory candle power of the gas supplied by the company as the Metropolitan Gas Referees may determine to be such as will secure that the actual amount of illumination per 1000 cubic feet to be afforded by the gas supplied by the company shall not be less than the actual amount of illumination required to be afforded per 1000 cubic feet by the gas supplied by the company immediately before the passing of this Act: Provided that the local authority or authorities concerned and the company may agree upon any other terms in lieu of the increase of statutory candle power provided for by this section.

(2) The provisions of this section as regards increase of statutory candle power and agreement upon any other terms in lieu thereof shall also apply in the event of the Board of Trade approving of any other burner, photometer, or standard light under the section of this Act of which the marginal note is "Testing Quality."

While submitting the clause, he asked that the Bill should be rejected absolutely. If the clause were accepted, it would, of course, mean a great deal of inquiry, and a considerable amount of time would have to be spent on the matter all over the country.

Mr. HONORATUS LLOYD then replied on behalf of the promoters. He said that the more he looked at this question the more convinced he was that the matter was really very largely one of argument. The evidence was, of course, necessary, in order to place before the Committee the details of the proposal; but, when all was said and done, it appeared to him to come back to this: What was the parliamentary bargain made between the various gas companies and their consumers when powers and obligations were placed upon them to supply gas? Were they by the Bill seeking to disturb that bargain, or was it, on the other hand, their opponents who had misapprehended the nature of the bargain? The promoters were merely seeking to put on the proper lines and make clear that that which was the intention of Parliament should be carried out; while the opponents had taken advantage of the occasion to ask for something to be given to them which Parliament never intended. It was perfectly obvious that Parliament said: "You shall supply, in return for the price and on the financial basis we lay down, a commodity which is equivalent to *x* candles;" and it was now suggested that when Parliament said, "You shall supply 16 candles," it did not mean 16 candles, but some varying light which might or might not be equivalent to 16 candles, and which depended upon the prescribed method of testing. It was idle to suggest that Parliament intended 16 candles in Manchester to mean something less than 16 candles in London. Parliament prescribed a light equivalent to the light of so many candles. That was the practice; and it was now crystallized by the Model Bill for testing the illuminating power of the gas—the burners to be used being the "Metropolitan" argand No. 2; or the Board of Trade might, on the application of a company or a local authority, approve the use of any other burner. From beginning to end it had been the intention of Parliament to prescribe that the commodity that should be supplied to the public was to be of so many candle power, and that this was to be fairly and accurately ascertained. Since the Model Bill was drafted, it had been the practice of Parliament and the Board of Trade to apply this clause of it; and the result was that there were numbers of gas companies now under the statutory provision that they were to supply gas of an illuminating power equivalent to so many candles, which was to be measured in the approved way. The position was that a burner was adopted very generally which was supposed to do that which Parliament intended should be done—viz., accurately test the illuminating power of the gas; and this burner was admirably adapted for 16-candle gas. Unfortunately, people rushed at it, and said: "Give us this new burner;" and it was applied indiscriminately—in some cases without, and in others with, the option of whatever other burner might hereafter be discovered. In the seventies, Mr. Charles Hunt found that the No. 1 burner, supposed to be so admirable for all purposes, though very good for 16-candle gas, was inaccurate and unreliable for other qualities; and eventually Dr. Vernon Harcourt publicly said the same, and it was generally admitted. This meant that though up to that time and afterwards, notwithstanding that Parliament had intended them to proceed upon the terms, financial or otherwise, they had laid down in the various companies' Acts, upon the basis of the standard prices upon which the capital had been subscribed, the companies had, by reason of the fact of the adoption of a faulty burner, been called upon to supply an article which had been untrue and inaccurately measured. The result was that this had been against the gas industry until modern times, when the No. 2 testing burner was invented. As a lower-grade gas became the commodity which the public required (and this, of course, was emphasized very largely by the introduction of incandescent lighting), it had been gradually realized by all, and was now admitted, that the No. 1 burner did an injustice to the purveyors of gas. Speaking for the public, he said the result was that, in order to appear to supply what Parliament had intended, the companies had to provide gas of a higher quality, because, in passing the test, defects were admittedly exaggerated; and therefore, unless gas of a higher quality was supplied to the burner, the result was that they did not get the statutory test they were bound to have. This meant that, to some extent, unnecessary expense had to be incurred by a company in order to produce an article which nobody intended should be manufactured. Speaking for the companies as well as for the public, he said this result was brought about at the cost of both purveyor and consumer. It was not in the interests of the consumer that a gas should be manufactured which was of a higher quality than he wanted—higher than he was entitled to by Parliament, and at a cost which was greater; and it was not fair

to the company that they should have to spend money in providing a gas which nobody intended should be supplied. The result was that the inaccurate burner tended to keep up the price of gas. A Departmental Committee inquired into the matter; and the Act of 1905 was passed, which provided that "the Gas Referees shall from time to time prescribe the burner for testing the illuminating power of the gas supplied by the company, and the chimney, if any, to be used with such burner. The burner so prescribed shall be of such a pattern, not being an incandescent or similar burner, as shall be practicable for use by the consumer; and the burner and chimney, if any, shall be the most suitable for obtaining, and in making the test shall be so used as to obtain, from the gas, when consumed at the rate of 5 cubic feet per hour, the greatest amount of light." He emphasized the words "from time to time prescribe." What was the use of its being said that, when Parliament said 15 or 16 candle power, it did not mean 15 or 16 candle power measured accurately, but measured in some particular artificial way, when Parliament had shown what their intention was, and had recognized that the burner which had been prescribed had been so ineffective and so irregular that they found it to be their duty to say, in effect, that the best burner the Referees should "from time to time prescribe" should be used? The candle power was to remain constant, the financial terms upon which the company's capital had been raised were to remain constant, but the testing-burner was to be variable "from time to time." Then, forsooth, these people who were appearing against the Bill said: "Now that we know the burner was inaccurate, that we have an accurate burner, and that there may be still more accurate burners, this is the time when Parliament should, and ought to, disturb the financial basis upon which a company has been established." Why was it now to be said, because the companies were seeking to get rid of an inaccuracy, were seeking relief from a burden which both the purveyor and the consumer had in common borne, that the whole of the relief obtained was to be taken by the consumer? Mr. Newbigging had admirably summed up the case in one of his answers. He was asked: "Since 1860, the gas purveyors, local authorities or companies, have had unnecessarily to go to the expense of manufacturing an article higher in value in order to produce the value which was intended." And his answer was: "Yes; for some gases." He (Mr. Lloyd) would challenge anybody to tell him, if the financial basis of any of those companies was altered upon the footing of the No. 2 burner being adopted, how the company were going to be dealt with in the event of any better burner being prescribed. It was to be said, according to the clause submitted to the Committee, that for the future the Board of Trade were to make inquiries, and were to be in the position of dealing, not only with the question of a better burner, but were to go into the question of the financial basis of the company; and in each case the company were to be liable to have their standard or maximum price altered. It was an end to investment of this sort. Under conditions such as these, who was going to invest money and pay large premiums under the auction clauses of modern Gas Acts? The consumers enjoyed the fact to-day that in sliding-scale companies enormous premiums were paid because the stability of the whole concern was the standard price as fixed by Parliament; and yet it was asked that this should be dealt with as a sort of movable feast. They had not taken the exaggerated view of the opposition, but they acknowledged that there would be some saving; and they agreed that it would vary according to the grade of gas, and in some degree according to the constituent parts of the gas. If the Committee were going to give him only the relief he asked, to the extent of only making him do what was intended when the standard price was fixed, there was no occasion to alter the thing at all. The whole policy of Parliament had been to legislate for people whom they presumed to be honest; and when they were dealing with gas companies, they made this presumption. In the Gas-Works Clauses Act, there was ample provision in regard to the application of profits; and in a maximum-price company, such as that at Liverpool, when maximum dividends were paid, they could not possibly put another farthing into the pockets of the shareholders. With regard to a sliding-scale company with a standard price, it had been told to their Lordships that the result of giving the promoters the relief they asked for would be that the consumer would get, by reduction of the actual price, from four-fifths to five-sixths of the benefit. This was the automatic effect produced by the sliding-scale itself; and it was what Parliament intended. If the relief were given, it would at once automatically apply to both shareholders and consumers—the latter getting a very large "lion's share." Parliament intended that a company should supply a gas which was reasonably free from impurities; and in the olden days, and until comparatively recently, it was necessary to go through a certain process with the view of getting rid of the sulphur compounds in the gas. Considerable expense was incurred in performing this operation. As time went on, it became obvious to everybody, and it was universally accepted, that an unnecessary outlay had been incurred, and that, so long as the sulphuretted hydrogen was taken out of the gas, there was no necessity for going to the expense of removing the sulphur compounds. This being the case, the gas companies went in a body to Parliament and submitted that they ought to be relieved from this incubus; and Parliament relieved them. Nobody suggested then that there was ground for interfering with the financial basis of the companies. Now it was said—and this was looking at the same question from another standpoint—that the existing fittings were unsuitable for use with the gas proposed. Evidence from this point of view had been given from Liverpool, because this happened to be a unique case. The figures given by Mr. Newbigging were totally at variance with those of the promoters. Mr. Newbigging had said with regard to incandescent lighting that there would be a loss of 10 per cent., and that 1100 cubic feet of gas would have to be consumed for the future in order to perform the work hitherto done by 1000 cubic feet. He also said the saving would be 3'85d. per 1000 cubic feet. If these figures were accurate, the result would be that the gentleman who for incandescent lighting to-day took 1000 cubic feet of gas at 2s. 6d. would for the future take 1100 cubic feet at 2s. 2'15d.; and he would therefore pay 2s. 4'3d. to produce the same result that to-day was produced for 2s. 6d. This was Mr. Newbigging's evidence; but he (Mr. Lloyd) did not accept it. It might be true that, with flat-flame burners and gas of high illuminating power such as there was at Liverpool, they did not get the same result with the low-grade gas; but they would require to burn

more gas or to adapt their burner. With regard to gas-engines—and this was very remarkable—his learned friend had discovered, at a late stage in the case, that some slight inaccuracy had been brought before the Committee by Mr. Newbigging and Mr. Isaac Carr. Mr. Carr had stated on three separate occasions that if gas of a lower grade such as he anticipated were supplied, the result would be that a large number of engines would be scrapped. This was either gross ignorance—he hoped it was—or something worse; it could not be a mistake. But Mr. Carr was the gentleman who thought Parliament had never understood this matter. If Mr. Carr had been endeavouring to assist Parliament, he (Mr. Lloyd) would not be surprised. But Parliament had understood it from beginning to end; and one of the very few gentlemen who had attempted to befog Parliament was Mr. Carr. Having made this slight inaccuracy, he was followed by Mr. Newbigging, who, in answer to his Lordship's question as to whether he agreed with the evidence of Mr. Carr as to the scrapping of gas-engines, said he did—another slight inaccuracy. They would never have heard any more about this but for the fact that they called Professor Burstall—and happily named he was. The slight inaccuracy was endeavoured to be developed by Mr. Courthope Munroe, who, as he (Mr. Lloyd) would have done, acted upon instructions. Mr. Burstall said the only difference was that it was a mere question of adjustment. If they had the lower-grade gas, they wanted more gas and less air; and therefore they altered the valves of the engine. Mr. Newbigging said that with reference to gas for heating, cooking, and power there would be a reduction of 15 per cent. in efficiency; or for the future, in order to get the result which 1000 cubic feet of gas per hour produced, 1150 cubic feet would have to be used. To-day, 1000 cubic feet of gas would cost 2s. 6d. Taking the saving of 3'85d. which Mr. Newbigging gave, the 1150 cubic feet would cost the user in the future 2s. 2'15d., and therefore he would pay 2s. 6'07d. for the 1150 cubic feet. Upon his own figures, the result would be that the engine would be worked at an extra cost of 7-rooths of a penny. Again, he did not accept this. There was on his side of the table a large gathering of gentlemen connected with the gas industry, and various witnesses fairly representative of it had been called. Those who had been called on the other side were gentlemen who, if they would allow him to say so (because there were some few in every profession, and many in his own), had a "crank." He did not say this offensively or unadvisedly. Mr. Carr had perhaps exhibited one of his already. But, in addition to this, he was one of those gentlemen who were like the twelfth man on the jury, who disagreed with everybody, and thought the other eleven were the most obstinate men in the world. Mr. Carr had his own view, and was strongly under the impression that, though these matters of gas legislation had been dealt with by Parliament for years to the satisfaction and admiration of the public, neither Parliament nor the Board of Trade had understood the question till that day. Mr. Newbigging, again, occupied a somewhat curious position. He had told the Committee that in Manchester they used to supply 19-candle gas measured by the flat-flame burner, and that they had now reduced it to between 13 and 14 candles. He (Mr. Lloyd) wondered whether Mr. Newbigging had scrapped all the gas-engines, and whether he was flooded with complaints because of the reduction. It was admitted that the flat-flame burner was unreliable for measuring low-grade gas; and when Mr. Newbigging said he reduced the candle power in this way, he did nothing of the sort. He did it as measured by the flat-flame burner, it was true; but he did not as supplied to the consumer, because when he had manufactured the gas it went to the consumer after being tested by the flat-flame burner, which was admittedly inaccurate for such a gas. After doing this, he adopted the "Metropolitan" No. 2 burner; and he said: "I altered the title, and called what I have hitherto called 13 and 14 candle gas by the old flat-flame burner, 17-candle gas by the No. 2 burner." The transaction sounded very well; but what Mr. Newbigging in fact did was to change what was a gas accurately measured by the flat-flame burner at 19 candles to gas measured by the No. 2 burner at 17 candles. Manchester could alter the candle power just as it liked, subject to the consumer crying out, without affecting the financial basis of the undertaking in any way. The next witness was Dr. Percy Frankland, who was a very able gentleman. But he, too, had a "crank" on this subject, because his view was that gas of high illuminating power was the gas, and ought to be maintained, and that Parliament had been mistaken for years in its policy of reducing it. Dr. Teed also seemed to have some curious cranks, because he was a gentleman who was formerly a gas examiner, and his view was that the No. 2 burner was not at all a good one for testing purposes. It really seemed to him (Mr. Lloyd) that the opponents of the Bill had gone round to collect the gentlemen who had extraordinary views on each particular subject, because the whole gas industry agreed that the No. 2 burner was the proper one. It was the prescribed burner, the one which was in the Model Bill, the one which was put into every Act of Parliament passed, and the one which Mr. Ram said should be adopted for all cases except Liverpool.

Mr. RAM: *Sub modo.*

Mr. LLOYD said he was coming to that. Mr. Carr, of all people, said it was the right burner, and that he had taken it himself. Mr. Newbigging had adopted it; and yet, forsooth, Dr. Teed came and said it was not the best burner for testing purposes. He (Counsel) could not follow him. With regard to the adoption of the No. 2 burner *sub modo*, the whole of the case for the opposition had been: "The No. 2 is probably the best burner, the accepted burner, and practically the parliamentary burner; but if it is adopted and prescribed here, we, the consumers, ought to have the whole benefit." They called attention to the Brighton case.

Mr. RAM: The Brighton case was that the consumer ought to share the benefit.

Mr. LLOYD: Ah! share the benefit. Continuing, he said the whole case against the promoters had been that they were not entitled to anything more—that their sliding-scale had been fixed by Parliament at a certain figure, that the price of so many candles reduction was so much per candle, and that the standard price ought to be reduced to so much a candle to correspond with the whole of the benefit. When the suggested clause was produced, it was a revelation to him, for it proved his case up to the hilt. If the Bill was passed, Mr. Ram asked the Committee to "ensure that we get for the same price the article that we have been getting in the past—that is, that we shall have the statutory

candle power *plus* something more in the way of candle power ordered by the Board of Trade." This was the whole of the main case; but he would make one special remark in reference to Liverpool, because Mr. Ram had suggested that they should differentiate as between the Liverpool Company and the others. Liverpool was unique, inasmuch as it still had 20 candle gas; and in this regard it was true that the flat-flame burner was a much more accurate one for testing. According to the figures given, the position would be practically the same for the consumers of gas for engine, motor power, and heating purposes; and the only people who would suffer to any extent would be those who still retained the flat-flame burner, who would be under the necessity of providing a burner, at a very small cost indeed, which would consume the right amount of gas under the altered conditions. There would be a saving in the Liverpool case which must result in a reduction in the price of gas; but, unfortunately, the high candle power there meant the unnecessarily high price that must exist. Unless injustice was done, it was highly desirable that there should be a uniform test. He admitted that there was a distinction between Liverpool and the other places; but he asked the Committee to say that the principle was right, and that it applied to all. If, however, they thought there was a distinction between Liverpool and the others, then he would ask them to exclude it.

The CHAIRMAN: You admitted just now that the flat-flame test was an accurate one for gas of high candle power. I think it has been suggested that the No. 2 burner is not very accurate for so high a power as 20 candles?

Mr. LLOYD: I think the real point about the No. 2 burner is that it is equally accurate for all grades of gas by means of the regulation of the air supply.

Mr. RAM disagreed with this, and submitted that in the case of Liverpool the test with the No. 2 burner was no test at all.

Mr. Carpenter was recalled on the point, and said the No. 2 burner was an accurate test for 20-candle gas, with the reservation that a smaller quantity of gas would be required to be consumed, and the illuminating power calculated from that quantity. With a very rich gas, the flame would, if 5 cubic feet were burnt within it, tail above the chimney. In order to get over this defect, a smaller quantity of gas must be used. He thought that if there had been other cases in which the illuminating power of the gas was 20 candles, the burner would have been made to suit it; but it was because there was only the one case of Liverpool that this was not part of the construction of the burner. They were to burn 4 instead of 5 cubic feet of gas an hour; and if 4 cubic feet gave 16 candles, 5 cubic feet would give 20 candles. The private consumer would turn down the gas to the lower quantity; or, supposing the Liverpool consumers were furnished with this burner, instead of having a governor that would pass 5 cubic feet he would have one that would give a smaller quantity.

Lord WILLOUGHBY DE BROKE: Would not that present a difficulty to the poor consumer of Liverpool?

Witness: I do not think it would. The poor consumer would use his gas in the same way that he would use his oil.

Mr. RAM: The Liverpool Act says the test is not to be any test that may be devised, but a specified test with 5 cubic feet of gas an hour?

Witness: Yes.

The Committee then considered their decision in private. When the parties were again called in,

The CHAIRMAN said: The Committee find that the preamble of the Bill is proved, and that it may proceed.

Mr. RAM said, with regard to Bill No. 2, that there were matters which would have to be brought up with respect to the calorific test and other things; and, having regard to the decision of the Committee, the opponents would like to consider the position. It might not be necessary to trouble the Committee at all; but there were many interests to consult.

Wednesday, April 13.

When the Committee met this morning,

Mr. RAM announced that the opponents of the Bill had very carefully considered the decision of the Committee. The Committee would recollect that both Mr. Talbot and himself had asked for the Bill to be rejected; but he (Mr. Ram) asked the Committee to consider a clause to the effect that the Bill should not take effect until such time as there had been an inquiry to see whether the particular provisions of each individual company were guarded in the interests of the consumers. Now he asked the Committee whether the opponents of the No. 1 Bill were to understand that, by the decision of the Committee, they had decided against the opponents in that matter also—in other words, in allowing the Bill to proceed, the Committee did not view with favour that such a clause should be brought forward. The opponents were not quite clear that, in giving their decision that the Bill should proceed, they intended to debar the opponents from bringing forward the clause, or whether the Committee had decided it.

The CHAIRMAN: We decided against you, Mr. Ram, when we passed the preamble. We considered this clause, and decided not to insert it in the Bill.

Mr. RAM remarked that on this they had carefully considered the whole situation, and they did not propose to occupy the time of the Committee further. But they reserved the right to oppose in the other House. There were many companies who appeared in the schedule to Bills Nos. 2 and 3; and they thought they ought not to appear again since the Committee had thoroughly thrashed the matter out on the first case. But he wished publicly to reserve their right—in no way were they there not opposing, but they were opposing—to carry on their opposition hereafter.

Mr. HUTCHINSON, on behalf of the promoters, said that was thoroughly understood; and they would not take any advantage of the very sensible line taken by the opponents. With regard to the Bills Nos. 2 and 3, he proposed to prove the preambles; and the Bills would then leave their Lordships' House.

Mr. CASH proved the preambles, and remarked that the only difference there was in these Bills to Bill No. 1 was that in the schedules there were different companies appearing.

The Committee formally ordered the Bills to proceed.

Mr. KEEN then brought up the following clause, which he asked to have inserted in Bills Nos. 2 and 3.

Within six months from the passing of this Act, the Radcliffe and Pilkington Gas Company, in this section called "the Company," shall provide a new testing-place with all necessary apparatus for testing the illuminating power, calorific value, pressure, and purity of the gas supplied by the Company at the office of the Radcliffe and Pilkington Urban District Council, and that Council shall provide a proper and sufficient room for that purpose. The said testing-place shall be deemed to be an additional prescribed testing-place for the purposes of section 28 of the Radcliffe and Pilkington Gas Act, 1878, and for the purposes of the provisions of the Gas-Works Clauses Act, 1871, by that Act incorporated.

After a short discussion, the Committee rejected the clause.

SOME SUPPLEMENTARY NOTES OF THE EVIDENCE.

The recording of the concluding stages of the Bill before the Committee of the House of Lords, affords an opportunity for noticing some of the points in the evidence both for and against the measure which were omitted from the report of the proceedings as given in last week's issue (pp. 119-121). It must, of course, be distinctly understood that the following notes are supplementary to, and not in substitution of, what then appeared.

In the course of his re-examination, Mr. Charles Carpenter—the first witness called by the promoters—was asked, from his experience of the South Metropolitan Company, about what percentage of flat-flame burners he thought were used in the Metropolitan area. He replied that he supposed from 10 to 20 per cent. existed; but he could not think that they were very much used. They were found in odd places, where it would not be worth while to put an incandescent burner, but where a flat-flame remained in position for use if wanted. The remainder were incandescent burners which would not be detrimentally affected by the change proposed in the Bill. In fact, matters would really be improved, because they would be dealing with a gas that more nearly conformed with the gas which was used where the burners were made. That was to say, most of them came from abroad, where the quality of the gas more nearly approached that which it was now suggested it would be a good thing to supply. The amount of incandescent lighting and flat flames was very much the same all over England. There had been an enormous amount of unnecessary fuss made about the new test-burner. If it had been the case that the supply of gas under test by the burner entailed a larger consumption by the public, it would have been noticed in the returns. He had endeavoured to make it clear that his Company did not find what the opponents to their propositions prophesied they must undoubtedly find. That was to say, they found that there was less increase in their consumption, rather than the greatly accelerated one which had been spoken of.

The next witness was Mr. W. J. A. Butterfield, M.A., F.I.C., who gave evidence with regard to the provisions as to illuminating power contained in the Metropolis Gas Act 1860, and the changes introduced by the City of London Gas Act, 1868. It was, he said, plain that the intention of Parliament was to prescribe a burner which was suitable for obtaining from gas the greatest amount of light in it. The methods of manufacture of gas, and therefore the composition of the gas, had changed; and the change had rendered the No. 1 argand no longer the most suitable testing burner. He thought it was desirable that all the companies' gas should be tested by the same standard burner. Such an evenness of standard would have an effect upon the appliances used for burning gas—such as stoves, fires, and fittings. They could be standardized; and it was reasonable to suppose that they would be cheaper and more expeditiously made if that were so. The No. 1 argand obtained the greatest amount of light from gas only of a particular quality and composition; whereas the No. 2 burner secured the greatest amount of light from gas of widely varying quality and composition. When testing with the No. 1 argand, the differences recorded in the burner had no fixed relation to the differences recorded in the use of a flat-flame burner. On the other hand, for the qualities of gas ordinarily supplied, a variation in the quality of gas as tested in the No. 2 burner was closely followed by a variation in the illuminating power obtainable in a flat-flame burner by the consumer. As to suggestions for the imposition of a calorific standard, he did not consider that there had been a sufficient investigation up to the present time to determine a satisfactory standard with regard to the different gases. It was only in London that they were yet in a position to know exactly what calorific power they might expect the gas they supplied would have in their ordinary methods of manufacture, because there had been a period of experimental testing of the gas for calorific power. The Gaslight and Coke Company had a standard which he thought they would find it difficult to maintain, if they only just fulfilled the legal obligation in regard to their illuminating power. Provincial companies should have a similar period of experimental testing before any standard of calorific power was imposed upon them. When information was secured as to what calorific standard could be complied with, it would be realized generally that testing for illuminating power was unnecessary.

Mr. W. C. Young, F.I.C., F.C.S., Gas Examiner for the City of London, who also expressed a favourable opinion of the provisions of the Bill, said it was a desirable one in the interests of all concerned. The change in the burner would enable the companies to supply gas of a slightly lower quality than at present—it would depend upon the conditions applying to the particular case. He explained how it was to his mind that the companies were not all affected alike by the Bill, from all points of view. He was gas examiner for about twenty local authorities.

In cross-examination, witness assented to propositions put to him that he had indicated the variety of circumstances under which the different companies' gas was tested; that he had indicated many varieties as to candle power and other matters; and that he had indicated also quite clearly that the adoption of the No. 2 burner would have different effects with different companies.

In regard to the next two witnesses for the promoters, Mr. James W. Helps, of Croydon, was asked in cross-examination whether he had

considered how the change would affect people who wanted gas for the purpose of cooking and heating. He replied that he found the loss in calorific power due to the slight reduction in illuminating power was so very, very slight—especially taking into consideration the small percentage of the theoretical heat units that were utilized in cooking and heating—that the loss would be hardly appreciable. It would be so slight that it hardly came within the realm of practical politics. He was, of course, speaking of gas of between 14 and 15 candle power. As to the loss to flat-flame consumers, in nine cases out of ten the substitution of one flat-flame burner for another would make up for any slight loss which might accrue from the reduction in the illuminating power of the gas.

Mr. Edward Allen, of Liverpool, expressed the opinion that there should be a uniform test throughout the country, and that the proposed burner gave a fair and true result for all qualities of gas from 10 to 20 candles. If any benefit accrued to the company from the change, the consumer would immediately get the whole of it.

Cross-examined, witness admitted that the Mersey Docks Board, who were very large customers, appreciated the high-grade gas now being supplied in Liverpool. They had a number of engines installed; but these would not be affected by the change. He certainly disputed that if the candle power was reduced these engines would become scrap iron. He added: "If you wish for my opinion, I will give it to you. It is my knowledge, from very careful experiments, that if this new burner is adopted—I will call it a new burner—they would not be affected more than to the extent of probably 1 per cent., and possibly not that. Therefore I do not consider that our action in this matter is in the slightest degree detrimental to that customer or other customers." He denied that if his gas was tested by the No. 2 burner instead of the flat flame it would reduce the illuminating power to the consumer by 5 candles. The number of gas-engines in Liverpool was 1361.

With the examination of Mr. Corbet Woodall (whose evidence was reported at some length last week) and Mr. William Cash, the case for the Bill was concluded. On the subject of the calorific test, Mr. Corbet Woodall expressed the opinion that if this was imposed, the illuminating test should be abolished. He would take one or the other; but he thought it unfair to have both. In Continental practice, especially in Germany, the illuminating power tests had been almost completely dropped. He had much to do with the supply of gas in Frankfurt; and there the illuminating power test was not now used. The gas was tested wholly for calorific value, on the ground that the luminosity of the flame was now of so little moment that it was only of importance in such burners as the argand, which was not used generally for private purposes, and the flat-flame burner, which should be abolished, as it was so very, very wasteful. All the gas that was used in incandescent burners was wanted only for the purpose of heating value; and, as a matter of course, with regard to gas which was used for power, cooking, and heating, the same thing applied. Probably of the gas which was now sent out by the gas companies, from 90 to 95 per cent. was used for purposes where the luminosity of the flame mattered nothing. The reason why it would be unfair to take two tests was because of the opportunities of differences between authorities. There was a great deal of dispute about the tests; and they did not necessarily go together. The calorific value did not necessarily follow the illuminating value. The circumstances that affected one did not affect the other. The Gaslight and Coke Company last year agreed to a trial of the calorific test, in order to placate the County Council. The Chairman: "Has it been accompanied by any inconvenience since?" Witness: "By no special inconvenience; but it has been found that working even with an illuminating value of 15 candles, the Company are not able to maintain the calorific value that was specified in last year's Act. I may say it is but a temporary arrangement. At the end of three years, the Company and the County Council are at liberty to reconsider the standard as to calorific power." Lord Sandys: "The calorific test seems to be the important one?" Witness: "There is no question whatever that the calorific standard is by far the more important; but I think it would be folly, because useless, to have the two."

The first witness called on behalf of the opponents was Mr. Isaac Carr, of Widnes, who, in addition to the evidence recorded last week, was cross-examined to some extent on the question of calorific power. In answer to questions, he stated that he did most assuredly suggest that there were gas-engines in Liverpool which could not be worked if the gas was tested with the No. 2 burner. With a gas which was returned at 20-candle power in the No. 2 burner, engines working at their maximum capacity now would no longer perform the same services. In the eighty cases in which the No. 2 burner had been adopted, all the gas-engines had not been put out of use. They would require more gas; and in cases in which the engines had been working to their full capacity with the higher quality of gas, the engines had either had to be scrapped or replaced by larger ones. The Glasgow Corporation were, he admitted, at present before Parliament proposing to reduce the illuminating power of their gas to 14 candles; and nobody was opposing it. He was not going to suggest that gas-engines in Liverpool and in Glasgow were altogether different. The Chairman: "I think we have been told that Glasgow gas was 25-candle power; it is now 16 candles; and they are asking for 14 candles. The point is did any gas-engines go out of use when it was reduced from 25 to 16 candles?" Counsel: "There has been no evidence of anything of that sort."

Mr. J. G. Newbigging, the Gas Engineer to the Manchester Corporation, who was the second witness called for the opponents (following Mr. Isaac Carr, of Widnes), the points of whose evidence were given last week, said, referring to Liverpool, that according to experiments made, extending over a great number of years, the effect of the Bill would be that the Liverpool United Gas Company would be able to distribute gas showing 15-candle power in the flat-flame burner which would give 20-candle power in the "Metropolitan" No. 2. At Manchester, the supply of gas had always been in the hands of the Corporation; who secured a very early Act—about 1844, and who had no prescribed illuminating power and no burner. For many years up to the early part of 1907 they tested the gas with the flat-flame burner; and they had gradually come down from about 19-candle power to 14 candles—between 13 and 14. Then they thought that they would put themselves in line with other undertakings, and adopt the "Metropolitan" No. 2 burner. The same gas that was before between 13 and

14 candles, was now returned, with the No. 2 burner, at something between 17½ and 18 candles. They changed the test-burner; but they did not change the quality of the gas. They took credit for the higher illuminating power without altering the gas. He had conducted experiments in order to determine the effect of the introduction of this burner. Taking Liverpool, he found the flat-flame consumer now got an efficiency of 4-candle power per cubic foot of gas; while with the new burner he would only obtain 3 candles. He had proved from a number of tests that the reduction of efficiency was about 2 per cent. per candle in an incandescent burner; so with 5 candles this would mean a reduction in efficiency of 10 per cent. Of course, in the photometer-room, by adjusting the burners, a skilled photometrist might get very close efficiencies, as he himself had done. With reference to calorific power, he found that the reduction of each candle meant a reduction in heating value of 3 per cent. This was taking the mean of many tests. Consequently, for 5 candles the reduction in heating value would be 15 per cent. Calculated in money, the effect of the reduction of 5 candles on the 20-candle gas in Liverpool, reckoned on a basis of 2s. 6d. per 1000 cubic feet, would be as follows: In the case of the flat-flame consumers, the increased cost would be 7½d. on 1000 cubic feet; for heating, cooking, and motive power, 4½d., and for incandescent lighting, 3d. The economy to Liverpool of manufacturing the lower quality gas, he took at 3'85d. per 1000 cubic feet. This figure was arrived at as the result of experiments carried out at Fazakerley, along with Mr. Carr and Professor Frankland. Supposing the change were sanctioned, and the Company reduced the price of gas by 3'85d. per 1000 feet, it would compensate the consumer who used incandescent burners, but not the others.

Witness was cross-examined at some length—the first questions having reference to the Manchester gas undertaking. He admitted that handsome profits were made, and that a large proportion went to the relief of the rates. This sum varied from £50,000 to £70,000 a year, though the Chairman of the Committee and some members were opposed to it. He himself was. Of course, the gas consumers were also the ratepayers largely. The Corporation did supply some people outside Manchester; and they charged a differential rate of 3d. per 1000 cubic feet. This was the extra cost of distributing the gas a long distance—8 or 9 miles. The anxiety of the Corporation was to see that the consumer got the full value for his money in one form or another. It was true that the consumer was not necessarily a ratepayer; but one very rarely found that the ratepayer did not consume gas. So that they were really one and the same person. Formerly they tested with the batwing burner. This was an accurate test for the quality of gas supplied at the time; but, with the introduction of the incandescent burner, it was thought that it would be better not to enrich the gas, but to give to the consumer the money which they had been expending in doing so. He would not advise his Corporation to adopt the batwing test to-day. Accepting this answer, Counsel asked: "And is it because the present No. 2 burner is the proper and efficient and accurate burner for gas as consumed to-day, that the Corporation adopt it?" Witness's reply was: "Certainly. Do not think I am opposing the use of the burner. I do not wish to do that. I think it is the best burner; but I think that, in any change that is made from one burner to another, the consumer should at least have the benefit of the saving." He admitted that, though the No. 1 burner was intended to be such as to be the most suitable for obtaining from the gas the greatest amount of light, it would not in all cases do so. It varied according to the quality of the gas. The new No. 2 burner was not the most suitable for obtaining from the gas the greatest amount of light; but he agreed that it was really a burner which ought to have been invented to comply with the provisions of the 1860 Act. There was another burner which gave still better results. He admitted that, for some gases, since 1860, inasmuch as a burner which was inaccurate had been used, the purveyors of gas had necessarily had to go to the expense of manufacturing an article higher in value in order to produce the value which was intended. He did not, however, regard the matter in the light that all this time an injustice had been done to the purveyor of gas. They were seeking to provide a test which would enable them to manufacture perhaps at a less cost; but he maintained that this saving in cost should go to the consumer. Counsel: "In other words, because the purveyors (in your language) of certain classes of gas have for half-a-century suffered a loss which Parliament never intended them to suffer, then because somebody has invented a burner which gets rid of that loss, you claim the benefit for the consumer?" Witness: "Yes, I do." Continuing, Counsel pointed out that as the Liverpool Company already paid maximum dividends, the whole of any saving effected in cost of production would go to the consumer. Witness agreed that under present conditions this would be so; but he added that there might be mismanagement. The Liverpool Company was, he said, most admirably managed now; but the same standard of management might not appertain in years to come, if Mr. Allen left. He thought therefore that it was only common justice to the consumers that they should have some protection from Parliament—that they should not simply rely on the Company. The Chairman: "Are you of opinion that the substitution of the No. 2 burner for the flat-flame standard burner in Liverpool will throw a lot of gas-engines on to the scrap heap?" Witness: "Where they are being worked up to their maximum power—that is, where a 20 H.P. engine is working with the present gas up to its maximum—the lower power gas certainly would necessitate a new engine, or working the engine at a lower horse power."

The next witness on the same side was Professor Percy Frankland, F.R.S., of the Birmingham University. He began by stating that he had always been emphatic on the advantage accruing to the consumer by the supply of high-grade gas, or gas of high illuminating power. The higher the illuminating power of the gas, the more advantageous it was to the consumer. All reductions in this respect were detrimental to the consumer. The Bill did not propose ostensibly to reduce the illuminating power of gas; but it might have this effect if the companies only delivered gas of the present nominal value. That was to say, it would enable them to supply lower grade gas which would still be within their existing parliamentary prescription. It would still be labelled with the same number of candles. For instance, in Liverpool they could supply gas of 15-candle power as tested by the present burner, which would come out as 20-candle gas by the new burner. Such a course would force the consumer to make a choice between

getting a less good result and burning more gas. He had made experiments at the Fazakerley Gas-Works of the Liverpool Corporation. The gas there which by the present flat-flame standard burner gave 14·1-candle power, with the "Metropolitan" No. 2 burner gave 19·1 candles. Dealing with the question of calorific power, he said that the calorific power of the gas to which he had been referring was 523·2 B.Th.U.; while the Liverpool Company's present gas he found to be 667 B.Th.U. net. In the reduction of 1 candle in illuminating power, there was about 3 per cent. diminution in the calorific power. But, of course, the gases must be of the same kind, and produced in much the same way. With what he would call 14-candle gas, as tested by the batswing burner, he got an efficiency of 18·14 candles per cubic foot in the incandescent burner; and with the Liverpool Company's gas (21 candles), he obtained an efficiency of 20·38 candles per cubic foot. All classes of consumers must unquestionably lose by the Bill. He calculated that the flat-flame consumer would lose 25 per cent.; the incandescent burner consumer, 8 per cent.; and the consumers of gas for heating and motive power, 15 per cent. Unless therefore some provision was introduced securing that the illuminating power or the calorific power of the gas was not reduced in fact, or securing some pecuniary compensation to the consumer, great injustice would be done to him.

One of the questions put in cross-examination was: "I understand you to say that the higher the illuminating power, the better for the consumer. You cannot have a very high opinion of Parliament under those circumstances. Parliament has been consistently reducing the illuminating power until it has got down to 14 candles, and that is in the Model Bill; and you come here and say the higher it is, the better for the consumer. Parliament has been acting against the interests of the consumer consistently for years?" To this, witness replied: "It has, unquestionably." He admitted that the tendency of the present day was to utilize the heating power of gas more than the illuminating power; but he denied that this was the main object in 90 per cent. of the cases. In Liverpool, he said, there were a very large number of people who used flat-flame burners; and in all cities the poor almost entirely employed it. People were well advised to use the flat-flame burner in Liverpool, because it was a good gas to burn in it.

This witness's evidence was followed by a short examination of Dr. F. L. Teed, who also expressed the opinion that under the Bill the consumer would get less lighting power, less heating power, and, of course, less motive power, for the same price. The consumer who used the incandescent burner would be damaged to a considerable extent, though less than would the flat-flame user. If they were to strive after uniformity in having one standard burner for testing purposes throughout the country, they should have all the other things standardized. That was to say, if they started altering the method of testing, they ought to make the burners uniform, and they ought to have the standard light uniform, the photometer uniform, and the method of testing uniform. As to the question of calorific value, he supposed this could be met entirely by considerations of price in certain cases. But it would put out of action a good many gas-heaters that were now in use. He had experienced this in London, where he had some stoves which were obtained at the time the Gaslight Company were supplying 16-candle gas by the No. 1 argand. Now the air supply had to be diminished; otherwise they roared frightfully. They were really quite obsolete. One of his objections to the lowering of high-grade gas was that they would have to arrive at their measurements by calculation. The proposed burner did not work in with a high-grade gas. In the case of 20-candle power, they could not burn as much as 5 cubic feet an hour and get the best light; and they were therefore thrown back on a calculation—which was unscientific, and ought not to be done. They should really have the flat-flame burner for testing 20-candle gas.

In cross-examination, witness maintained that the No. 2 "Metropolitan" burner was an unscientific instrument, and was not a good burner for test purposes. In fact, he did not think it should be used for testing at all.

The results of a gas-testing tour throughout were to have been detailed by Mr. A. G. Smith, Gas Examiner to the Liverpool Corporation. He submitted a table showing the figures obtained in various tests; but it was discovered that Hastings was the only place in the table which was included in the No. 1 Bill (the one before the Committee). On March 22, two tests were made there, at 7·20 and 7·25. Harcourt's table photometer was used. With the No. 1 "London" argand, the candle power was 15·28; and about five minutes afterwards the result obtained with the "Metropolitan" No. 2 burner was 18·44 candles. This meant that the same gas measured by the new means indicated a nominal increase of 3·16-candle power.

Professor F. W. Burstall, of Birmingham University, was called on behalf of the promoters, and said that, retained by the Mersey Docks and Harbour Board, he had visited their premises in Liverpool. There were four gas-engines, each of 600 H.P., engaged in pumping out the dry docks; and as at present arranged, these required a high-grade gas of approximately 700 B.Th.U. per cubic foot. To pump the docks out in the time at disposal, they had to work at absolutely full load. No explosions were cut out at all. If the calorific power of the gas was lowered by (say) 10 per cent. from its present standard, the power of the engines would fall off by 10 per cent. or more. That was to say, the engines now giving 600 H.P., would not then furnish more than 540 H.P. If the reduction was 15 per cent., the power would be still lower. In the case of the Dock Board, a lowering of the calorific power of the gas would therefore involve the provision of new engines or substantial alterations to the existing ones, either of which course would entail large capital outlay, as the money value of each engine was about £3000. In addition, there were smaller engines employed, which would also be permanently lowered in their full-power capacity. Asked whether he was one of those who thought it a desirable thing to lower the candle power of gas, witness said: "I think it is quite indifferent, so long as it is done on a heat-unit base. On a calorific base, I think it is quite indifferent whether you reduce the standard or not. I consider it is just as advantageous to have 2000 cubic feet of weak gas as to have 1000 cubic feet of rich gas, provided you pay the same for the two lots." A gas-engine *per se*, he added, was not in the least dependent on a high quality of gas. His own gas-engine at Birmingham worked on a 140 B.Th.U. gas. He considered it was the

duty of whoever made the change to place the engines in a proper condition to work with the new gas. He had a table designed to show that Liverpool was at present paying the highest price for calorific power of any important undertaking in the Provinces. The table was as follows.

| | Coal at 20s. per Ton, 12,000 B.Th.U. per Pound. | Heat Units per Penny. 112,000. |
|---------------------------|--|--------------------------------------|
| Mond gas at Dudley Port . | Gas at 1·5d. per 1000 cubic feet, 140 B.Th.U. per cubic foot | 93,300 |
| Widnes gas | Gas at 10d., 700 B.Th.U. | 70,000 |
| Coke-oven gas | Gas at 6d., 400 B.Th.U. | 66,600 |
| Birmingham gas | Gas at 1s. 6d., 600 B.Th.U. | 33,300 |
| Liverpool gas | Gas at 2s. 6d., 700 B.Th.U. | 23,300 |

In reply to some questions put to Professor Burstall in cross-examination, he said he had no objection to weak gas. He thought it was the right direction to work in. Counsel suggested that if there was an engine using gas of 700 B.Th.U., and it was desired to employ gas of 400 B.Th.U., it would be necessary to alter the valves. But to this witness replied that he might have to alter all the pipes leading up to the engine. Counsel: "So far from scrapping the engines, it is the alteration of valves, and possibly the size of pipe, if the pipe is too small?" Witness: "Yes. In other words, you would have to modify the engine to suit the new conditions." In further explanation of his point, he added that he had an engine in Birmingham that was purposely made to work with different classes of gas, ranging from 130 B.Th.U. to 180 B.Th.U.; and this engine was altered by altering the valves that were required for working it. He got the same power out of it whatever was the quality of the gas employed; but he had to make alterations to the mechanism of the engine itself.

WICKLOW GAS BILL.

The Unopposed Bills Committee of the House of Commons met on Thursday to consider the above Bill. Mr. EMMOTT presided.

Mr. COOPER, Parliamentary Agent, said the Bill was one to confer parliamentary powers on a Company, registered under the Companies Acts, who were at present supplying gas in Wicklow. The existing capital was £10,000, in preference and ordinary shares, and £2400 in mortgage debentures. Further capital power as to £4000 was sought. The terms of the Bill had been agreed with the Wicklow Urban District Council. The Company were to work under the sliding-scale arrangement with a standard price of 4s. 6d. per 1000 cubic feet. The actual prices now charged were 4s. 11d. for gas supplied to ordinary consumers, 4s. 7d. for cooking purposes, and 4s. 3d. for gas-engines; but the Company were permitted, under the arrangement with the Urban Council, to reduce these figures to 4s. 9d., 4s. 5d., and 4s. 1d. respectively. The dividend paid on the preference stock was 4½ per cent. The population was only slightly increasing; but the Company thought the consumption of gas would appreciably increase if they had more money with which to provide slot meters and cookers—a class of consumer which they did not at present effectively supply. The new capital was required for the ordinary development of the undertaking.

Mr. G. W. Anderson, the Managing-Director of the Company, stated that originally fresh capital powers of £6000 were sought; but an agreement with the Council had been arrived at under which the amount was to be only £4000. This sum was to be expended on retorts, a condenser, an exhaustor, a gasholder, slot-cookers, parliamentary expenses, &c.

At the instance of Mr. MOON, a provision was deleted under which, instead of raising new capital under the auction clauses, the Company would have been able to allot it to shareholders.

Mr. Anderson having formally proved the preamble, Mr. CULLINAN asked to be allowed to address the Committee. He stated that the Tipperary Gas Bill had been before another Committee that day, that the Committee had conceded all the objections of the opponents, but that they not being unanimous on the question of granting costs, the costs would have to be borne by the Urban District Council. The Company promoting the Tipperary Bill (which was the same as that which was promoting the Wicklow Bill) had refused to accept the Bill; and the Urban Council therefore were in the unpleasant position of having to levy the rate to meet the costs in one year. In these circumstances, he asked the present Committee to allow the Wicklow Bill to stand over so that a provision might be inserted in it for the relief of the ratepayers. The Irish Local Government Board would acquiesce in such an arrangement.

The CHAIRMAN said the Committee could not adopt the course suggested. The matter was not covered by the notices.

The clauses having been adjusted, the Bill was ordered to be reported.

Consolidated Water-Works Company of Rosario, Limited.—The ordinary general meeting of this Company was held last Tuesday. Mr. W. T. Western, who presided, in moving the adoption of the report, said the net revenue had increased by £5400, or about 11½ per cent. A feature of the year's business was the large number of small houses connected with the Company's supply; the growth of the tramway system in the city having encouraged the formation of colonies of these houses in hitherto unoccupied districts. The motion was carried.

Petersfield Water Supply.—The Petersfield Urban District Council have decided to increase the water supply of the town. The present supply is obtained from a well in the greensand; but it is inadequate, especially in dry summer weather. The Council intend to procure water from springs at Oakshot, whence it will be conveyed by gravitation into their existing service reservoir. For supplying the portion of the district which lies above the level of the reservoir, the water will be raised by hydraulic pumps into a high-level reservoir to be constructed of ferro-concrete. The estimated cost of the scheme is about £6000.

GLASGOW GAS CONSOLIDATION BILL.

House of Commons Committee.—Monday, April 11.

(Before Mr. MOONEY, Chairman, Mr. ESSLEMONT, Mr. ELVERSTON, and Captain TRYON.)

The Bill promoted by the Corporation of Glasgow, the opening proceedings in which were given in the "JOURNAL" last week (pp. 122-126), came again before the Committee to-day.

Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. H. BEVERIDGE appeared for the promoters. The petitioners were represented as follows: Royal Burgh of Rutherglen and Burgh of Pollokshaws, Mr. FREEMAN, K.C., and Mr. T. JONES; Burgh of Clydebank, Mr. FORBES LANKESTER, K.C., and Mr. COLIN SMITH; Burghs of Dumbarton and Milngavie and Baillieston Gas Company, Limited, Mr. BLENNERHASSETT, K.C.; Burgh of Govan, the Hon. J. D. FITZGERALD, K.C., Mr. RAM, K.C., and the Hon. EVAN CHARTERIS; Burgh of Partick, Mr. TALBOT, K.C., and Mr. CLODE; the County Council of Lanark and the District Committees of the Middle and Lower Wards of that County, Lord R. CECIL, K.C., Mr. WILSON, K.C., and Mr. KING; Caledonian Railway Company, Mr. HENDERSON; Busby and District Gas Company, Mr. WILSON, K.C. Counsel was reserved on behalf of the North British Railway Company and the Glasgow and South-Western Railway Company.

Lord R. CECIL addressed the Committee in support of the petition of the County Council of the County of Lanark for themselves and the District Committees of the Middle and Lower Wards of the County. He said he appeared for a very large portion of the proposed supplementary area, and for a considerable part of the portion of the city supply district which was outside the City of Glasgow proper. This case was one of an area relatively small, but of great power and wealth, controlling the supply of gas to everyone in a much larger area. There was no kind of elective relation between the inhabitants of the outside areas and the Corporation of Glasgow. These inhabitants had no kind of control over the Corporation gas policy; and however much they might disapprove of anything done with regard to gas, they had no remedy such as was provided for the ordinary ratepayers in Glasgow. Glasgow was in exactly the same relation to the outside areas as a company who were supplying gas would be; and its constitutional duty was to carry on the gas undertaking, not for the benefit of the outside areas, but for the benefit of the people to whom the Corporation were responsible. He did not suggest that this made it their duty to oppress or ill-treat the outside areas, because that would be very foolish policy. His point was that their interest and duty were to carry on the undertaking for the benefit of their ratepayers, and not for the benefit of those living outside. The Committee had also to remember that some members of the Glasgow Corporation had stated that they proposed to use their control of gas, water, and tramways in order to induce outside areas to become part of Glasgow. In these circumstances, if the Corporation were a company supplying gas in these districts, Parliament would, as a matter of course, take great precautions to prevent their making undue profit by applying the sliding-scale arrangement. In the case of corporations, Parliament either prohibited the making of any profit or made rigid provision that all people within the limits of supply should be supplied at the same rates. In many cases both provisions had been applied. He did not think they would find any case except Glasgow in which neither had been applied with respect to any part of the outside areas. There was avowedly no provision at all as to the amount or application of profits, or with respect to the equality of treatment of those inside Glasgow and those inside the supplementary area. Moreover, by clause 26, "The Corporation may, within the supplementary supply district, or any part thereof, charge rates for gas higher than those charged within the city supply district, and such higher rates may vary in different parts of the supplementary supply district, but shall not at any time exceed the said maximum price." Thus the Corporation would be entitled to charge in the supplementary district for any supply for any purpose up to 4s. 7d. per 1000 cubic feet, and make any distinction they chose between any one class of consumer and any other class of consumer, and any one part of the district and any other part. Such provision was absolutely out of date—indeed, he doubted whether such a provision could be found in any Act. The Corporation already possessed this power; but it could only be exercised in two little places. Under the present Bill, however, the power would be enormously extended, because the supplementary area would be absolutely indefinite. The position was made worse by the fact that, under the Act of 1876, wherever the Corporation were supplying gas, no one could come in and compete against them. The suggestion that the Corporation should be limited to charging in outside areas not more than 50 per cent. more than in the City supply district was grotesque. It was an utterly indefensible proposition that, once the Corporation had crossed the line, they should be able to charge half as much again. There were an immense number of cases in which there was no geographical differential rate; and the cases in which there was such a rate, and in which the difference was 50 per cent., were so few as to be practically negligible. Normally, a difference of 10 or 15 per cent., or something of the kind, was the very utmost that was allowed. Where there was a relatively high rate, or where there was a modern grant of a differential rate, it was combined with a provision that the Corporation should make no profit out of their gas supply—an arrangement which made it much less likely that there would be any great oppression of the outside area. There should surely be equality throughout the whole limits of supply, and the Corporation should be forbidden to make profit by dealing with gas. This would mean, in effect, the abolition altogether of the supplementary area. But if for any reason the Committee held that this was going rather far, the petitioners would urge that, at the very least, there should be a strict limitation of the supplementary area, and a very much lower differential rate than anything which had been suggested—10 or 12 per cent. at the outside. No paper provisions were quite effective in a matter of this kind; so much depended on the meaning attached to the words "profits." If they put away an immense amount for depreciation, they would not have profits which ought to be applied to the

reduction of the price of gas; and this was a thing that must happen, so far as he could see, in any case where they had such a state of things as existed here. Undoubtedly the real solution of such a case was the establishment of a Joint Board, which should really represent the districts supplied with gas or water. It would not be reasonable, in view of the evidence, to ask the Committee to compel the establishment of a Joint Board; but the matter was one which must be considered by Parliament, and ought to be considered by the Committee. It was a matter on which the Committee might very properly express their opinion when giving their decision.

Mr. BALFOUR BROWNE: I want to point out that my learned friend is not appearing for all the outside authorities. Renfrew, Stirling, and Dumbarton are all assenting to these very provisions that he is objecting to. They are not here; and they assent to the 50 per cent. in the Bill.

Lord R. CECIL: I do not know anything about them at all.

Mr. FITZGERALD said the cases of the Burgh of Govan and of other burghs were very similar; and it had been arranged therefore that, so far as the facts and considerations representative of the various burghs were similar, he should present the general case to the Committee. By clause 26, the promoters proposed to re-enact the maximum price of 4s. 7d. per 1000 cubic feet, which was fixed in 1869. When the actual selling price was 2s., a maximum price of 4s. 7d. was absurd. Of course, there should be a margin; and he suggested that 25 per cent.—making the maximum 2s. 6d.—would be reasonable. Clause 9 of the Act of 1882 made it absolutely obligatory that the Corporation of Glasgow should charge an equal price for all gas supplied by meter throughout the whole of their district, and also that they should make an equal charge for the public lighting. This clause prevented them charging a smaller rate for public lighting in Glasgow than in any of the outside burghs. The Law Courts had, however, held that, where gas undertakers were not prohibited from making a differential rate in different districts, they might do so. Still, the Glasgow gas undertaking had been carried on for the last 28 years on terms of perfect equality to all consumers (except in some very outside places with which he was not dealing). By the present Bill, however, it was proposed to repeal section 9 of the Act of 1882, and not to re-enact it; and there was no prohibition of differential rates, and no obligation to charge equal rates in respect of what the promoters called private lighting. There was nothing, as the Bill stood, to stop a differential rate as regarded gas for private lighting purposes in Govan or Partick, or any other burgh, and the City of Glasgow. As regarded gas supplied for purposes other than private lighting, the intention and meaning of clause 26, so far as it applied to public lighting, was to enable Glasgow to charge themselves one rate for public lighting and the burghs outside another rate. There was no ground for upsetting the arrangement of 1882. Section 9 of the Act of that year provided that: "The price to be charged for public lamps shall at all times be charged equally (regard being had to the consumption of such lamps respectively) to the Police Commissioners"—the name of the Glasgow Corporation at that time for gas purposes—"and to all local authorities of Police burghs and other districts within which the Corporation are empowered to supply gas." The present Bill would work very unfairly in this respect. The public lighting bill in Glasgow was thirteen times that of Govan. If regard was to be had to the quantity used, there was nothing to prevent Glasgow saying: "Where a quantity such as we consume is used, we shall charge 6d.; and if any other body consume the same quantity, we will charge them 6d. too." Of course, no one else consumed as much; and so Glasgow might charge themselves 6d. and other burghs 2s.

Mr. BEVERIDGE: The Corporation have made it clear that this was not their intention. If the clause is so drafted, they will alter it to meet that need.

Mr. FITZGERALD: I am not at all aware that they have made it clear that this is not their intention. On the contrary, I understood clearly that their intention was to charge themselves a lower rate.

Mr. BEVERIDGE: The initial cost of the gas in Glasgow, Govan, and Partick is to be the same. The reduction will only be on the quantity consumed.

Mr. FITZGERALD: That is the very point. They are going to make a reduction because a larger quantity is consumed in Glasgow. But what reduction? It is left entirely in their hands.

Mr. BEVERIDGE: Mr. Corbet Woodall said 15 per cent.

The CHAIRMAN: I think it is perfectly clear what the Corporation intend.

Mr. BEVERIDGE: One of our witnesses gave it as 15 per cent., and, of course, we accept that.

Mr. FITZGERALD maintained that if the Bill was passed in its present form, the Corporation would be able to do what they liked with regard to the supply of gas for public purposes. Under clause 26, moreover, the Corporation would be able to charge a differential rate when supplying for power or heating purposes based on the quantity used; so that a large consumer would be supplied at a lower rate than a small consumer. Obviously, if this clause were allowed, Glasgow would get the principal benefit, because the bulk of the large consumers were in the City. The principle to be considered was this: Was it right that a large manufacturer should get his gas cheaper than a small manufacturer? There were precedents both ways. If a lower price were charged the large consumer, the reduction would have to be made up by the other consumers. Section 9 of the Act of 1882 had worked well for 28 years; and there was no reason for altering it. Clause 27 ran: "The Corporation may, if they think fit, allow discounts or rebate to consumers of gas in consideration of prompt payment of gas charges, not exceeding in any case 5 per cent. Provided that all discounts or rebates shall be of equal amount under like circumstances to all consumers." If the Committee struck out the words "under like circumstances," the clause would be a perfect one. With reference to clause 49, relating to the application of revenue, he urged that, as the gas consumers supplied the profit, it was only reasonable that the profit, when made, should be applied to reduce the price of gas. Since 1876, there had been no case in which fresh power had been given to apply gas profits otherwise than in reduction of the price of gas; and surely what was the general law of Scotland should be the general law in Glasgow. An object lesson had been afforded by Glasgow in connection with their

water undertaking. A large portion of the water area of the Corporation was outside Glasgow; and while they charged a rate of 4d. inside, they charged a rate of 10d. outside.

Mr. FREEMAN, on behalf of Pollokshaws, prayed in aid what Mr. Fitzgerald had said; and, on behalf of Rutherglen, he said that not only had he the support of the Act of 1882, but also a statutory agreement, made at the time the private Company supplying Rutherglen was purchased by Glasgow, under which the price of gas supplied in Rutherglen and Glasgow should be the same. This parliamentary bargain had been loyally carried out by Rutherglen; and he asked the Committee to refuse to annul it.

Mr. TALBOT and Mr. COLIN SMITH having also addressed the Committee,

Mr. Macfarlane was recalled, and, in reply to Mr. BEVERIDGE, handed in certain tables. One showed that the capital expenditure of the Corporation on the Milngavie gas undertaking, after deducting the price of the property sold, was £9520. The total sum written off for depreciation was £2428; leaving £7092 to the debit of capital account. Another table showed the yearly expenditure in connection with the supplementary Milngavie district; the result to the year 1908-9 being an apparent surplus of £109. No allowance had, however, been made for leakage and the cost of distribution. If from the £7092 were deducted the accumulation of sinking fund, together with interest thereon at $3\frac{1}{2}$ per cent., and also the surplus revenue, amounting *in cumulo* to £1741, the balance remaining unpaid at May 31 last was £5351.

Mr. Alex. Wilson, recalled, was examined and cross-examined with regard to details concerning the cost and size of pipes and other items connected with the supply of gas by Glasgow to Milngavie.

Mr. H. D. Ferguson, one of the Bailies of the Burgh of Milngavie, examined by Mr. BLENNERHASSETT, stated that when the Glasgow Corporation acquired the undertaking of the Milngavie Gas Company, it was understood that Milngavie was to be charged a differential rate only until the amount of the purchase was recouped by the Glasgow Corporation. It was on the faith of this understanding that the Milngavie Corporation consented to the purchase. He calculated that the total capital sum chargeable against Milngavie was £3666, the whole of which, together with £3660 in addition—less, however, a small percentage—had been repaid to Glasgow. The time had therefore arrived when Milngavie should become part of the City area.

Cross-examined by Mr. BEVERIDGE: He agreed that in a letter the Glasgow Corporation informed Milngavie that they would charge in that area a differential rate. If there had been an understanding with Glasgow such as he had referred to, it would have been wise on the part of Milngavie to put it in writing.

Colonel John Birrell, the Convener of the Lighting Committee of Milngavie, stated that prior to 1901 Milngavie was supplied by a Company, the illuminating quality of whose gas was 26 candles. He confirmed the last witness as to the understanding on which the Milngavie Council supported the transfer of the local Gas Company to the Glasgow Corporation.

Tuesday, April 12.

Colonel Birrell, cross-examined by Mr. BEVERIDGE, said his statement that the Milngavie Gas Company had supplied gas of 26 candle power was based on "the general information of the district."

Mr. BLENNERHASSETT then addressed the Committee on behalf of the Burgh of Milngavie. It was, he urged, a very serious thing that there should be a premium on the development of his clients' area in the form of a charge for gas 50 per cent. in excess of that in force in Glasgow and in the district within a few yards of Milngavie. On the other hand, the matter was an infinitesimal one for the Corporation of Glasgow. It was absolutely right and just that Milngavie should be included within the City area and charged the same rate for gas as was charged to Glasgow. The position from the beginning had been that Milngavie should be treated in future like other districts taken into the area of the Glasgow Corporation. When the Milngavie gas undertaking was taken over by the Glasgow Corporation, Milngavie knew that they were to be charged a differential rate; but the arrangement was to last only until the loss incurred by Glasgow in acquiring the undertaking was recouped. In the tables put in by the promoters, they seemed to have acted on the principle of charging as much as possible against Milngavie in respect of the gas undertaking. Although the mains laid to supply Milngavie were larger than were required for the purpose, and although places other than Milngavie were supplied from these mains, every shilling of the expense of the mains had been charged against Milngavie. The true and proper way to deal with this matter was that which had been submitted by Bailie Ferguson, from which it appeared that the whole of the cost incurred by Glasgow in acquiring the Milngavie gas undertaking had been repaid to Glasgow by the year 1907, and that the account between the two Corporations now showed a credit in favour of Milngavie. Differential rates were objectionable in themselves, and on general grounds should be done away with. Certainly there was nothing in the present case to justify a differential rate being charged Milngavie.

Mr. BALFOUR BROWNE said most of his learned friends who represented petitioners had deprived him of the right of reply to the cases they had presented, inasmuch as they had not called evidence. He could, however, deal with the Busby Company and the Burgh of Milngavie—evidence having been called on their behalf. In the former instance, the object was to force Glasgow to buy the whole of their undertaking. To this Glasgow objected. If they acquiesced, they would spread their limits of supply indefinitely—a thing they were not desirous of doing. There was no invasion of the Busby Company's district. If the Committee rejected this portion of the Bill, how would the people in the two localities in the Busby area now being supplied by Glasgow get gas? The Busby Company were not supplying in these localities; and if Glasgow were dislodged from them, the Busby Company, a non-statutory concern, would, as regarded these places, be put in the position of a statutory undertaking without having imposed on them any obligation to supply. As to the Milngavie petition, the principle on which Glasgow acted was that everybody getting the benefit of the gas supply should contribute fairly to the cost. Instead of having been recouped, Glasgow was still out of pocket in connection with Milngavie,

and was not therefore in a position to charge a flat-rate of 2s. It was said that 4s. 7d. was a very high maximum; but a high maximum was necessary for use in the event of a coal famine occurring. If they had not a high maximum, and if a coal famine occurred, the loss would fall on the ratepayers of Glasgow. When the capital cost of the Milngavie undertaking had been recouped, the price in the place would be still further reduced; but the charge in Milngavie must always be greater than in Glasgow, because the cost of distribution and loss from leakage must always be greater in the case of Milngavie.

The CHAIRMAN: Can you tell me, from your experience of these rooms, is it often that a differential rate, when given, is expressed by a percentage?

Mr. BALFOUR BROWNE: Not often. It is usually in money. In this case, we are putting on a 50 per cent. differential rate; and this has been assented to by Renfrewshire.

The room was then cleared while the Committee deliberated in private. On the re-admission of the parties,

The CHAIRMAN said: The Committee are prepared to pass the preamble of the Bill, subject to the following conditions: (1) Milngavie and Baillieston to be included in the City supply area. (2) The Committee will allow the area of supply shown on the map in the parish of Mearns and Carmunnock, provided the Corporation purchase the undertaking of the Busby Gas Company. (3) The Committee will also require that clause 26 be altered so as to maintain the safeguards guaranteed by clause 9 of the Act of 1882, subject to differentiation for power purposes. (4) They will also require sub-section 3 to be altered so as to give the same protection to all districts in the supplemental supply area as is given to the County of Renfrew. (5) In clause 27, they will require the omission of the words "under the like circumstances." (6) In clause 49, they will require the omission of lines 23 and 24. (7) The Committee will also require that clauses 46, 47, and 51 be altered to meet the points raised by the Secretary for Scotland.

The Committee then adjourned till the next day, in order to allow the promoters to consider the Chairman's announcement.

[In explanation of the decision, it may be stated that the third condition means that an equal rate is to be charged to all consumers of gas, save consumers for power purposes; thus abolishing differential rates. The effect of the fifth condition is that, if discount is given for prompt payment of accounts, it shall be given to all consumers alike, irrespective of the amount of their account. The sixth condition provides that surplus profits shall only be applied to the gas undertaking. The seventh condition relates to certain points connected with the borrowing powers of the Corporation, and the sinking funds in connection with borrowed money and the annuities payable by the Corporation.]

Wednesday, April 13.

At the commencement of the proceedings to-day,

Mr. BLENNERHASSETT asked the Committee, before proceeding to deal with clauses, to hear him on behalf of the Baillieston Gas Company. There had been an agreement he said for the purchase between the Company and the Glasgow Corporation, and this agreement was embodied in certain clauses annexed to the Bill. One of the conditions was that the Corporation should endeavour to procure the inclusion within the supplementary supply district of the area now supplied by the Company; and it was further stipulated that, if the Corporation failed to secure the insertion of a clause to this effect, the agreement should cease to be binding. In these circumstances, the Corporation were no longer willing to carry out the agreement. The Company therefore had to go on as an independent undertaking. In 1857, the old Glasgow Gaslight Company were authorized to supply Baillieston, and in 1869 the Company's undertaking was acquired by the Glasgow Corporation, but no supply was given in Baillieston. In 1862, the Baillieston Company was formed, constructed works, and, with the permission of the Local Authority—for they had no statutory power—laid pipes. They had now served the area for 48 years; the present price of gas there being 3s. 1½d. per 1000 cubic feet. The Company were in a perfectly sound position, and all that they desired was to be let alone. They were willing to sell because they were confronted with the serious competition of the Glasgow Corporation; but they had failed to find a purchaser.

Mr. BALFOUR BROWNE: We are going to leave you alone.

Mr. BLENNERHASSETT said he desired to support the petition of the Company, which asked the Committee to exclude them altogether from the area of supply of Glasgow. The decision of the Committee placed Baillieston in the city supply area; and therefore the Company was menaced by the competition of Glasgow, at 2s. per 1000 cubic feet. Having the competition of Glasgow, it would be almost impossible for the Company to undertake any large responsibility and to expend any big sum of money, because at any time their undertaking might, practically, be ruined by the competition of Glasgow. The result would be that the locality would seriously suffer, and the Company would be paralyzed. As the Corporation had left the district alone for fifty years, the Company asked that it should not be included in their area unless the Corporation wished to purchase the undertaking. As regarded the Busby district, there was a provision that the Corporation must purchase the undertaking or be excluded from the Company's area.

Mr. BALFOUR BROWNE: I am perfectly willing to exclude you. It is only the decision of the Committee that has included you.

Mr. BLENNERHASSETT: I say that the area of the Baillieston Company should be excluded.

Mr. BALFOUR BROWNE: You have not got an area at all. You are a non-statutory Company.

Lord R. CECIL: This to some extent affects the County Council of Lanark, because the effect of this would be to exclude that portion of the County of Lanark from any possibility of receiving a supply of gas from Glasgow. My clients think that such a change would be very deleterious to the district, and that the matter ought to be left in the position in which you, Sir, left it by your decision.

Mr. ESSELMONT (to Mr. Blennerhassett): You want to be made a statutory Company for the supply of gas?

Lord R. CECIL: That is exactly it. My learned friend asks to be given the status of a statutory company without having it, and without

having any of the obligations of a statutory company. This, continued counsel, was quite improper. If the Company chose to supply gas as a non-statutory Company, they were exposed to competition by anybody. The Company wanted to have a monopoly, and yet not to be a statutory Company. No other company had jurisdiction in the area; and the Company were not entitled to what they sought. The position, as left by the Committee the previous day, was the right one.

Mr. BALFOUR BROWNE: I am told that the Coatbridge Company have statutory powers over the whole of the area which the Baillieston Company are supplying; so that the county would not be excluded from getting a supply.

Lord R. CECIL: That makes it all the stronger, because my learned friend then will not be hurt at all.

Mr. BALFOUR BROWNE: If you alter your decision, Mr. Chairman, I am still bound to purchase. It is only if they are in the supplementary area that I am bound to purchase. Your decision was that they should be put in the city supply area; and that relieves me from the obligation to purchase. Rather than purchase, I will exclude them.

The CHAIRMAN: I may mention one of the considerations which weighed with the Committee in giving the decision they did yesterday. The interests of the public in the buying-up of the Company had very great weight with us in putting it inside the city supply area. Your exercise of the powers reserved to you under the agreement, and your decision not to buy the Company creates a new state of facts which I think we ought to consider before giving a decision.

Mr. BALFOUR BROWNE: It makes all the difference to us whether we buy a Company for £10,000 when we are entitled to charge them higher rates than we charge in the inside area, or whether we buy them when we are bound-down to charge the same rates as in the inside area. We would not give £10,000 for this Company if their area were brought into the City supply area.

Mr. BLENNERHASSETT: We do not want to alter our position. We can come in future and ask for statutory powers if we are not killed in the meantime.

The CHAIRMAN: But if we were to give the decision you ask for, do not you think it would be a very strong factor in any application that you might make hereafter to be constituted a statutory Company?

Mr. BLENNERHASSETT: Our position would remain unaltered. If we ask in future to be made a statutory Company, we should have to give good reasons. If we did not, our claim would not succeed.

The CHAIRMAN (after deliberating with his colleagues): The Committee do not see their way to alter the decision they gave yesterday on the question of Baillieston.

Mr. BLENNERHASSETT: You will not exclude it?

The CHAIRMAN: No.

Mr. BALFOUR BROWNE, referring to the decision of the Committee the previous day, said that the first point was that they would require that Milngavie be included in the City area. He had not had an opportunity of consulting the Corporation; but he had had an opportunity of consulting the Parliamentary Committee in London, and the latter were prepared to acquiesce in the decision of the Committee, and include Milngavie in the City supply area. With regard to the next point, the Corporation were not prepared to purchase the Busby Company; and, therefore, they asked the Committee to exclude the portions of Mearns and of Carmunnock which were in question. As to the third point, that clause 26 should be altered so as to maintain the safeguards guaranteed under section 9 of the Act of 1882, this had been done. The words "subject to a differentiation for power purposes" he assumed were intended to mean trade purposes generally, and accordingly words had been inserted which were identical with those of the Greenock Act of last session, save that certain words which went beyond the decision of the Committee had been omitted. The proposed new clause 26 was as follows:

(1) The price to be charged by the Corporation for gas supplied by them to persons within the limits of supply who shall take the same by meter shall not at any time exceed the maximum price of 4s. 7d. per 1000 cubic feet.

(2) Except as by this section otherwise provided, the price to be charged by the Corporation for gas consumed by meter shall at all times be charged equally to all consumers within the City supply district.

(3) The Corporation may supply gas for heating, cooking, or motive power, warming, ventilating, and for the particular requirements of any trade, undertaking, industry, manufacture, or business, and may do all things needful therefor, on such terms and conditions in all respects as may be agreed between the Corporation and the person to whom such supply shall be given (regard being had in each case to the consumption): Provided that the rate charged for gas supplied for any of such purposes shall be the same to all persons under like circumstances.

(4) The price to be charged for public lamps within the City supply district shall at all times be charged equally (regard being had to the consumption of such lamps respectively) to the Corporation and to all local authorities of burghs and other districts within the City supply district.

(5) The Corporation may, within the Supplementary supply district, or any part thereof, charge rates for gas higher than those charged within the City supply district, and such higher rates may vary in different parts of the Supplementary supply district, but shall not at any time exceed the rates charged for any similar purpose within the City supply district by more than 50 per cent. of the rate charged for private lighting purposes within the City supply district, and shall not in any case exceed the said maximum price.

The CHAIRMAN (to Mr. Fitzgerald): Do you think sub-sections 2 and 4 do not give you the protection you have at present?

Mr. FITZGERALD: I think that sub-section 2, if the words "Except as by this section otherwise provided" are left out, is effectual. Sub-section 4 I consider is effectual, too. Continuing, Counsel said that he strongly objected to the way sub-section 3 was framed. It said: "The Corporation may supply gas for heating, cooking, or motive power, warming, ventilating" and so on. But heating and cooking were ordinary domestic purposes. Gas fires and cooking stoves were quite common; and it seemed undesirable that they should be excluded from sub-section 2 unless they made the charge under sub-section 3 equal to all consumers. The words "and may do all things needful therefor, on such terms and conditions in all respects as may be agreed between the Corporation and the person to whom such supply shall be given (regard being had in each case to the consumption)" should be omitted, because

their effect was not merely that the Corporation would be able to charge a lower price for gas supplied for heating, cooking, motive power, warming, and so on, but that they could differentiate the price between different consumers according to the amount each consumer took. He did not think that the Committee intended that if gas was to be supplied for heating or cooking to a workman's cottage it was to be supplied at a higher rate than that at which it was supplied to a large house where a great amount of gas was consumed.

The CHAIRMAN: What the Committee had in mind was that if you are supplying gas for lighting purposes at 2s. per 1000 cubic feet, you should be entitled to supply for power at 1s. 8d. They did not intend that the charge for power to a consumer taking 5 million cubic feet should be less than to one consuming 500,000 feet.

Mr. FITZGERALD: Then "regard being had in each case to the consumption" ought to be struck out. The words "under like circumstances" should also go out. If you strike out these words, I do not think there is really any objection to this new clause.

Mr. BALFOUR BROWNE: If it is your intention, Mr. Chairman, that there is to be no reduction to a consumer taking 5 million cubic feet as compared with one taking 500,000 feet, I do not know what the Corporation of Glasgow may say. Their object was certainly to make a reduction for a larger quantity, because it is much cheaper to give a supply in large bulk.

Mr. CRAIG HENDERSON, on behalf of the Caledonian and North British Railway Companies, said the words of the clause "regard being had in each case to the consumption" met their point that large consumers should be given an advantage.

The CHAIRMAN: I am afraid we have already decided the point. We will not give a reduction to any class of consumer.

Mr. BALFOUR BROWNE: Then as I understand there are to be two flat-rates—one for lighting and another for heating and other purposes.

The CHAIRMAN: Other purposes than lighting?

Mr. BALFOUR BROWNE: I think it is very serious. I only want to understand the decision. I must yield to it, of course. I will accept the clause modified in the way you suggest, although I want to put it on record that it places the gas undertaking at a very serious disability as compared with electric lighting, because they can and do reduce for large quantities. One of our great objects was not only to supply gas at a very cheap rate, but to avoid the smoke nuisance, which would be avoided if we could induce manufacturers to take gas for manufacturing purposes. Continuing, Counsel said that the requirement of the Committee, that the same protection should be given to all districts in the supplementary area as was given to the County of Renfrew, was effected by sub-section 5.

The CHAIRMAN: What about limiting words in sub-section 3—"the particular requirements of any trade" is a very wide definition?

Mr. BALFOUR BROWNE: I have not the least objection to making it "other than lighting." I will put in these words.

The CHAIRMAN agreed.

Mr. BALFOUR BROWNE said the next point in the Committee's decision was that lines 23 and 24 of clause 49—"and may carry any balance thereof to the credit of the Corporation for their general purposes"—should be deleted. If these words were struck out, and there was anything left after meeting the other requirements of clause 49, what was to be done with it? The Committee had not stated. Sub-section 2 of clause 49 provided that income might be used "in payment of the expenses of managing and maintaining the gas undertaking." Nothing was allowed for depreciation. If the Committee were to adopt a clause proposed by one of the opponents, and say "and any balance shall be carried to the debit or credit of the succeeding year," the Corporation would not be able to use a penny piece for depreciation. Everybody admitted that depreciation should be provided for, and therefore he proposed sub-section 5 to clause 49, that the income of the gas undertaking might be applied "in providing the sum necessary to meet depreciation." Even then there might be a surplus; and he therefore proposed a sixth sub-section, so that it might be used "in payment to the Corporation of a sum not exceeding 1d. for every 1000 cubic feet of gas sold in consideration of risk and management, which sum shall be carried to the credit of the police rate of the City." In the case of Salford last year, 1 per cent. was allowed, which was the same as 1d. per 1000 cubic feet of gas sold. An allowance for depreciation was necessary if lines 23 and 24 of clause 49 were to be deleted. If the Committee desired, he would insert words, in conformity with the Burghs Gas Supply (Scotland) Act, 1876, limiting the amount to "not less than 1½ per cent., and not more than 2 per cent." The present expenditure under this head was between 1½ and 2 per cent.

Mr. FITZGERALD thought the words of the clause as they stood would enable the Corporation to use a sum for depreciation whenever necessary; but if Mr. Balfour Browne thought the word "depreciation" should be mentioned, he would have no objection to the insertion of a proviso that the income should be used "in providing a sum necessary to meet depreciation," provided it was limited reasonably. But as regarded the proposal that income might be used in payment of a sum not exceeding 1d. per 1000 cubic feet, Mr. Balfour Browne had not told the Committee that it amounted to £70,000 per annum.

Mr. BALFOUR BROWNE said that was the amount calculated on the maximum capacity of the works. Taken on the annual consumption, it was £25,000.

Mr. FITZGERALD said, for the purpose for which he was speaking, it did not matter whether the sum was £70,000 or £25,000. Having had the power for 40 years to carry any balance to the credit of the Corporation for general purposes, they had only exercised it to the extent of £21,000 in all. Yet the provision now proposed would enable them to carry £25,000 per annum out of gas profits to the benefit of the police rate. Thus the consumers would be placed in a worse position than they were in at present. If the Committee gave them the depreciation for which they asked, and if they added, in accordance with the Burghs Gas Supply (Scotland) Act, that any balance over matters mentioned in the proposed clause should be carried to the debit or credit of the succeeding year, they would be placed on the same footing as the bulk of the gas undertakings in Scotland.

The CHAIRMAN: Did we not understand from your witnesses, Mr. Balfour Browne, that in recent years you had adopted what may be called a standard rate of depreciation—that is, 1½ per cent. on works,

3 per cent. on chemicals, 2 per cent. on pipes, 6 per cent. on meters, and 10 per cent. on stoves?

Mr. BALFOUR BROWNE: That is what we have been doing.

The CHAIRMAN: The Committee are prepared to give you power to set aside for depreciation, but not as you have put it in. They suggest that it should be altered so as to give you the standard rate of depreciation which you have adopted in your own accounts.

Mr. BALFOUR BROWNE: I have no objection to that.

Mr. FREEMAN: But nothing for management?

The CHAIRMAN: Our decision yesterday was to the effect that the Corporation should really balance expenditure and revenue, and that profits should be used in reduction of price. Therefore we cannot see our way to give that sub-clause in any shape or form.

Mr. BALFOUR BROWNE: Your words are very large; but surely we must have some working capital? No undertaking can be carried on without working capital. Even in a little place like Greenock they were allowed £2000. In every case I have heard of, working capital is allowed. In the Edinburgh case, they were allowed it, though they were not permitted to make a profit. If you leave me without this, what is to happen to me if there is an extraordinary demand? In our Electric Lighting Acts we have power to lay aside a reserve fund. I do not understand how an undertaking can be conducted without some such reserve. I ask for a certain amount of working capital and for a reserve fund.

The CHAIRMAN: I am afraid we cannot make any alteration in our decision on that point.

Mr. FITZGERALD: Will you put in the words "any balance shall be carried to the debit or credit of the succeeding year"?

The CHAIRMAN: I want to hear Mr. Balfour Browne on that. Our decision is that the money received for the undertaking should be used to balance expenditure and revenue. Therefore if you have a loss one year, it will be met out of the profit of the next year. If you have a continuing profit, the price will be reduced.

Mr. BALFOUR BROWNE: Those words of Mr. Fitzgerald (I point it out against myself) would enable us to carry forward any amount so long as we did not apply it to city purposes.

The CHAIRMAN: I want a clause brought up by you carrying out the decision of the Committee as you now understand it.

After further discussion,

The CHAIRMAN said the Committee thought the only way in which Mr. Balfour Browne could meet their view was to insert words similar to the provision in the Oldham Act.

Mr. WILSON: That provision is: "Any balance remaining in any year shall be carried forward to the revenue account of the undertaking for the next succeeding year, and shall, whenever and so soon as there shall be an amount sufficient for the purpose, be applied to the reduction of the gas charges equally throughout the limits of supply."

Mr. BALFOUR BROWNE: That is all right at the end. It depends on what goes before. In the Oldham case, they got £7500 first. You are not giving us that.

A number of other points of little importance having been disposed of, the Committee adjourned.

Thursday, April 14.

This morning, the clauses, adjusted in accordance with the decisions of the Committee, were approved; and the Bill, as amended, was ordered to be reported to the House.

TIPPERARY GAS BILL.

House of Commons Committee.—Tuesday, April 12.

(Before Mr. ARMITAGE, Chairman, Major WILLOUGHBY, Mr. SCANLAN, and Mr. HODGE.)

This is a Bill promoted by the Tipperary Gas Company, Limited, for the purpose, among other things, of conferring additional capital powers on the Company.

Mr. FREEMAN, K.C., and Mr. C. C. HUTCHINSON, appeared on behalf of the Tipperary Urban District Council (the only petitioners against the Bill). The promoters were represented by Mr. RAM, K.C., and Mr. SZLUMPER.

Mr. RAM, in opening the case for the promoters, said the requests they were making in the Bill were modest; and they were necessary for the purpose of the works. This was a limited liability Company, which was incorporated in 1882. The work now performed by the Company was formerly carried on by two private individuals—Mr. Dobbin and Mr. Burke. In 1882, the War Office required gas for some large barracks at Tipperary. The gas-works at the time were inadequate to supply the amount of gas called for; and in that year they were remodelled, and the concern turned into a limited liability Company. There was a Memorandum of Association, which fixed the capital at £10,000, in 1000 shares of £10 each; and there were mortgage debenture bonds to the amount of £3330, which had been issued to the extent of £2280. The capital to-day was £8500 in ordinary shares, and £1500 in preference shares. There were also £2280 of 5 per cent. debenture shares; making a total capital of £12,280. The Company had been working as far as they could on this; but the balance-sheet for 1909 showed that the capital was barely sufficient. To enable them to have enough floating capital for carrying on the works, the Company had had to use their undivided profits, and had also made inroads into their reserve fund. If the Company were to continue to do their duty to the public, they must have increased facilities. Up to a point, the relations between the Company and the Local Authority were altogether on a satisfactory basis, and there were no troubles. Later, however, there had been some friction as to the opening of roads; and the Company had found themselves gravely fettered in extending their mains. In 1903, the Company promoted a Provisional Order; and what they then asked was very much the same as in the present Bill. The result of the inquiry held by Mr. Pelham on behalf of the Board of Trade was unfavourable; and the Order was refused. One of the grounds on which the Order

was refused was that the site chosen was objected to; the other two reasons being that the method of charging was peculiar, and that, relatively to some of the consumers, the price was high. With regard to the question of the site, he still could not show any alteration. It was the only one which was available. The Company had managed to pay their way, and latterly had made good dividends. They had had very little capital; and if they were asked to move the works to another site, it would result in shutting up the whole concern. For many years the Company had supplied gas practically without complaint at all; and there was no suggestion that anybody but the Company could supply Tipperary with gas. If the Company were not allowed to manufacture on this site, they could not supply at all. Lord Barrymore was the principal landowner; and it was from him that the site was leased. The area served by the Company was 3300 acres; the population being 10,000. The consumers numbered 560. The annual make of gas was 18 million cubic feet, and the annual sale 14 millions. Of this, 4 million cubic feet had been supplied to the barracks; but this had now ceased. If the Company had more capital, there was undoubtedly scope for an extension of the business. The capital worked out at £800 per million cubic feet of gas sold. There was capacity in the works for 2 million cubic feet more than they were selling to-day. The expenditure of £3000 would give them a capacity of output up to 25 million cubic feet; and this would bring their capital down to £630 per million. The Company were asking for new capital of £7000, and for borrowing powers of one-third of the amount actually raised, including the premiums. On the original capital of £8500, they asked a dividend of 10 per cent.; on the original preference capital of £1500, 5 per cent.; and on the additional and new ordinary capital, 7 per cent. For the ordinary stock they asked 7 per cent., and for the preference stock 6 per cent. It was also proposed to create a reserve fund and a special purposes fund. A standard price of 5s. was proposed, subject to a sliding-scale. At the present time the price charged was 4s. 11d. per 1000 cubic feet to ordinary consumers. One of the matters which was objected to before Mr. Pelham was that the Company were charging in some extraordinary method, and that the price was high. But now they had brought their ordinary method of charging into absolute line, and there was nothing extraordinary about it. At the time the Order was refused, the price charged was 6s. 8d. It had been gradually reduced from 6s. 8d. to the present figure of 4s. 11d. It was alleged that in 1881 something was paid in respect of goodwill, and that this ought not to be allowed to be considered in relation to capital. It was in 1881 that the undertaking was owned by Mr. Dobbin and Mr. Burke, who sold it to the Company under agreement; Mr. George Anderson being appointed Managing Director. He bought 256 shares at par, and Messrs. Dobbin and Burke retained 257 shares. These were, however, afterwards purchased by Mr. Anderson, who also took 70 preference shares. Mr. Anderson eventually made a capital analysis, and arrived at an amount which included the value of the lease, legal expenses, and so on, which he summed up under the name of goodwill. The promoters denied that there was anything that could properly be called goodwill at all; but if there was any goodwill at any time, it went into the pockets of Messrs. Dobbin and Burke, 29 years ago. Now the Council were asking that this goodwill should be eliminated from the capital.

Mr. FREEMAN pointed out that when a company were coming for certain powers, but were not asking to be incorporated as a statutory concern, the invariable practice was to proceed by Provisional Order before the Board of Trade, and not to come to Parliament as this Company had done.

Mr. RAM said that the sum of £1500 which was described as goodwill was a misnomer.

Mr. FREEMAN remarked that in the agreement between Messrs. Dobbin and Burke and the Company the expression "goodwill" occurred.

Mr. RAM submitted that if he could satisfy the Committee that the works were to-day worth the money they had put down as capital, that was the amount which ought to be allowed as capital. The Council were seeking to put difficulties in the Company's way, though they were not asking to buy them out.

Mr. Robert Bruce Anderson then gave evidence. He said he was the General Manager of the Tipperary Gas Company. With regard to the allegation that if the Bill was passed the Company would not have to publish their accounts, he said he was under the impression that they were compelled to publish them; but if this were not so, they were perfectly willing to be put under an obligation to do so. Regarding the reference in the petition as to the unusual mode of procedure in coming to Parliament for a Bill instead of proceeding by Provisional Order, he considered the latter procedure as more expensive, and he would not go to the Board of Trade unless it was in the case of an unopposed measure. As to the question of goodwill, he said that the agreement under which the Company was formed necessitated that the partners were to assign to the Company everything connected with the undertaking, and the goodwill and everything else was included. Not a single farthing was added to the valuation. When the Company was formed, the price of gas was 7s. 6d. per 1000 cubic feet. Prior to this, it was 8s. 4d.; now it was 4s. 11d. A large quantity of the gas sold was for power purposes and for cooking. The price now charged for cooking was 4s. 6d., and for engines 4s. Their prices were lower than other companies in similar circumstances. The Company's relations with the Local Authority had always been perfectly satisfactory; and he was unable to understand why they were opposing them. The usual practice of Parliament was to take the average price charged for gas, and add 2d. or 3d. on to it. Therefore he considered 5s. a very moderate standard price.

Cross-examined by Mr. FREEMAN, witness said he was interested in some twelve or fourteen other gas companies in Ireland. He held a considerable amount of the share capital—in some cases being the Manager, and in others the Engineer.

Mr. FREEMAN: In this particular business you are Secretary, Engineer, General Manager, and owner?

Witness: No, I am not the owner.

Your family are the principal owners of this undertaking?—My father acquired one-third of the undertaking when he was appointed Managing-Director.

I suggest to you that, on a fair valuation, there is not even approaching £10,000 worth of plant, &c., on the ground?—I think there is quite that.

Replying to further questions, witness said he agreed that when the Company passed a resolution that it should be a private concern, they thereby got rid of the obligation of publishing the accounts.

Mr. FREEMAN then proceeded to deal with the report made by Mr. Pelham as a result of the Board of Trade inquiry, and, quoting from the report with regard to the site of the gas-works, said: "I think that the present site is unsuitable for the manufacture of gas, and that at any rate no statutory authority should be given to the extension of these works on the present site."

Witness agreed that if the site was objectionable then, it was still objectionable. The report concluded with the words: "It is, of course, desirable, if possible, to bring all gas undertakings under statutory control; but in the special circumstances of the case, I do not think that it is possible to make a satisfactory arrangement."

The CHAIRMAN: Supposing you do not get this Bill, what are you going to suffer in the carrying on of your undertaking?

Witness: That is a difficult question. One must consider the difficulty in getting at the mains.

Mr. E. H. STEVENSON, answering a question asked by a MEMBER OF THE COMMITTEE, said it was a common thing all over England among gas companies that a differential rate was charged for cooking and lighting purposes. The works at Tipperary were planned as well as the site would allow. There was no doubt the additional capital of £10,000 would be absolutely necessary. His valuation of the works came to £12,180; and there was no question that the capital was fully represented. The proposal to have a standard price of 5s. was a fair one, in view of the fact that the Company had recently lost the barracks supply. In consequence of this, the standing charges would be increased.

Wednesday, April 13.

Mr. STEVENSON continued his evidence this morning. In cross-examination by Mr. HUTCHINSON, with regard to the procedure in coming to Parliament after having been refused a Provisional Order, he said that in 1903 the Company tried to obtain the sanction of the Board of Trade, and now they were appealing to a higher Court. He agreed that in 1903 the Board of Trade decided that the site was unsuitable for the manufacture of gas, and that Mr. Pelham, the Inspector, had had a very wide experience in gas matters. The policy of the Board of Trade was practically that where people within 300 yards radius objected, the power to use the lands for gas purposes was refused. But this was not the policy of Parliament. Parliament held that where gas-works had been for many years there was no reason to order a change. He had often appealed in the House to upset the decision of the Board of Trade, and had succeeded. In this case, the retort-houses were 60 yards away from the main street. He had known a Provisional Order, where there had been opposition, to cost £3000 or £4000. By the expenditure of £7000 they anticipated an increased sale of about 22 million feet; but he did not know where it was going to be sold, because it would be some time before they got a large number of new consumers. If it was the desire of the Local Authority not to buy the Company out, he could quite understand their pressing that there should be no Act or Order; but if they desired that the consumers should be served in the best possible way, the Company should be put under regulations. If it were decided that they should not have any parliamentary powers, the Company would probably lose all their money.

Mr. HUTCHINSON: In the Fermoy case, you said gas ought to be sold at 4s., and that anything above this would be extravagant?

Witness: I said the standard price for gas ought to be fixed at 4s. That was upon the facts in Fermoy; but the facts here are very different.

Replying to further questions, witness said that the works in Tipperary were well managed up to a certain point; but the quantity of gas made per ton of coal ought to be more. All the Company needed to enable them to carry out their duties was fixity of tenure. He held that it was absolutely impossible to make a valuation upon the contents of a document prepared 29 years ago.

Mr. Frank Jones was also called in support of the Bill. He agreed generally with the evidence given by Mr. STEVENSON.

Mr. Grant, the past Manager, and Mr. Young, the present Manager, of the gas-works, said there had been no written complaints as to the unpleasantness of the works; and the gas supplied was good.

This closed the case for the promoters; and evidence was called on behalf of the Urban District Council.

Mr. Allen, of Tipperary, said the gas-works were quite close to his house, and were a serious nuisance. On the whole, with the incandescent burners he used, the gas supplied was of very fair quality. But if the Bill were passed and the present unsuitable works authorized, there would be no remedy against the Company by obtaining an injunction in case there was a nuisance. There had been general complaint as to the way in which the works had been conducted.

Mr. Daniel Kelly said there were 400 or 500 houses in Tipperary rented at about 1s. per week, which, even when rebuilt, would be unlikely to take a supply of gas. In Fermoy, the standard price was fixed at 4s. per 1000 cubic feet, whereas they were now charging 5s. 5d. In Tipperary, they did not wish for a similar state of things.

Mr. Pelham, of the Board of Trade, then gave evidence, having attended at the request of the Committee with reference to his report upon which the Provisional Order of 1903 was refused. He said that if the plant were increased from 18 million cubic feet to 35 millions, it would tend towards making the gas-works more objectionable. In 1903, his greatest difficulty was with regard to the price. The whole system was so unsatisfactory that he could not see any way out of refusing the Order. He also thought that the then capital was a great deal more than was represented by the plant.

Mr. SZLUMPER: If the question of price could be amicably arranged, would the matter of site be a small point?

Witness: I do not think I should like to express any opinion on the present application.

Witness went on to say that in 1903, if the difficulties of price and

capital had been amicably settled, he might have been inclined to consider the question of the site.

Mr. W. Newbigging said that, having read Mr. Pelham's report, he agreed with it. The price of gas at the present time was too high. The sale of gas averaged, in the years 1907-9, 886 cubic feet per ton of coal carbonized. Under proper management it ought to be at least 1200 cubic feet more. He had made a structural valuation of the works as scheduled to the conveyance of 1882, which amounted to £4326. There was no difficulty whatever in making such a structural valuation. It was unreasonable to suggest that Mr. George Anderson should have purchased the works in 1882 as a going concern, without paying goodwill. He had also made a valuation of the works as they existed to-day, including works and mains, amounting to £8566. If the Bill were passed, he would fix the original capital at £4326, plus the amount the Company had since spent; so that it would amount to about £6500.

Mr. SCANLAN: At what price do you think the Company could afford to supply gas at a profit to themselves?

Witness: At 4s.; and they would be a most successful concern.

After a short consultation, the Committee decided that the Bill ought to go through, subject to certain clauses being introduced. They decided that the price of gas ought to be fixed at a maximum of 4s. 3d. per 1000 cubic feet; they thought there was sufficient capital in the concern for its needs; on the site, the quantity they were now able to produce ought not to be increased, and they would like to hear how this could best be defined—there were certain parts of the plant which were able to produce more gas. The interest on the ordinary capital should be 7 per cent., and on the preference capital 5 per cent.; and the power to apply for an Electric Lighting Order ought to come out of the Bill.

Mr. RAM remarked that the points dealt with by the Committee were those which were really vital to the Bill; and although they were passing it, the terms imposed were such that it seemed to him to make the Bill absolutely impossible for the promoters to take it. Having regard to the great gravity of the situation, he asked that they should have time to consider the matter, because, under the terms, it was a question as to whether they could continue to survive.

Mr. FREEMAN intimated that at the next meeting of the Committee he would ask that the amount of the original capital be reduced.

Thursday, April 14.

This morning, Mr. COOPER, the Agent for the Bill, announced that, under the conditions imposed upon them by the Committee, they could not proceed. He asked leave to withdraw the Bill.

Mr. FREEMAN then asked, on behalf of the Urban District Council, for an allowance in regard to their costs in opposing the Bill; but this was refused by the Committee.

MALLOW URBAN DISTRICT GAS BILL.

House of Commons Committee.—Wednesday, April 6.

(Before Mr. ARMITAGE, Chairman, Major WILLOUGHBY, Mr. SCANLAN, and Mr. HODGE.)

The object of this Bill, promoted by the Mallow Urban District Council, is to empower the Urban District Council of Mallow to, among other things, supply gas, and to provide for the transfer of the undertaking of the New Mallow Gas Company to the Council.

Mr. FREEMAN, K.C., and Mr. C. C. HUTCHINSON appeared on behalf of the promoters; the Company were represented by Mr. RAM, K.C., and Mr. SZLUMPER.

Mr. FREEMAN said he could not understand why the Gas Company were opposing the Bill, because what he was asking was simply what had been granted on every single occasion that it had been asked for by Parliament during the past twenty or thirty years. There was a Gas Company at Mallow which went into liquidation in 1888; and in 1889 it was acquired by a Mr. Anderson, who was interested in a group of small Irish Gas Companies which were distinguished by one characteristic—namely, the high price charged for the gas they sold. The New Mallow Company was formed; and it was registered as a limited liability Company in 1889. The capital of the new Company was £2000, which was in 400 £5 shares, of which 200 were actually taken up. In 1905, the capital was increased by £3000, and debentures authorized up to £1500. So that up to the 6th of April, 1909, the total share capital was £3500. Since that time, preference share capital had been issued to the amount of £1500; making a total of £5000. Under the Bill which the Company promoted, and which was now before the Committee along with the Council's Bill, they were asking for £5000 of what they called original capital, and £6000 which they called the additional capital; making £11,000 in all. Under the Bill, they were asking for a dividend of 10 per cent. on the original capital, 7 per cent. on the additional capital, and 6 per cent. on the preference capital. The only object of the Bill was, of course, to improve their position, and to increase the price they would get from the Local Authority when they came to purchase. This was a small Company; the valuation of the gas-works being at the present time £110, and the mains £60. Complaints had been constantly made both as to the price and the quality of the gas. Prior to 1904, the price charged was 6s. 8d. per 1000 cubic feet; but this was reduced by various stages until at the present time it was 5s. 3d. for the gas supplied by ordinary meters and 5s. for that supplied by the slots. It had been the perpetual endeavour of the Corporation to get the Company to put the supply of gas on a more reasonable basis. There were many complaints against the Company for breaking up the roads and not restoring them to the satisfaction of the Local Authority; and in the end a conflict arose between the two parties. There were other matters of difference owing to the exceedingly high price at which the Company supplied their fittings. Things got from bad to worse; and in 1909 the Local Authority prohibited the Company breaking up the roads, and it was unanimously desired that the Council should purchase the gas undertaking. Strong objection was raised by the

Company to the proposal that the arbitration should be conducted as in railway cases; and he was willing that the arbitration should be carried out by some gentleman to be appointed by the Board of Trade. The result of the procedure under the Lands Clauses Act was an exceedingly expensive tribunal, and was perfectly unsuitable to a small undertaking of this kind. Application had been made by the Council to see the Company's books; but permission had been refused. Dealing with the petition put in by the Company, Counsel said the Company strongly objected to the proposed acquisition of the undertaking by the Council; and they submitted that there was no justification for the unusual condition that the purchase price should be ascertained in the manner suggested. Counsel concluded by asking the Committee to decide on the Council's Bill. If they decided that the Council were to purchase, there would be no necessity to go into the details of the New Mallow Gas Company's Bill.

Mr. RAM pointed out that the purchase should be conducted on such lines, and under such terms, as would insure perfect safety to the persons who were to be bought out against their will. In the Council's Bill, they were proposing a perfectly fantastic mode of arriving at the value of the undertaking, and one which could not fail to put the Company at the greatest possible disadvantage. On behalf of the Company, he could not accept the suggestion of the appointment of an arbitrator by the Board of Trade. The Company should not be made an exception to the general rule, which was that they should have compensation according to the terms of the Lands Clauses Act. If the Council inserted the arbitration clause in the usual terms of the Lands Clauses Act, and agreed to go on with their Bill, the Company's opposition would go. If this were not done, he asked the Committee, before giving their decision on the Council's Bill, to hear the Company's case on their Bill.

Mr. FREEMAN said he desired that the arbitration should be under the Lands Clauses Act, with the one exception that he did not wish to have the totally unnecessary expense of a cumbersome tribunal of three judges in a matter of this kind.

After consideration, the Committee decided that if the Urban District Council were to purchase the gas undertaking, it should be done in the usual way—namely, with two arbitrators, and, if they disagreed, an umpire.

Mr. RAM then asked the promoters to give an undertaking to go through within a reasonable time with their Bill, and use all efforts to get it passed, and, in addition, to go on with the arbitration in a reasonable time under the Lands Clauses Act, and that during the time that must elapse before the purchase was completed they would give all facilities for the opening of the roads.

Mr. FREEMAN agreed, and asked, in return, for an undertaking from the Company that they would not increase their capital or incur anything beyond ordinary expenditure without the consent of the Council, and that they would not in the interval raise the price of gas.

Mr. RAM agreed that this should be done; and he placed before the Committee a clause which he asked should be inserted in the Bill.

Mr. FREEMAN said the Council had repeatedly approached the Company with a view to negotiations for the purchase of the undertaking; but the Company refused an inspection of their books. In the clause which had now been put before the Committee, the Company were asking that there be a direction to the arbitrator varying the Lands Clauses Act by taking away the discretion of the arbitrator and putting an obligation upon him; the whole object being to increase the number of years purchase they would get, and obtain some allowance from the arbitrator for compulsory purchase. He also objected to the suggestion that the Council should pay £500 to the Company in regard to the expenses of promoting their Bill.

Mr. RAM contended that they were being compulsorily bought out.

Mr. FREEMAN also objected to the compensation of the officers of the Company, and especially to the compensation of the Managing-Director. He said that persons had recently been appointed to certain offices in order to come under the clause. It was without precedent that such a thing should be done in the case of a non-statutory Company.

The Committee decided that, as to the words with regard to compulsion, they would be omitted, because they thought it better to leave it to the arbitrator. He would have the whole of the correspondence and the proceedings before the Committee before him, and would be able to see what the position was. The portion of the clause asking the Council to pay £500 towards the cost of the Company's Bill was also struck out; and with regard to the compensation of the officers and servants of the Company, the Committee left it to the Urban District Council to treat them properly and fairly.

Kimberley Water-Works Company.—The report of the Directors of this Company for the past year sets forth that the accounts show a profit of £19,567. The sum of £554 has been provided for the usual items of depreciation and £1600 for debenture interest. The Directors propose to write off £1662 from construction, and to pay a dividend of 2½ per cent. for the six months to Dec. 31; making a total of 5 per cent. for the year. The consumption of water in the period covered was 143,106,000 gallons, compared with 172,566,600 gallons in 1908.

Bombay Gas Company, Limited.—At the meeting of the Company on the 12th prox., the Directors will report a satisfactory increase in the sale of gas amounting to 9·6 per cent., of which 12·4 per cent. was due to private consumers, and 5·8 per cent. to public lamps. The Directors, in continuation of their policy of keeping down the price of gas to as low a figure as possible, have announced to the private consumers a further reduction of 4 annas per 1000 cubic feet, to take effect from and after the 1st of July next; and they have also extended specially reduced rates to consumers of gas for power and trade purposes. It is anticipated with confidence that the increasing demands of the public will still further expand in the near future as a result of these reductions. The profit for the year, as shown by the net revenue account, amounts to £18,259; making, with £3587 brought forward, £21,846 available for distribution. After allowing for the interim dividend paid in December last (£7200), and placing £662 to the reserve fund, there remains £13,984, out of which the Directors recommend the payment of a dividend of 4 per cent., free of income-tax; making 7 per cent. for the year. This will leave £4384 to carry forward.

MISCELLANEOUS NEWS.

PUBLIC LIGHTING OF WESTMINSTER.

Electric Light to be Displaced in the West End—Competitive Tenders—Gas Recommended and Adopted.

As will be seen by the accompanying report of the Works Committee of the Westminster City Council, and by the discussion and vote at the meeting of the Council last Thursday, an important decision has been arrived at as to the lighting of Piccadilly Circus, Piccadilly, St. James' Street, Pall Mall, Regent Street, Waterloo Place, Shaftesbury Avenue, and Coventry Street. In these thoroughfares, high-pressure gas lighting, in units of from 1800 to 3000 candle power, is to take the place of electric lighting. These streets and open spaces are at present lighted by arc lamps, of which there are 66, exclusive of five of different illuminating powers lighting certain refuges. The 66 arc lamps are of the following illuminating powers: Sixteen are of 3000-candle power, four are of 1600 to 1800 candle power, and 46 are of 1000-candle power. These lamps are lighted by the St. James' and Pall Mall Electric Supply Company. The contract for the 66 lamps was entered into in 1886. They were to be 10-ampère lamps; and (there were no flame arc lamps then available) as only 1½ candles per watt at the most could be obtained, the illuminating power of the lamps was nominally 700 candles—the price being £30 apiece. The contract expired in 1925; and the Electric Company then made an offer of £20 per lamp. The Council, however, asked for tenders from the Gaslight and Coke Company; and they quoted £15 1s. for 900-candle power lamps. The Electricity Company then reduced their price to £17 for about 900-candle power; and of lamps of this illuminating power, the 46 referred to above are still in existence, but it is an existence with to-day a limit imposed on it. The other twenty lamps were changed last year, without any increase in the maintenance costs; but the Council paid in respect of conversion £162. Of course, using flame arcs, it required very little increase in the consumption of current to produce the extra light. Therefore, at the present moment there are, under the electrical contract, 66 lamps all costing £17 each per annum.

Contracts for the lighting are expiring; and the City Engineer (Mr. J. W. Bradley) called for tenders, through the Works Committee (of which Mr. Jacques Abady is the Chairman), for definite units of illumination, so as to give them means of comparing costs in respect both of gas and electric lamps. Now if one takes the district, and puts into it sixteen 3000-candle power lamps, and replaces the remainder by 1800-candle power lamps, it will mean an increase in the total light of some 50 per cent. The Electric Company quoted for 3000-candle power lamps £28 per annum, and for 1800-candle power lamps £21 per annum. The Gas Company quoted for 3000-candle power lamps £22 per annum, and for 1800-candle power ones £15 10s. Therefore, inasmuch as the lamps will be on exactly the same columns, and in exactly the same position, it will be seen that, since the lamps are to be tested photometrically and penalties inflicted for infractions of the illuminating contract, the lights will be absolutely comparable as regards candle power. The total of the Gas Company's tender (without capital costs, which came to about the same as those of the Electric Company) for maintaining the lamps was £1204 10s., as compared with £1603 for the Electric Company. The present cost (without capital) is £1209; but it must be remembered that the new prices are for 50 per cent. more light. What alternative had the Works Committee in face of these figures, seeing that they can get more illumination from the Gas Company than from the Electric Company at less cost? The other areas considered are at present lighted by low and high pressure lighting; and it need hardly be said that the Gas Company have easily held their own. The new prices will about double the light for 10 per cent. less cost.

At the Meeting of the Westminster City Council last Thursday, the question of the public lighting of the city came up for consideration, on the following report presented by the Works Committee.

The expiration this year of the street lighting contracts, practically all held by the Gaslight and Coke Company, in (a) Knightsbridge, (b) the parish of St. Margaret and St. John, (c) a portion of St. Martin's parish and the Strand District, and (d) St. James's, made it possible for the Council to deal with this question in a comprehensive manner, in relation to the marked improvements which have been made in recent years in the methods of producing artificial light from gas and electricity at less cost per unit of higher power than formerly. An opportunity was consequently afforded for generally improving upon what now exists in these districts, at a saving in the cost, or of still further improving the lighting without increase of cost. Competitive tenders were therefore obtained from the Gaslight and Coke Company and the several electric light companies for the installation of lighting units of different powers—viz., 90, 180, 300, 1800, and 3000 candles; the Council being placed in a position to select one or other of the units, according to the needs of each class of street as may be determined by considerations of width, conditions of traffic, &c. For the supply of gas or current, as the case may be, to these several units, and for general maintenance, further tenders were obtained, any of which may be accepted for a term of five, ten, or fifteen years, at the option of the Council.

It should be pointed out that the basis on which tenders were invited was so much light for a given number of hours per annum; and as a given candle power—for instance, 90 or 300 candles—has exactly the same value whether produced by gas or by electricity, all the Committee have had to consider has been the cost of installation, and also the annual cost for the different units. The classification of streets for lighting purposes—another important matter—will be for the Council to decide at a later date. But whatever classification is adopted will not affect the comparative costs of the different methods of illumination. It may, however, be stated that, in settling the specification, certain streets of importance were named in each district in which the Council

TABLE I.—Existing Units of Light under Contracts Terminating in 1910.

| Number of Lamps. | System. | Average Candle Power and Cost per Lamp per Annum. | Number of Lamps in | | | |
|------------------|-------------------------|---|--------------------|-------------|-------------|-------------|
| | | | District A. | District B. | District C. | District D. |
| 1568 | Low-pressure gas | 53 c.p., at £3 2s. 10d. | 363 | 951 | 254 | .. |
| 1235 | " " " (two burners) | 83 c.p., at £5 9s. 6d. | 20 | 79 | 580 | 556 |
| 27 | " " " (three ") | 130 c.p., at £8 12s. 6d. | 3 | 10 | 8 | 6 |
| 9 | " " " (four ") | — c.p., at £9 15s. | .. | 1 | 8 | .. |
| 6 | " " " (five ") | — c.p., at £10 12s. 3d. | .. | .. | 6 | .. |
| 43 | High-pressure gas | 1044 c.p., at £15 1s. | .. | 33 | 20 | .. |
| 8 | " " " " | 473 c.p., at £13 os. 9d. | .. | .. | .. | .. |
| 2 | " " " " | 284 c.p., at £8 os. 4d. | .. | .. | .. | .. |
| 46 | Open arc electric lamps | 911 c.p., at £17. | .. | .. | .. | 46 |
| 16 | Flame arc " " | 3575 c.p., at £17. | .. | .. | .. | 20 |
| 4 | " " " " | 1656 c.p., at £17. | .. | .. | .. | .. |

N.B.—Strand district electric lighting contract, terminable in 1913 or 1920 at option of Council : 121 arc lamps, average candle power 614, at £27 18s. 3d. (average) each per annum ; and 3 flame arc lamps, average candle power 1270, at £27 13s. 4d. (average) each per annum. St. George's parish electric lighting contract : (a) Terminable in 1913, 5 flame arc lamps, average candle power 1573, at £14 each per annum. (b) Terminable in 1931, 957 arc lamps, average candle power 449, at £41 2s. 5d. each per annum ; and 216 lamps (various), at £3 9s. (average) each per annum.

TABLE II.—Summary of Tenders for Installation, at Per Unit.

| Candle-Power Units. | | Gas. | | | | Electric. | |
|---------------------|----------------------------------|-------------|-------------|-------------|-------------|----------------------|-------------|
| | | District A. | District B. | District C. | District D. | Districts A, C, & D. | District B. |
| | | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| 90 | Fitted to existing gas pillars . | 0 7 6† | 0 7 6 | 0 7 6 | 0 7 6 | .. | .. |
| | | 1 5 0* | 1 5 0 | 1 5 0 | 1 5 0 | 2 10 0 | 2 10 0 |
| 180 | Do., with extension to 12 feet . | 0 12 6† | 0 12 6 | 0 12 6 | 0 12 6 | .. | .. |
| | | 1 5 0* | 1 5 0 | 1 5 0 | 1 5 0 | 2 15 0 | 3 0 0 |
| | | 3 10 0* | 3 10 0 | 3 10 0 | 3 10 0 | 6 10 0 | 6 10 0 |
| 300 | Do., with extension to 15 feet . | 1 10 0† | 1 10 0 | 1 10 0 | 1 10 0 | 4 0 0 | 4 0 0 |
| | | 4 0 0* | 4 0 0 | 4 0 0 | 4 0 0 | 7 10 0 | 8 0 0 |
| 1800 | Special design pillar, 20 feet . | .. | 2 10 0 | 2 10 0 | .. | .. | .. |
| | | 10 0 0* | 10 0 0 | 10 0 0 | 10 0 0 | .. | .. |
| | | 20 0 0* | 17 0 0 | 17 0 0 | 20 0 0 | 30 0 0 | 35 0 0 |
| 3000 | " " " " | .. | 2 10 0 | 2 10 0 | .. | .. | .. |
| | | 10 0 0* | 10 0 0 | 10 0 0 | 10 0 0 | .. | .. |
| | | 21 0 0* | 18 0 0 | 18 0 0 | 21 0 0 | 35 0 0 | 35 0 0 |

* New pillars. † Converting existing lanterns. ‡ New lantern where necessary. § New lantern on electric pillars.

TABLE III.—Summary of Tenders for Maintenance, at per Unit per Annum (3940 Hours).

| Candle-Power Units. | Gas—A, B, C, and D Districts. | | | Electric—A, C, and D Districts. | | | Electric—B District. | | |
|---------------------|-------------------------------|-----------|-----------|---------------------------------|-----------|-----------|----------------------|-----------|-----------|
| | 5 Years. | 10 Years. | 15 Years. | 5 Years. | 10 Years. | 15 Years. | 5 Years. | 10 Years. | 15 Years. |
| 90 | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| | 2 16 6 | 2 15 0 | 2 12 6 | 5 0 0 | 4 0 0 | 3 7 6 | 5 0 0 | 4 10 0 | 4 0 0 |
| 180 | 4 10 0 | 4 7 6 | 4 4 0 | 8 0 0 | 6 10 0 | 5 15 0 | 8 0 0 | 7 5 0 | 6 10 0 |
| 300 | 6 10 0 | 6 6 0 | 6 0 0 | 12 0 0 | 10 10 0 | 9 5 0 | 11 0 0 | 10 0 0 | 9 0 0 |
| 1800 | 15 10 0 | 15 0 0 | 14 5 0 | 21 0 0 | 19 5 0 | 17 10 0 | 20 0 0 | 19 0 0 | 18 0 0 |
| 3000 | 22 0 0 | 21 5 0 | 20 5 0 | 30 0 0 (28 0 0 in C and D.) | 25 0 0 | 22 0 0 | 28 0 0 | 27 0 0 | 26 0 0 |

might, as foreshadowed above, wish to effect greater improvements by the adoption of higher lighting power units. Certain experimental installations have been set up in Victoria Street and elsewhere at the expense of the competing Companies, which constitute a practical and valuable exhibit of different forms of lighting in juxtaposition ; and besides viewing these exhibits, the Committee made a tour of inspection of the systems now in use in Westminster, and extended their inspection to the City of London, where, in Fleet Street, a notable example of gas lighting is set up.

Table I. shows the existing units of lights under contracts terminating in 1910, and with which, therefore, this report deals. It will be seen from the table that the districts now being dealt with are those lighted by gas, together with the district lighted by 71 arc lamps by the St. James's and Pall Mall Electric Light Company. The electric lighting in the Strand district and throughout the parish of St. George is not affected. Table II. deals with the first cost—i.e., installation ; and the only remark to be made upon this is that the Gas Company offer to spread any cost over the contract period without interest, thus further increasing the difference in the cost of installation which a glance at the table will show exists between the gas and electric light tenders. Table III. deals with the annual cost—i.e., the supply of various units of light, together with lighting, extinguishing, maintenance, &c.

The above quotations in Tables II. and III. for identical units of lighting need little comment. The Gas Company's tender for installation (Table II.) is very much below the electric supply companies' tenders. For lighting and maintenance (Table III.)—that is to say, the annual charge—the same marked difference in cost is shown in favour of gas, light for light. Not to labour the point too much, one comparison only is made. Worked out, the difference in cost (Table III.) for a term of five years for the five units specified is 76·99, 77·77, 80·77, 33·87, and 29·54 per cent. respectively in favour of gas. That is to say, it would cost these percentages more for maintenance year by year if electricity were preferred to gas ; and for such extra cost not a single candle power better lighting would be obtained. The Committee therefore recommend the acceptance of the lowest tender—that of the Gaslight and Coke Company—for the districts at present lighted by that Company, and for that lighted by 71 arc lamps by the St. James's and Pall Mall Electric Company.

The Westminster Electric Supply Corporation supplemented their tender by an offer that if the Council extend the Company's contract for public lighting in the parish of St. George (which continues until

1931) to the whole of District B (St. Margaret and St. John), they will convert the 962 arc lamps in St. George's parish to flame arc lamps of 1800-candle power, and also convert the incandescent lamps in the same parish to metal filament lamps, at their own expense. Under the above-mentioned contract for public lighting in St. George's parish, the Council may, in certain circumstances, obtain from the Company an improvement in the lighting of the parish without additional cost ; and, moreover, the cost of the supplemental scheme submitted by the Electric Light Company would be very much greater than the cost if the lowest tender (that of the Gas Company) be accepted.

In a letter, dated the 14th of March, which accompanied their tender, the Gas Company asked the Council to waive, as in former contracts, the clause relating to rates of wages and hours of labour ; and, as they have their own insurance fund, amounting to £126,900, they presumed they would not be required to enter into a special insurance policy to insure the Council against any liability under the Workmen's Compensation Act, 1906, as provided in clause 22 of the conditions of contract. They also suggest that in place of the uniform penalty of 5s. per day per lamp not giving specified candle power, provided by clause 19 of the conditions of contract, the penalty should be 6d. per lamp for small units, and 5s. per lamp for large ones. The Committee see no objection to the Council modifying the conditions of contract as to wages and hours, and as to insurance, subject to protective conditions.

They recommend : (1) That the lowest tender in each district—viz., that of the Gaslight and Coke Company—be accepted for a term of five years, leaving for after-consideration the settlement of what units of lighting shall be installed street by street, when only the actual figures of cost can be worked out. (2) That the Council do waive clause 21 of the conditions of contract, relating to rates of wages and hours of labour, as regards the acceptance of the Gaslight and Coke Company's tender. (3) That the Company's insurance fund be accepted as the insurance company referred to in clause 22 of the conditions of contract during such time only as the Council shall be certified that such fund is not less than £100,000, and subject to the Council being satisfied of the stability of the fund. (4) That the Company be asked whether they are willing to continue the contract after the expiration of five years for a further period of five years, making ten years in all, on the terms of the tender for ten years, in the event of the Council so deciding, and giving the Company written notice, not less than six months before the expiration of five years of the contract period, that the contract shall be continued for such further period.

A petition from shopkeepers in Regent Street and Piccadilly was presented to the Council by Mr. F. H. Bingham, asking that the consideration of the subject dealt with in the foregoing report should be postponed "for further consideration."

On the motion for the adoption of the report and recommendations, Mr. BINGHAM moved, as an amendment, that they be referred back for further consideration and report. He said the decision of the Committee had been arrived at at a not very full meeting; but they had come to their conclusion on a very exhaustive report, and they felt there was no alternative but to accept it. He was of opinion that the Council really had no alternative than to do likewise; but before doing so there were one or two matters which they should make quite sure of. These were: (1) That they were really paying for their light on the candle-power system; and (2) that they were getting their light under the new arrangement as cheaply as was made out, and that it would be as good as that which they were now getting. He had not been on the Sub-Committee who went round to view the lighting, but he had gone about on his own account. In Fleet Street there was a very fine light given by means of high-pressure gas; but it was to be remembered that in recent months electric lamps had been put up in Regent Street which each gave a light of 3000-candle power, and made the street probably the best-lighted thoroughfare in Europe. Municipal experts came from all quarters to see such extremely good lighting; and the inhabitants were disturbed at the prospect of being interfered with, and at the possibility that they would not get so good an illuminant. In his opinion, if it was quite certain that the illuminating power would be maintained, and the lighting be equally effective, then the Council ought to adopt gas. He, however, found in Fleet Street that the high-pressure gas-lamps were 34 yards apart; and standing midway between them he tried to read a newspaper, but could not do so. The electric lights in Regent Street were 54 yards apart, and he found that he could easily read a newspaper while standing midway between them. While he was quite prepared to admit that it was not desirable to convert the streets into reading-rooms, he held that the Council should be cautious in what they were doing. If the same light was to be given in Regent Street by gas as they had now, and the Fleet Street scheme was adopted, for every four lamps in Regent Street five-and-a-half would be wanted, and the whole of the saving supposed to be made by the adoption of gas would disappear. As he had indicated, he had an open mind on the whole question; but he certainly thought the ratepayers in the streets concerned should be considered, and that no harm could be done by postponing the subject for a fortnight. He had just been told by the Chairman of the Works Committee that the lamps in Fleet Street were not 3000, but only 1000-candle power. This being so, they should see a 3000-candle power gas-lamp burning before coming to a decision.

Mr. FLINT, seconding the amendment, said that, like the previous speaker, he was perfectly indifferent as to which illuminant was adopted, so long as it was the best and the cheapest. To people who were not familiar with recent improvements in gas, it was something of a shock to propose to go back to gas from electric light; and he favoured delay, in order that the tradesmen of Regent Street and Piccadilly might get a better knowledge of the subject. Everyone on the Sub-Committee was astonished to see the enormous decrease in cost which would be effected by adopting gas instead of electricity; and he was perfectly sure that the shopkeepers in the streets named would, at the finish, be convinced that gas was the better illuminant. Under these circumstances, and considering the heavy rates paid by these people, he was of opinion that it would be better not to press the matter to a decision at this meeting. If the tests of the City Engineer with the photometer were absolutely accurate, gas came out very much better than the electric light; and on these tests no one need be nervous about the contract not being carried out by the Gas Company to its fullest extent, as all the records showed that they kept up the candle power better than the electric light people.

Mr. JACQUES ABADY, the Chairman of the Committee, said he rose to correct a misapprehension upon which the previous speakers had founded their remarks. There was no suggestion to introduce into Regent Street lamps similar to those used in Fleet Street. In Regent Street the columns belonged to the Council, as did also the lamps; and what was proposed was that the arc lamps should be taken from the tops of the columns and high-pressure gas-lamps substituted for them. There would be 50 per cent. increase in the light at 30 per cent. cheaper cost; and the positions of the columns would be absolutely the same.

Alderman C. SPENCER-SMITH said he did not see why the whole thing should be hung up because certain people did not know what they were going to get. There was no comparison in cost between the tenders for gas and electric light.

Alderman EVERITT said the shopkeepers in Regent Street and Piccadilly were very large ratepayers, and were entitled to some consideration. He therefore favoured an adjournment. At the same time, he wished to make it perfectly clear that he was absolutely in favour of gas instead of electric lighting for the streets. He was not always so, because electric lighting was introduced into the streets by the St. George's Vestry on his casting vote as Chairman. Since then, however, the Gas Company had awakened. If they had started to make improvements before, the streets of St. George's would never have been lighted by electricity. There was no comparison now between the two illuminants; gas was unquestionably the better and the cheaper. Some of the best-lighted streets in London, or anywhere else, were now lighted with gas. The shopkeepers of Piccadilly and Regent Street paid an enormous amount in rates; and when they were fully aware of the situation, he had no doubt they would hold that the decision of the Committee was right.

Mr. GRAY endorsed the remarks of the last speaker, that when the St. George's Vestry accepted the contracts for the electric lighting of the streets improvements in gas lighting were only in their infancy.

Mr. ABADY said he was perfectly willing to take the report back, if any good object could be accomplished by so doing. He, however, failed to see what could be done. The petition simply asked that the matter should be postponed in order that it might be further considered. Considered by whom? The Committee who had charge of the matter had given it the most careful consideration—both by the Special Lighting Sub-Committee and the Works Committee; and the

decision was unanimous. The tenders had been viewed on a strictly competitive basis. What he wanted to know was what the Committee had further to consider. He asked the Council to suspend their judgment as to the advisability of the matter going back until they had heard the facts which he proposed to give them. A copy of the private and unpublished report of the Committee and its recommendations had got into the hands of someone who, acting obviously in the interests of one of the parties, went round to the shopkeepers of Regent Street and got them to sign the petition on the alleged ground that reverting to gas would be a retrograde movement. That the proposal was not a retrograde one would be evident from the following facts: St. George's parish was lighted by arc lamps under a 31 years' contract already 10 years old; and as its revision was not before them, the matter was *sub judice*. Part of the main streets in the Strand district were lighted by electricity under a contract expiring in 1913; and if only they could revise this now, they could save a good deal. The rest of the city was lighted in this way: All the minor streets by low-pressure gas; Whitehall, Kingsway, &c., by high-pressure gas; and Regent Street, Piccadilly, &c., by arc lamps provided by the St. James' and Pall Mall Electricity Company. The low-pressure lighting cost about £13,000. If they accepted the Gas Company's tender, they could double the light for about 10 per cent. less cost. If they accepted the Electricity Company's tender, the same light would cost about £20,000—a difference of £8000 a year. Was there any question there as to what course they should take? The high-pressure gas lighting by 53 lamps cost £920. If they accepted the gas tender, they could just upon double the light for £7 per annum more. Electricity would cost £1400. Was there any question there? The remaining part to be decided was as to Regent Street, Piccadilly, St. James' Street, &c. Here there were 71 arc lamps—part 3000, part 1800, and part 1000 candle power—costing £1338 per annum. The Electricity Company had now put up their prices for the two former units, which were all they contemplated using, from £17 to £28 and £21 per lamp per annum; and if they fitted these 71 lamps, 15 of them with 3000-candle power and 55 with 1800-candle power, the total light would be increased by 50 per cent. it was true, but the price would be £1700 per annum, or nearly £400 a year increase. By putting 16 3000 and 55 1800 candle power high-pressure gas-lamps, they would get the same increased light, but for £1340 per annum, or what they were paying now for 50 per cent. less light; and if the contract were accepted for 10 years, which the Committee would not do—they could have saved £100 per annum. This was the decision they had come to; and how could they do otherwise, even if the matter was sent back? Was the decision of the representatives of the ratepayers to stand, or would the Council give the lighting of the streets into the hands of persons who were not elected? Right through the Committee had considered the matter on the basis of candle power; and if there was any advantage in the matter of colour, it was all on the side of gas, for flame arc lamps gave a yellow light, which was prejudicial to the appearance of the goods that shopkeepers displayed in their windows. The light of gas was very much whiter. Candle power for candle power, no matter how the light was produced, had been the basis upon which the Committee had gone; and they had no alternative, in the interests of the ratepayers, but to accept the lowest tender. As business men, they had indeed no choice in the matter. If the Council accepted the tender, they would increase the light in the West End area, where the shopkeepers were afraid that the illumination might be decreased. They were making stringent conditions as to the manner in which the light was maintained by the Company; and he could not see what good it would do to defer matters. He had no personal interest either in gas or in electricity; but he had taken an immense amount of trouble in this matter, and he wished other people had enlightened themselves on the subject before they came to the Council and talked about it being a retrograde step to go from electricity to gas. Many modern cities were abandoning electricity for gas because it was cheaper. The Commission from the Corporation of London who visited all the best Continental cities had lately, as the result of what they saw, adopted high-pressure gas lighting in the City. The Council must remember that gas had been made much cheaper by the introduction of the inverted burner. Five years ago they could only get 15 or 20 candle power per cubic foot; now they could get 25 candles on low pressure and 40 candles on high pressure. If the matter was to be postponed who was to consider it, and how was it to be considered otherwise than had been done?

Alderman PROBYN said he thought it would be admitted that the Gas Company's tender should be accepted; but he thought it would strengthen the Committee's case not to hurry the matter, in deference to the petitioners' wishes.

Mr. GEORGE COX suggested that, as a local authority, they were not concerned with the lighting which was best for the tradesmen's shops. All they had to concern themselves with was what was the best light for the thoroughfares; and if they could get as good a light with gas as with electricity at a reduced cost, they ought to accept it, and leave to the tradesmen the matter of lighting their own premises sufficiently.

Mr. SOMERS-COCKS thought, however, that the matter might be formally adjourned for a fortnight as a sop to Cerberus, and to show that the Committee were considering the matter thoroughly; also that a letter should be sent to the petitioners.

Mr. PULMAN felt that some attention ought to be paid to the petition of the ratepayers of Piccadilly. The only doubt in their minds was whether 3000-candle high-pressure gas was absolutely co-equal with 3000-candle electric light. This was the position of the petitioners; they did not want to take any chances in the matter. He thought a light of 3000-candle power might be put up in the district in question as an experiment; and if this proved satisfactory, the contract could then be accepted.

The amendment was then put, and negatived by a large majority.

Mr. BROWNE-MARTIN (a Director of the Westminster Electricity Corporation) said he did not believe 5 per cent. of the councillors used gas in their homes, but they tried to force it on the tradesmen. He moved, as an amendment, that the Council should accept the contract, but give the Committee the option to exempt the Regent Street and Piccadilly lighting from it if they thought fit.

Mr. ABADY said the Committee had already a right to do this under the contract.

Mr. BINGHAM seconded the amendment ; but on being put it was lost. Alderman EVERITT then moved that the contract be accepted, but that the question of the 71 arc lamps in Pall Mall should be referred back. He said the Council had no right to refuse to consider the petition sent in by any ratepayers ; and as the petition in question had only arrived that day, it could not be said to have received proper attention.

The amendment having been seconded,

Mr. ABADY, in reply, said he had given the gist of the petition in his speech. He felt sure that if the petitioners had known the facts which had been put before the Council that afternoon, they would never have sent in the petition ; and when they heard what had been done and said, they would be quite satisfied.

The amendment was then put and lost. No other being forthcoming, the Committee's recommendations were adopted. The majorities against the amendments were in each case so large that hands were not even counted.

PUBLIC LIGHTING OF LAMBETH.

The Lighting Committee of the Lambeth Borough Council have had under consideration for some time the question of the charges made by the Gaslight and Coke Company for the public lamps, as compared with those of the South Metropolitan Company. There has also been some correspondence with the former Company, with the view of obtaining reductions in their charges in order to make those in the two districts more nearly equal. The illuminating power and price of gas supplied by the two Companies are now the same ; but the charges in the Gaslight and Coke Company's district are 1s. 6d. per lamp per annum less than they would have been if it were not for the introduction of the automatic lighting system, which is not in use in the other Company's district. The South Metropolitan Company, as well as the South Suburban Gas Company, allow a discount of 5 per cent. from their charges on payment of accounts within one month from the rendering of them. These two Companies also include in their charges repairs to, or replacement of, lamps damaged, run against, or decayed beyond repair ; but the Gaslight and Coke Company have not hitherto done this. In the result, they have agreed to make somewhat considerable reductions in their charges, subject to a new agreement being entered into, and for the future to accept the charges as covering the cost of replacements or repairs. The effect of these proposed new arrangements can best be seen from the following table, which is based on the present number of lamps :—

| No. of Lamps. | Kind of Lamp. | Present Charge per Lamp per Annum | Total Present Cost. | New Charge per Lamp per Annum. | Total Future Cost. |
|---------------|----------------------------------|-----------------------------------|---------------------|--------------------------------|--------------------|
| | | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| 437 | No. 2 burners | 2 6 2 | 1008 14 10 | 2 4 4 | 968 13 8 |
| 148 | Do. | 2 4 8 | 330 10 8 | 2 4 4 | 328 1 4 |
| 7 | Do. (day and night) . . | 3 13 2 | 25 12 2 | 3 11 6 | 25 0 6 |
| 1 | Do. with bye-pass . . . | 2 9 8 | 2 9 8 | 2 7 8 | 2 7 8 |
| 255 | No. 4 burners | 3 3 3 | 806 8 9 | 2 18 0 | 739 10 0 |
| 1 | Do. on refuge | 4 12 9 | 4 12 9 | 4 6 0 | 4 6 0 |
| 2 | Do. (day and night) . . | 5 11 2 | 11 2 4 | 4 17 6 | 9 15 0 |
| 3 | Do., special lanterns . . | 3 9 7 | 10 8 9 | 3 5 0 | 9 15 0 |
| 1 | No. 4 burners | 7 7 9 | 7 7 9 | 5 2 0 | 5 2 0 |
| 4 | Do. | 8 17 4 | 35 9 4 | 7 0 0 | 28 0 0 |
| 2 | 3 5-ft. per hour burners . | 10 7 0 | 20 14 0 | 9 15 0 | 19 10 0 |
| 1 | "Horns"—lighting only | | | | |
| | "Horns"—pay for gas, &c. | 0 15 0 | 0 15 0 | 0 15 0 | 0 15 0 |
| | Totals | .. | £2264 6 0 | .. | £2140 16 2 |

Total reduction per annum, £123 9s. 10d.

The Council already have an agreement with the Gaslight and Coke Company as to the reduction of 1s. 6d. per lamp per annum on account of the use of the automatic lighting apparatus. This will expire on Feb. 8, 1914, after which a further reduction is contemplated if the use of the automatic apparatus is continued. It is suggested that the new agreement should expire on the same date as that relating to the automatic lighting agreement, in order that any rearrangement of prices may be made as from the date of the expiration of the two agreements. The revised prices stated above will be subject to fluctuation on an increase or reduction in the price of gas.

At the meeting of the Council last Thursday, the Committee recommended that the offer of the Gaslight and Coke Company should be accepted, and that an agreement on the basis named should be entered into for the period expiring on Feb. 8, 1914. This was agreed to.

The same Committee reported that in July last the Council accepted an offer from the South Metropolitan Gas Company to convert all the existing lamps fitted with No. 4 burners to the inverted pattern, at a charge of 3s. per lamp, subject to a reduction in the annual charges for maintenance. The Committee had received an offer from the Gaslight and Coke Company to convert certain lamps to the inverted system as follows :—

| Kind of Lamp. | Charge per Annum. | Cost of Conversion. | Charge per Annum after Conversion. |
|------------------------|-------------------|---------------------|------------------------------------|
| One No. 4 burner . . . | £2 18 0 | .. 9s. 6d. | £2 15 0 |
| Two No. 4 burners . . | 5 2 0 | .. 11 3 | 4 18 3 |
| Three " " | 7 0 0 | .. 11 3 | 6 16 3 |

It will be seen from the above that the cost of conversion is equal to three years' saving on the reduced charges after conversion. The Company, however, had offered to bear the cost of the conversion if the Council would agree to pay for three years the charges that would be borne if the present burners were retained—the charges then to be reduced to the above-mentioned figures. The Committee recommended that the 255 lamps fitted with a single No. 4 burner, one lamp with two of these burners, and four lamps with three of them should be converted to the inverted incandescent system at the cost of the Gaslight

and Coke Company, subject to the charges for the lamps being reduced as shown above at the end of three years. This was agreed to.

In a further report, the Committee stated that they had also had under consideration for some time the question of the conversion of the refuge lamps in the South Metropolitan Company's district to the inverted system. The present cost per annum of these was £182 11s. 8d. ; and if the offer of the Company was accepted, the future cost would be £168 7s. 9d. By the Company's scheme, for an immediate expenditure of £18 3s. there would be a considerable increase in the illuminating power of the refuge lamps, with a reduction in cost of £14 3s. 11d. per annum. The Committee recommended that the Company's offer be accepted ; and this was agreed to.

BRISTOL CORPORATION AND THE GAS COMPANY.

Withdrawal of Opposition to the Company's Bill.

At the Meeting of the Bristol Town Council last Tuesday, reference was made to the compromise which has been come to between the Corporation and the Gas Company, as the result of which, as mentioned in the "JOURNAL" last week, opposition to the Company's Bill will be withdrawn.

Alderman PEARSON, on behalf of the Parliamentary Bills Committee, said this was the first occasion on which they had ever had an opportunity of discussing with the Gas Company their proposals ; and he thought the new departure was extremely useful, and would lead to good results. It was a testimony to the common sense of those who were responsible for the Bill, that they saw fit to consult the Committee on the subject. Both sides considered the matter with a straightforward desire to come to an agreement if they could, and to reconcile the differences which apparently existed between them. The result was that there would be no further expense incurred. As to the question of sulphur being eliminated, he might point out that this was not an impurity which it was worth while to go to great expense to get rid of ; and the Committee gave way to the Company, as also on the question of 14-candle illuminating power gas. As to testing, they had accepted a modified proposal, which would appear in the Bill. He wished the Company had taken power to lay mains in streets not at present dedicated to public use ; but they felt they had better not do this. The only objection the Committee had was that the Company proposed to lay pipes where they thought fit in such cases, while the Committee felt they ought to be put in subject to the supervision of the Corporation, so that when they took over the street they might not be in the position of having to move the pipes at their own expense.

He moved the adoption of the Committee's report.

Mr. ILES seconded the motion.

Mr. WHITEFIELD asked for information in regard to the clause as to referring the right of the Company to require consumers to execute repairs to pipes laid under the streets. He wished to know if it had been the law in the past for the tenant to be responsible for it ; if not, it was a most serious thing for the inhabitants of the city, and a matter that should be very carefully looked into. If it had been the custom in the past, why did the Company wish to incorporate it in their Bill ?

Alderman PEARSON replied that the original clause in the Bill would have made it compulsory on the consumer to make any necessary repairs between the main and the meter and the meter and the house ; but the present arrangement was that the repairs would be apportioned. Time was when they were not allowed to have a meter in their own house ; but now that it was brought into the house, it did not seem to him to be an injury to agree that the tenant should repair the pipe on his premises, but that when it was off it should be repaired by the Company. The private individual had no right to break up the highway and put the pipe in repair ; so that it was clear with whom the duty should rest. The Committee did not think that the Company were acting at all unfairly in the matter.

The report was adopted.

MR. A. DOUGALL ON THE MANUFACTURE OF GAS.

At the Town Hall, Tunbridge Wells, on Monday evening last week, Mr. Andrew Dougall, M.Inst.C.E., the Engineer and General Manager of the Tunbridge Wells Gas Company, gave a lantern lecture before the members of the Tunbridge Wells Chamber of Commerce on "Coal Gas : Its History, Manufacture, and Uses." There was a large attendance. Mr. Dougall first traced the development of the gas industry from the early discoveries of more than a century ago, which proved the possibility of obtaining gas from coal for illuminating purposes, and then proceeded to describe in great detail, and by the aid of many illustrations, the methods employed to extract the gas, purify it, and collect the numerous, and in some cases valuable, residual products. The Bunsen burner and the Welsbach mantle were described ; and tables showing the illuminating power obtained from various burners were quoted. Examples of public and shop lighting were exhibited ; and the most economical methods of using gas-fires were explained. A series of slides furnished evidence of the substantial progress made in the gas industry during the past quarter-of-a-century.

As a concluding picture, Mr. Dougall showed a portrait of Alderman Delves, the Chairman of the Tunbridge Wells Gas Company, who is the only freeman of the borough. He said he ventured to think that among the many and varied services Mr. Delves had rendered to Tunbridge Wells none had been more generally useful than that of Director of the Gas Company—a position he had filled for more than fifty years ; and it was largely to his business ability and keen perception that the price of gas had been brought down to the present moderate figure of 2s. 7d. per 1000 cubic feet, compared with 6s. 8d. formerly charged. In conclusion, Mr. Dougall said that what he thought was very striking in the progress of the gas industry during the half-century Alderman Delves had been on the Board of the Company was the fact that it had been possible to obtain 35 times more light for the same money now than was the case before. Surely this was a wonderful development for an industry.

GLASGOW GAS CONSOLIDATION BILL.

Observations on the Position.

At the Meeting of the Glasgow Town Council last Thursday, the decision of the House of Commons Committee on the above-named Bill, reported in our "Parliamentary Intelligence," was the subject of some remarks.

Mr. W. F. Anderson asked the Convener of the Parliamentary Bills Committee (Mr. J. Macfarlane) if they would afford the Council an opportunity of considering the effect of the decision before proceeding to the House of Lords. Mr. Macfarlane said he rose with some sense of responsibility to reply to the question. He felt that there was some feeling in the Council in regard to the success, or non-success, their efforts had met with in London. He might say that, so far as the Sub-Committee were concerned, he had received from each member the whole-hearted support he had expected; and in the course of the proceedings the Sub-Committee were absolutely unanimous. He could assure the Council that they were as disappointed as the members of the Corporation could be at the findings of the Committee. They considered the matter very carefully in all its details, and came to the conclusion in the meantime that they should proceed with the Bill. They were quite agreed that the matter should be laid, not only before the Parliamentary Bills Committee, but before the Gas Committee; and that the Corporation should have an opportunity of considering the matter very carefully.

In the Pollokshaws Town Council, on Thursday evening, the Town Clerk reported on the result of their opposition to the Bill, and said that if the measure had passed, the outside authorities would have been absolutely at the mercy of the Glasgow Corporation. Provost MacDougall said that if the opposition had achieved nothing else than the defeat of the proposal of the Corporation to apply the profits of the gas undertaking to the reduction of the city rates, it would have been worth all the trouble and expense. The Corporation now found that the outside authorities were determined to resist any encroachment by the city on their rights.

PROFITS AND THE RATES AT MANCHESTER.

When a proposal of the Electricity Committee of the Manchester Corporation to borrow £40,000 for extensions came before a special meeting of the City Council last Wednesday, Alderman Holt, the ex-Lord Mayor, raised an objection. He pointed out that the Corporation had spent about two millions sterling on the electricity undertaking, and submitted that it was about time they had some return from this department in aid of the rates. The Electricity Committee ought to be placed on the same footing as the other trading Committees. Their refusal to contribute to the rates placed the Gas Committee in a very unfair position. In his reply, Mr. Haworth, the Chairman of the Electricity Committee, argued that the department was not established for the making of large profits, but to supply current at the lowest possible price to citizens not in a position to provide for themselves. If they were to be compelled to pay over a given sum each year in relief of the rates, the operations of the Committee would be limited. There was no justification for the Gas Committee paying over £50,000 in aid of the rates. They ought, instead, to reduce the price of gas considerably—especially for stoves. The special charges for current required for power purposes were intended to attract all of the big works' owners possible within the city boundary, and to encourage firms to erect works in the city. Last year the Electricity Committee did allocate a sum of £12,000 out of profits in aid of the rates. Alderman Holt said his purpose had been served by the discussion; and he therefore withdrew his opposition. The minutes of the Electricity Committee were then confirmed.

It will be remembered that last year, after considerable pressure had been brought to bear, the Manchester Gas Committee agreed to increase their contribution to the rates to £60,000; but to do this, it was necessary to draw on the reserve fund of the department to the extent of £42,731, with the result that the fund was practically extinguished. Four years previously, the fund stood at £147,608. Though the Committees have not yet completed their estimates, there is sufficient evidence that the Council are faced with an increase in the rates. There is an impression that an advance of 2d. in the pound will be necessary.

COALITE MANUFACTURE AT HYTHE.

Serious Complaints of Nuisance.

At the last Monthly Meeting of the Committees of the Hythe Town Council, the subject of the nuisance arising from the manufacture of coalite in the borough was under discussion. The Mayor (Mr. F. W. Butler) presided.

The Town Clerk (Mr. G. S. Wilks) reported that he had received a letter from the Secretary of the Coalite Company, stating that the letter sent by the Council on the 10th ult. would be placed before the Directors at their next meeting. It was added that steps were being taken to abate the nuisance complained of. The trouble was one which would take some time to remedy; but the Council could rest assured that everything possible would be done to put the matter right. He (the Town Clerk) replied to the letter, and again drew attention to the nuisance caused by the manufacture of coalite in the borough; reminding the Company that when the Directors met the members of the Council, it was stated that certain works were to be carried out to remedy the nuisance, which, however, was still unabated. He asked to be informed of the exact position. The Council were loth to indict the Company; but they could not allow the nuisance to exist. He wrote again on the 31st ult., asking if any steps were being taken in the

matter, and again protesting against the nuisance; and he had received another letter stating that everything possible was being done to mitigate it. He had written asking them to state what steps were being taken, as he was sure he would be asked some questions by the Council on the matter; and he pointed out that the word "mitigate" was hardly applicable, as the nuisance must be abated altogether. The Council could take action against the Company, and apply for an injunction. He had been given to understand that the Company had manufactured enough coalite to last them through the summer months. This, however, was no answer to the complaints, as the nuisance might be created again in the autumn. He suggested that the Council should give the Borough Surveyor instructions to take notice of the nuisance from time to time. The Borough Surveyor had taken notes of the condition of the atmosphere, and also photographs of the steam and smoke coming from the works; and there was no doubt in his mind that they could prove their case right up to the hilt. They had ample evidence, assuming that they did eventually take proceedings against the Company; and he was sure they could obtain an injunction against them.

The Mayor remarked that when the representatives of the Company saw the deputation from the Council in January, they stated that they were going to make an erection at the gas-works which would do away with the smell and also with the nuisance, so far as the quenching of the coalite was concerned. He understood that they would have some enclosed structure to prevent the steam coming out. However, there was no sign that it was being erected.

Mr. STRAHAN pointed out emphatically that the Council wanted an exact account of what the Company were doing. If the Council were satisfied that steps were being taken to abate the nuisance, they should have an explanatory letter from the Company, so that they might know whether the remedy would be sufficient. He moved that this course be adopted.

The Town Clerk stated that when he wrote to the Company on the 30th ult., he enclosed an objection signed by a number of householders and inhabitants of Hythe, calling attention to, and complaining of, the noxious fumes sent out from the gas-works from time to time. He pointed out that they were not residents in one particular neighbourhood, but in various parts of the town. Between 30 and 40 signed the objection.

Alderman JEAL said he thought the action the Council were taking was not strong enough. The Company still continued the nuisance, and it was one that they should take immediate steps to abate. He fully realized that this was a new industry in Hythe, and they did not want to put anything in the way of new industries; but if this was allowed to continue, they would have their lodging-house keepers ruined. He was in favour of the Council taking immediate proceedings to cause the Company to abate the nuisance, or get rid of the manufacture of coalite altogether from Hythe. Personally, he saw no advantage from it. They were having as much as 700 tons of coal a week brought into Hythe. There was the extra cartage on the roads, and the stuff was afterwards sent away, and they derived no benefit whatever from it. He failed to see why they should put up with a nuisance, when they had a memorial from the inhabitants, who would back them up in whatever action they took to abate it forthwith.

Mr. TUNBRIDGE, while agreeing with the previous speaker, pointed out that as much as £100 a week was being paid in wages, and that therefore a large number of the poorer ratepayers derived a benefit from the new industry. He suggested that the Council should give the Coalite Company reasonable liberty, and not to go to law if they could possibly avoid it. The Company should be asked whether they were prepared not to make any more coalite till the end of September; and meanwhile they should take such action as would mitigate the nuisance. The Council were only acting on behalf of the ratepayers; and the Company must not run away with the idea that they were trying to get rid of the industry. They would try to keep it if they could get rid of the nuisance attending it.

Alderman SCOTT then seconded Mr. Strahan's proposition.

The Mayor remarked that the Council were quite justified in asking the Company not to make any more coalite between now and the end of September, as this would give them six months in which to take the necessary steps to get rid of the nuisance.

The proposition was then carried unanimously; and the Borough Surveyor was instructed to continue to take notes with regard to the nuisance.

SOUTH BARRACAS (BUENOS AYRES) GAS COMPANY.

The Twentieth Ordinary General Meeting of the Company was held last Thursday, at the London Offices, No. 1, East India Avenue, Leadenhall Street, E.C.—Mr. J. C. IM THURN in the chair.

The SECRETARY (Mr. W. Upton) read the notice convening the meeting and the Auditor's certificate; and the report and accounts for the year to Dec. 31 last were taken as read.

The CHAIRMAN remarked that he was sure the shareholders would agree with him that the balance-sheet and revenue account for the twelve months were satisfactory. During the past year, the works had been maintained in efficient condition; and propaganda had been carried out energetically in the districts served by the Company, with successful results. Good progress had been made in all branches of the Company's business—especially in the installation of gas for public lighting. As the proprietors were aware, the three Gas Companies in Buenos Ayres had amalgamated. This had affected their undertaking to the extent of the gas which, for mutual convenience, they had been supplying to the Buenos Ayres (New) Gas Company for consumption in the city. Owing to this, and to expense incurred in opening new show-rooms and offices in Banfield, and the creation of a new staff, the result of the year's trading was somewhat less than that for 1908—being £9441 (including suspense account). This, together with £5243 profit other than trading, and £3904 brought forward from the previous year, made an available total of £18,588. After placing £5000 to the reserve fund, the Directors recommended a dividend at the rate of 5 per cent. per annum, free of income-tax, absorbing £7500, and carrying

forward £688, which was a good increase over the carry-forward of the previous year. The profits other than trading had been chiefly derived from the sale of shares of the Province of Buenos Ayres Water-works (Construction) Syndicate, Limited; and as this profit was non-recurrent, the Directors had thought it well to create a reserve fund of £500, which would help to consolidate the position of the Company now that it was separated from its former relationship with the Buenos Ayres (New) Gas Company. In order to settle outstanding matters of account with the latter Company for advances to the South Barracas Company in respect of extensions, a loan was secured from the bankers by the creation of a mortgage debenture. The Directors had paid off £10,000 of the original loan of £50,000; leaving £40,000 outstanding. The work of the Province of Buenos Ayres Water-works (Construction) Syndicate had been rapidly pressed forward during the past year, and one section was within measurable distance of completion. Towards the end of this year, the whole of the work was expected to be finished. The Directors anticipated that completing this important work would have a most beneficial effect upon the prosperity of the districts served by the South Barracas Company; for the great drawback of this valuable residential and industrial part of Buenos Ayres had been the want of a proper water supply. On Feb. 24 last, an extraordinary general meeting of the Company was held at which special resolutions were passed—(1) Subdividing the 15,000 issued shares of £10 each into 150,000 shares of £1 each, (2) subdividing the 5000 unissued shares of £10 each into 50,000 shares of £1 each, and (3) increasing the capital of the Company to £300,000 by the creation of 100,000 additional shares of £1 each. These resolutions were subsequently confirmed. The reason which led the Directors to decide upon reducing the shares of £10 to an equivalent value in £1 shares, was the very large amount of fractions which would have been left over upon the division of the capital of the Company among the shareholders of the Buenos Ayres (New) Gas Company, which would have resulted in a very large number of shares having to be withheld from the shareholders in order to provide, by their sale, the amount of money required by these fractions, which had to be paid in cash. The conversion to a £1 share would result in the number of shares requiring to be sold being kept well within reasonable limits. In addition, the Directors thought it would also be more convenient unit in practical working. It was the intention of the Board, at an early date, to offer the shareholders the prior right to the proposed further issue of capital required for paying off the loan from the bankers and for providing for the further extensions which it was anticipated would soon be necessitated by the increase in the number of houses in the progressive districts served by the Company. He had pleasure in stating that Mr. J. M. Macmorran, who for many years held the position as Secretary to the Company, had joined the Board. Mr. W. Upton had been appointed Secretary in his place. He concluded by proposing the adoption of the report and accounts. The motion was seconded by Mr. ROSS PINSENT, and unanimously passed without discussion.

The subsequent proceedings consisted of the declaration of the dividend recommended (5 per cent., free of income-tax), the re-election of the retiring Directors and the Auditor, and an acknowledgment of the excellent work done by the staff, both at home and in South Barracas.

GAS SUPPLY IN SHANGHAI.

The Annual Meeting of the Shanghai Gas Company, Limited, was held on the 23rd ult.—Mr. E. JENNER HOGG in the chair.

The SECRETARY (Mr. G. R. Wingrove) having read the notice convening the meeting, the report and accounts for the year ended Dec. 31 last, were presented. The former set forth that the business of the Company continued to be satisfactory, and that the profit on the year's working amounted to 249,882 taels; being an increase of 8689 taels compared with the preceding year. The net profit was 232,059 taels, or 12,897 taels more than before. The balance at the credit of the profit and loss account, after crediting the account with 4306 taels brought forward, and deducting 4000 taels bonus paid to the foreign staff and the interim dividend, was 160,366 taels, which the Directors recommended should be appropriated as follows: Final dividend making 13 per cent. for the year, 84,000 taels; and allowance for depreciation, 71,657 taels—leaving 4799 taels to be carried forward.

Appended to the Directors' report was one by the Engineer (Mr. H. G. Hiller) which furnished the following particulars: Coal carbonized, 44,494 tons; gas made, 521,936,100 cubic feet, or 11,730 cubic feet per ton; gas sold, 483,658,400 cubic feet; used at works, unaccounted for, and in stock, 38,277,700 cubic feet; unaccounted for in distribution, 5,48 per cent.; length of mains laid during the year, 950 yards; approximate total length of mains, 88,88 miles. The gas sold was divided as follows: Private consumption, 472,764,900 cubic feet; public lighting, 10,893,500 cubic feet.

The CHAIRMAN, in moving the adoption of the report, said he felt sure the shareholders would be well pleased with it and the accounts, showing as they did such satisfactory results through a continued period of bad times. There had been several hindrances during the year to the extension of the consumption. The bad times enjoined economy on the part of consumers—the closing of opium shops had had its effect; and they had lost some public lighting—not always, he thought, to the advantage of the public. It must also be borne in mind that the extended use of improved and more economical gas lighting appliances, while benefiting consumers, tended to reduce the quantity of gas they individually consumed. This, however, the Company welcomed, since the cheaper their methods were, the better it was for them ultimately, as the facts became more clearly understood. Though the output of gas for 1909 was rather less than in 1908, the actual number of their customers had increased; and a very satisfactory feature was that they had a large proportion of new consumers of gas for heating and cooking purposes. Turning to the accounts, the receipts had been 693,440 taels, against 666,719 taels, or an increase of 26,721 taels, while the total expenditure had been 443,557 taels, against 425,526 taels—an increase of 18,031 taels, due chiefly to the high cost of carbonizing material. Purifying had cost rather more than before. The manufacturing and main-

tenance expenditures showed slight increases; but the cost of manufacture was lower, partly due to salaries and wages being less, and also to a very satisfactory economy in labour. The general expenditure on distribution had only increased in proportion to the enlarged area of the Company's distributing system. The balance of profit available for appropriation was, as shown in the report, 160,366 taels. Passing on to refer to the controversy with the Council concerning the Canton Road mains, the Chairman said it was satisfactory that it had been closed. It was one that he regretted to have had forced upon the Company. There was, however, really nothing for the Directors to do, in justice to the shareholders, but to claim their rights, which had been entirely upheld throughout by the Courts and the arbitrations. The matter was twice before the Court of Consuls and twice before the Arbitrator. The terms of settlement were contained in correspondence which had been printed and circulated to shareholders for their convenience.* He wished he could say that they had received from the Council the equality of treatment in regard to public lighting that they were led to expect, and to which their ability to light economically and their contribution to the municipal funds should entitle them. They found themselves sometimes misrepresented; and when occasion arose, during the last year, they laid before the Council at some length certain facts showing the advantage to be derived from the improved systems of gas lighting, and they demonstrated their economy for the ratepayers. The Council's rejoinders could hardly be considered convincing. There was a ray of hope, however, in their last letter, wherein they informed the Directors that, though the lighting arrangements were at the time so complete that nothing could be done during 1909, yet that the whole of their representations would be taken into consideration in framing proposals for 1910. They would try to look forward with some confidence to see what came of this, and hoped that it opened to the Company the "fair field and no favour" which he had so frequently claimed. Having referred at some length to the remarks of Mr. Corbet Woodall, on municipal competition, at the last meeting of the Gaslight and Coke Company, which he said were applicable to the Shanghai Company, the Chairman passed on to allude to the future. In regard to this, he thought he might speak with considerable confidence, as there was every reason to look for an extension of their business. He did not think either the shareholder or the public were alive to the enormous improvements which have taken place in the methods of lighting, heating, and cooking. After citing some instances of the applicability and convenience of gas, the Chairman concluded by saying that those who were familiar with the history of the Company forty-six years ago would remember that the policy had been followed of including the public in a participation of the prosperity of the undertaking by reducing the price of gas as occasion offered, until the present charges compared more than favourably with those in force in most towns of similar size to Shanghai in England and the Colonies, and also on the continents of Europe and America. He added that he could not close without speaking in terms of high appreciation of the staff, on whose systematic, zealous, and scientifically progressive work the success of the undertaking so much necessarily depended. He knew the Company might rely upon the continuance of such work; and he therefore asked the sanction of the proprietors to the Directors making some recognition of this in the shape of a bonus, which he thought might be 5 per cent. on the salaries of the staff.

Mr. J. M. YOUNG seconded the motion, and it was carried unanimously.

A final dividend at the rate of 3½ taels per share was then declared for the past year; and the retiring Director and Auditors having been re-elected, the proceedings closed.

* This matter was noticed in the "JOURNAL" for April 6, 1909 (p. 44), —ED. J.G.L.

LABOUR CO-PARTNERSHIP ASSOCIATION.

Progress of the Movement.—Views of Mr. Corbet Woodall.

The Annual Meeting of the Labour Co-Partnership Association was, by permission of the Lord Mayor of London, held in the Mansion House last Friday afternoon. The chair was taken by Mr. ANEURIN WILLIAMS, M.P. (the Hon. Treasurer), in the unavoidable absence of Mr. D. J. Shackleton, M.P., the President for the year. It may be remarked that the object of the Association is to bring about an organization of industry based on the principle of Labour Co-Partnership—that is to say, a system in which all those engaged shall share in the profits, capital, control, and responsibility. With this view, it seeks (1) in the co-operative movement to aid by its propaganda and advice all forms of production based on the above principle; and (2) in other businesses to induce employers and employed to adopt schemes of profit-sharing and investment tending in the same direction.

THE REPORT OF THE COMMITTEE.

In the course of their twenty-fourth report, the Committee made the following interesting remarks with regard to the progress of co-partnership in the gas industry: "The increase in the number of gas companies practising co-partnership principles is a striking one; and it is noteworthy that the largest and the first British Gas Company—viz., the Gaslight and Coke—which was established in 1809, is included in the list. Twenty companies administering £43,675,811, being over one-half of the total capital employed in this industry, apart from municipal undertakings, are now working on the co-partnership principle. One interesting feature is the obviously growing confidence of the employees of gas companies in the opportunity that these schemes offer for investment of their savings. In the case of the pioneer Co-Partnership Gas Company (the South Metropolitan), considerable difficulty was experienced in the early days in getting many of the employees to take advantage of the facilities offered for the investment of their share of profits. It will be seen that, so far from this being the case now, the employees, as regards practically all the later schemes, have more invested in one form or another than has been credited to them as dividend on their wages. It is evident that co-partnership has at last 'caught on' in the gas industry. Many persons of a sceptical turn of mind prophesied that when the personality of Sir George Livesey was

withdrawn, the whole thing would decline. Instead of this being the case, we see that his example is becoming more fruitful as time rolls on; and it seems to be quite within the range of possibility that before very long we may be able to record the conversion of practically a whole industry to the adoption of co-partnership principles. It is difficult to believe that the remarkable progress in this direction will be without influence on other industries in the country. It may be said that the conditions are peculiarly favourable in the gas industry, and this is no doubt true; but we are convinced that, if employers can be found in other industries who will apply themselves with the same public spirit and determination to discovering the best method and working the same out as Sir George Livesey did, co-partnership will be adaptable on a large scale to many other occupations and industries than that of gas making."

A LETTER FROM THE PRESIDENT.

Mr. SHACKLETON expressed regret at his compulsory absence, in a long letter which was read by the Secretary (Mr. Henry Vivian, M.P.). Proceeding to deal with the work of the Association, he said, in the course of his remarks, that it appeared to him there were three essential and most desirable results to be achieved from the application of the principle of co-partnership—(1) A better understanding between employer and employed; (2) an educational opportunity which must tend to a clearer view of the relationship between Capital and Labour; and (3) a personal interest in the daily work of the employee which would tend to remove the monotony and tediousness of the average life of a machine worker. As regarded the first of these results (and in his view the most important), nothing but a closer relationship would break down the present barrier, and lead to a higher conception of each other's duties. An improvement had taken place of recent years, which had led to Arbitration Courts, Conciliation Boards, and Joint Boards between the two sides of industrial life. The action of the Board of Trade in this connection could not be too highly appreciated. The less there was of compulsion in these methods, the better. Co-partnership, if properly worked, avoided almost entirely trade disputes. The workmen were generally represented on the Committee of Management. They knew all the details of their trade, and would in consequence appreciate and meet the difficulties of the situation. Any scheme of co-partnership or profit-sharing which made it a condition that the men must forego their right to collective bargaining—the right to use the weapon of strike, not to mention leaving their Trade Union—would receive the strongest opposition of the whole Trade Union world, for one very elementary reason—viz., that for many years to come the ordinary industrial method of carrying on business by the employer and employee would continue. To secure continued improvement in the standard of living and the various legislative reforms which affected the industrial classes would require the united service of every worker. His own view was that far too many trade troubles were due to mutual ignorance; but with a proper application of the principle of co-partnership, this could not exist. He looked to the personal interest in their work which co-partnership would give to employees as one step, and not an unimportant one. He could not close without a word of congratulation on the splendid progress made by the housing side of the co-partnership movement. The Co-partnership Housing Societies looked like making a real and very substantial contribution towards the solution of many problems connected with home life.

PROGRESS OF CO-PARTNERSHIP.

Mr. L. W. SIMPSON ROSTRON then read a paper on this subject, in the course of which he said:

I understand the principle of co-partnership to be that it is desirable for men employed in an industry to have, in addition to their wages, some share in the profits, some interest in the capital, and, where possible, some voice in the management of the business in which they are employed.

The advocates of co-partnership believe: (1) That the average man will do better work if he has an interest in the results of his labour than if he is a mere wage earner. (2) That he will take more interest in his work, and a wider view of the requirements of the industry in which he is employed, if he has some permanent interest in it. (3) That a system of giving employees a share in the profits and the investment by them of such profits in the employer's business is the most natural and equitable means of remedying the property-less condition of the working classes. (4) That a man who works his best, takes an intelligent interest in his work, and has some property of his own, is not only a more efficient producer, but a happier man and a better citizen.

Co-partnership, in my view, is advantageous to everybody. It does good to the employee by giving him a share in profits, an opportunity for saving and safely investing his savings, a greater interest in his work, and more knowledge and experience of business; it gives the employer a more efficient and more contented body of men, and more knowledge and experience of their point of view; and it gives to the nation the increased political and commercial stability and prosperity which must arise from the growing-up of greater industry, efficiency, and contentment, and the wider distribution of property among its citizens.

It may fairly be contended, therefore, that a system which tends to diminish friction between capital and labour and to create mutual confidence and sympathy between them, which tends to increase the industrial efficiency—which must always be, whatever our fiscal system, our main safeguard against foreign competition—and which makes it easier for the working classes to acquire property, is entitled to a high place among schemes of social reform, especially when we reflect that, unlike some other schemes of social reform, it does not involve additional taxation, any interference with personal liberty, or the appointment of one single additional public official. I do not think, therefore, that I need take up any further time in dilating on the merits of the principle of co-partnership; I am sure that we all agree about them. The only possible question can be: Is it practicable? And the object of this paper is to show that it is practicable, and capable of enormous extension, by giving instances of various businesses in different parts of the country where the system has been adopted and is in successful operation. These practical examples of co-partnership may be divided into three classes: (1) Businesses formed by societies of workmen on complete

co-partnership principles; (2) regular businesses formed in the ordinary way which have adopted in a greater or less degree co-partnership principles; and (3) the co-partnership housing movement.

The author then proceeded to cite instances of co-partnership productive societies, and stated that at the end of 1908 there were altogether 112 in this country, with an aggregate capital of £1,941,112. The amount of trade was £4,214,542; the profit (including interest on shares, but not on loans), £182,663; the loss, £7607; and the dividend to labour, £24,262.

Dealing next with joint-stock companies who have adopted co-partnership principles, Mr. ROSTRON pointed out that the largest group is composed of gas companies; 23 of them, with an aggregate capital of upwards of £43,000,000, and employing more than 20,000 men, having up to the present time adopted co-partnership schemes. The following is a list of these Companies: Bournemouth, Cambridge, Cardiff, Chester, Commercial (London), Croydon, Dartford, Enfield, Gaslight and Coke (London), Gloucester, Grantham, Ilford, Leamington, Newport, Rugby, South Metropolitan (London), South Suburban (London), Tottenham and Edmonton, Tunbridge Wells, Walker and Wallsend, Watford, Wellingborough, and Wrexham. The author explained that the pioneer in this movement was the South Metropolitan Gas Company; and as their scheme had been tested by twenty years' experience, and formed the model on which the schemes of the other companies were based, he thought it would be of interest to give its history and indicate its main features. This he did in some detail, and then reproduced the table giving statistical particulars in regard to co-partnership and profit-sharing in British Gas Companies which appeared in the "JOURNAL" for the 11th of January last (p. 113). This table, it may be remembered, showed that the twenty Companies mentioned divided £93,679 in the course of last year among their employees, who on Dec. 31 held in the respective undertakings, shares and deposits of the market value of about £528,843. Mr. ROSTRON mentioned that since the table was compiled, the Cambridge, Enfield, and Ilford Gas Companies had adopted co-partnership schemes; and that considerable further quantities of stock, amounting in the case of the Gaslight and Coke Company alone, to £32,200 nominal value, had been acquired by, or on account of, the employees.

The author then gave examples of the adoption of co-partnership schemes in other businesses. Referring to the one introduced at the beginning of last year by Sir Christopher Furness to his shipbuilding employees at Hartlepool, he explained that special employees' shares were created which were entitled to interest at 4 per cent., and also to share rateably in any surplus profits after 5 per cent. interest had been paid on the capital of the Company; and the men agreed that these new shares should be paid up by deductions up to 5 per cent. from their wages. Unfortunately, however, in spite of the successful working of the scheme, the men had, so far, declined to renew it for another year. Mr. ROSTRON expressed the hope that some means of overcoming the difficulties in the way of renewal might be found. He said his list of co-partnership businesses, which did not profess to be in any way exhaustive, at all events showed that the principle had been adopted in one form or another in some of the leading industrial undertakings in the country, by some of the ablest men of business, and in industries so widely different as gas, woollen, jam, building, soap, and shipbuilding. He considered it justified the conclusion that the system is a practical one, and capable of wide extension, if only employers of labour as a body will take it up, and adopt the principle whenever and wherever they find it practicable to do so.

The concluding portion of the paper was devoted to the co-partnership housing movement, which Mr. ROSTRON said was spreading by leaps and bounds. In bringing it to a close, he expressed the hope that he had put before his audience sufficient facts to justify the claim he made at the outset, that co-partnership was not only right in theory, but sound and successful in practice. The whole history of the growth of the movement was, he said, a most cheering thing at a time when matters were not very cheerful, because it showed that there is a solution for some of the chief difficulties which arise between capital and labour, that there are employers able to apply it, and that the working classes will respond if approached by the right people in the right way.

A DISCUSSION.

Mr. T. C. TAYLOR, M.P. (speaking as one who had turned his business into a limited liability company for the purpose of giving his men a share in the capital) remarked that he believed the essential feature of profit sharing was that the capitalist should pay over part of the profits he obtained as capitalist to the workers as workers, independent of any conditions. The splendid scheme of the South Metropolitan Gas Company, with which was associated the name of Sir George Livesey (never to be forgotten), had been developed, and one of the steps had been to associate in the management elected employees. He himself hoped some day not only to give profits to his own men, as at present, but to transfer the management of the business to the workers themselves.

The CHAIRMAN said he would now call upon Mr. Corbet Woodall, the Governor of the Gaslight and Coke Company, and President-Elect of the Association, to move a resolution.

Mr. CORBET WOODALL said the resolution that he had the honour to propose was: "That this meeting tenders its hearty thanks to Mr. Shackleton for his letter, and expresses its deep sense of the value of the principle of co-partnership as a means of promoting industrial peace, progress, and efficiency." He was sure they were all deeply indebted to Mr. Shackleton for his very wise and sympathetic letter; and he thought those who had heard it read must have had their regret increased at his absence from the meeting. Before making any remarks in support of the resolution, he (the speaker) would like to say how glad he was to be at this interesting meeting, to help carry on the work initiated, so far as the industry with which he was identified was concerned, by his late friend Sir George Livesey. Sir George was a very lovable man; and one did not wonder at it, because of the sympathy he had, not only with those of his own class, but with all those who were associated with him in the work in which he was engaged. With reference to co-partnership, he (Mr. Corbet Woodall) did not think that the principle of co-partnership as applied to the remuneration of labour stood in need to-day either of explanation or of

recommendation. What was wanted was earnest and sympathetic study of the best examples, and patient investigation of the failures—coupled with willingness to give any warrantable scheme a fair trial. It was difficult to interest the right people in these things; while the wrong people had only too much say about the designs of employers. It must not be forgotten that the efforts and intentions of co-partnership organizers were met with strong dislike, if not with overt opposition, by some representatives of working-class organizations; and that those persons would not be easily converted. Those whose purpose was to help the wage-earning class to become owners of property, must remain content to bear opprobrium from “a sort of” Socialist. Co-partnership, like most things in the world, was always upon trial; but there were enough successful examples of schemes in operation to make out a case for more. He confessed that he had not much patience with imaginary *a priori* criticisms of the principle, such as one who had put his hand to this plough was occasionally bombarded by persons standing by, with their hands, so to speak, in their pockets—usually filled by somebody else. They were told that the amount of the partnership share of an industrial undertaking which could be spared for this purpose was too small to have any effect upon the morale of the recipients, and that therefore it was as good as thrown away—if, as they understood it, the idea was that the grant should come back again in the form of increased interest on the part of the beneficiaries. The answer to this criticism was that the amount, though small in the eyes of a capitalist, was by no means insignificant to the day-worker, who under the ordinary wage-system often never got half-a-crown ahead of the world from beginning to end of his career. He felt already that the amount he might save by going without things he liked was too small to be worth the sacrifice. He was wrong, as there was any amount of proof to show. But the difficulty lay in helping him up the first step. This was the justification for the regulation, so often questioned in co-partnership schemes, that a proportion of the payment must not be withdrawn. They were sometimes asked, not for information, but as a taunt, how a share in a business could belong to a man if he must not deal with it as he would like. One answer was that this was by no means the only kind of property that was owned and enjoyed, but could not be sold away. In point of fact, however small the allocation of profit from his employment to a workman, it mounted up very remarkably in the course of years. Meanwhile, its influence upon the man, and also upon his circle, was positive on the side of respectability and self-respect. The man was a citizen, with the sense of responsibility greatly increased. Let them be fair to the workman, even when his weaknesses appeared to be beyond the reach of sympathy. They should remember his limited horizon, his often monotonous toil when in work, and his helplessness when unemployed for ever so short a period. He drank and betted because he was a man, not an animal content to feed in a stall. Let them give him other interests, a new and brighter outlook towards old age, and much of good would follow. This change of the status of the wage-earner must come from above, if he might so qualify the source of the wages, and could never be appropriated on their own motion by the workpeople. It was therefore condemned out of hand by those, mostly interested persons, who desired to keep the workman apart from the rest of the community, in a class of his own. These Particularists objected to co-partnership root and branch—not, like the theorists already mentioned, on account of the smallness

of the interest it conveyed, but because this was enough to leaven the whole lump of working-class aspirations. He was not an enemy of Trade Unions, as means for the mutual protection and assistance of workmen. Far from it. He thought such societies competent to effect great good in the world. But he did not hold himself bound to accept whatever might be put forward by individuals as the true voice of Trade Unionism. There were more ways than one of improving the living conditions of any class of the community; but he believed that all must have the common impulse of individual striving after the better thing. They did not pretend to reform mankind from outside, but to open the road for a man to enter into a larger citizenship, if he would take it. The element of co-operation must be there; for which reason they adhered to their point of initial selection. Men ought to offer some promise of having a root of fidelity and thrift in them before they were admitted into an honourable partnership with their employers and companions. The advocates of co-partnership had set their hands to cut a long furrow across the accumulated prejudices, indifferences, and misunderstandings of time immemorial. They were bent upon regaining, or rather upon creating, the personal good-will of those whom they employed in their concerns in and towards their interest; and this could best be done by sharing it with them. It was not philanthropy, but common sense. It was not their fault that outsiders condemned their proceedings. They must hold on their way according to their lights, undaunted by prophecies of failure which, in the face of accomplished facts, sounded more impudent than terrible. A good co-partnership system was self-acting, and not the least of the incidental benefits derivable from it was the mutual enlightenment and improved understanding which flowed from the exercise of the continuous supervisory arrangements, in which all grades of the fellowship participated. It widened men's views, both of what was good for themselves and for their associates. It was not putting it too high to claim for it in operation the furtherance of the saving idea of “neighbourhood,” and the consequent repression of the evil of class selfishness, which was an ill weed that flourished only too readily in all grades of the social system. It helped men to realize that they did not labour for themselves solely, but that their well-being was the result of reflection from the general prosperity. This was why, mainly, he was a convinced co-partner; and in this faith he hoped still to continue, even though progress were less rapid in the future than present indications encouraged them to hope.

Professor A. W. KIRKALDY, of Birmingham University, remarked that it was difficult to obtain statistics; but he had been assured that in this country at the present time profit-sharing was practised to an extent that very few people realized. Co-partnership had come to stay.

The discussion was continued by Mr. H. DANIELS and Mr. F. MADDISON. The latter speaker said he had been specially struck with the remarks of Mr. Corbet Woodall, because he had approached the question from the point of view of a business man possessing imagination, and realizing that, if businesses were merely run for profit, without any concern for the employees, they were not the best businesses. The labour co-partnership principle brought into businesses the thought of possession; and this materialized, and became possession.

The resolution was carried unanimously; and the proceedings closed with votes of thanks to the Lord Mayor for permitting the meeting to take place in the Mansion House, and to the Chairman for presiding.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 163.

| Issue | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|------------|--------|-------------------|-------------------------------|---------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|-------------------------------|---------------------------|-----------------|---------------------|------------------------|
| £ | Stk. | | p.c. | | | | £ s. d. | £ | Stk. | | p.c. | | | | £ s. d. |
| 1,474,000 | Stk. | Apr. 1 | 5 | Alliance & Dublin Ord. | 85-87* | +1 | 5 14 11 | 4,940,000 | Stk. | Nov. 11 | 8 | Imperial Continental | 181-183 | .. | 4 7 5 |
| 310,000 | Stk. | Jan. 13 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 1,235,000 | Stk. | Feb. 10 | 3½ | Do. 3½ p.c. Deb. Red. | 94-96 | .. | 3 12 11 |
| 200,000 | 5 | Oct. 28 | 7½ | Bombay, Ltd. | 68-69 | .. | 5 5 8 | 195,242 | Stk. | Mar. 16 | 6 | Lea Bridge Ord. 5 p.c. | 122-124 | .. | 4 16 9 |
| 40,000 | 5 | | 2½ | Do. New, £4 paid. | 5-5½ | .. | 5 5 8 | 561,000 | Stk. | Feb. 25 | 10 | Liverpool United A. | 222-224 | .. | 4 9 3 |
| 50,000 | 10 | Feb. 25 | 15 | Bourne-) 10 p.c. | 29-30 | .. | 5 0 0 | 718,100 | | | | Do. B. | 163½-165½ | .. | 4 4 7 |
| 311,810 | 10 | | 7 | mouth Gas B 7 p.c. | 164-165 | .. | 4 3 7 | 306,083 | | Dec. 29 | 7 | Do. Deb. Stk. | 103-105 | .. | 3 16 2 |
| 75,000 | 10 | | 6 | and Water) Pref. 6 p.c. | 15-15½ | .. | 3 17 5 | 560,000 | 100 | Nov. 26 | 5 | Malta & Mediterranean. | 43-5 | .. | 6 0 0 |
| 380,000 | Stk. | | 12½ | Brentford Consolidated | 251-254 | .. | 4 18 5 | 250,000 | 100 | Apr. 1 | 5 | Met. of 15 p.c. Deb. | 100-102* | .. | 4 18 0 |
| 300,000 | " | | 9½ | Do. New | 183-190 | .. | 5 0 0 | 541,920 | 20 | Nov. 11 | 4½ | Melbourne 4½ p.c. Deb. | 100-102* | .. | 4 8 3 |
| 50,000 | " | Aug. 12 | 5 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 0 | 1,775,892 | 20 | Nov. 11 | 3½ | Monte Video, Ltd. | 12½-13½ | .. | 5 5 8 |
| 206,250 | " | Dec. 29 | 4 | Do. 4 p.c. Deb. | 101-103 | .. | 3 17 8 | 529,435 | Stk. | Feb. 25 | 4½ | Newcastle & G'tesh'd Con. | 141-143 | .. | 4 3 4 |
| 220,000 | Stk. | Mar. 16 | 11 | Brighton & Hove Orig. | 213-216 | .. | 5 1 0 | 55,940 | Stk. | Dec. 29 | 3½ | Do. 3½ p.c. Deb. | 91-93 | .. | 3 15 3 |
| 246,320 | " | | 1 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 300,000 | Stk. | Feb. 25 | 7 | North Middlesex 7 p.c. | 134-136 | .. | 5 11 11 |
| 460,000 | 25 | Apr. 1 | 10½ | British | 44-45* | .. | 4 14 8 | 60,000 | Stk. | Nov. 26 | 8 | Oriental, Ltd. | 6-6½ | .. | 6 8 0 |
| 109,000 | Stk. | Feb. 25 | 6 | Bromley, A 5 p.c. | 116-118 | .. | 5 1 8 | 31,800 | 53 | Apr. 1 | 13 | Ottoman, Ltd. | 134-136 | .. | 5 1 0 |
| 165,700 | " | | 4½ | Do. B 3½ p.c. | 87-89 | .. | 5 1 2 | 60,000 | 50 | Feb. 25 | 13 | Portsea Island A. | 126-128 | .. | 5 1 0 |
| 82,278 | " | | 5½ | Do. C 5 p.c. | 104-106 | .. | 5 3 9 | 100,000 | 50 | " | 12 | Do. B. | 110-121 | .. | 4 19 2 |
| 55,000 | " | Dec. 29 | 3½ | Do. 3½ p.c. Deb. | 87-89 | .. | 3 18 8 | 114,800 | 50 | " | 10 | Do. C. | 100-102 | .. | 4 18 0 |
| 500,000 | 10 | Oct. 14 | 7 | Buenos Ayres (New) Ltd. | — | .. | — | 398,490 | 5 | Oct. 28 | 7 | Do. D and E. | 7½-8 | .. | 4 7 6 |
| 250,000 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 98-100 | .. | 4 0 0 | 796,980 | 5 | Jan. 27 | 5 | Do. 5 p.c. Pref. | 58-59 | .. | 4 8 11 |
| 100,000 | 10 | | — | Cape Town & Dis., Ltd. | 4-5 | .. | — | 488,900 | 100 | Dec. 1 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 50,000 | 50 | Nov. 2 | 6 | Do. 4½ p.c. Pref. | 6-7 | .. | — | 1,000,000 | Stk. | Dec. 14 | 8 | River Plate Ord. | — | .. | — |
| 100,000 | Stk. | Dec. 29 | 4½ | Do. 6 p.c. 1st Mort. | 49½-50½ | +½ | 5 18 10 | 312,650 | Stk. | Oct. 29 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 157,150 | Stk. | Feb. 25 | 5 | Do. 4½ p.c. Deb. Stk. | 96-98 | .. | 5 2 3 | 250,000 | 10 | Apr. 1 | 1 | San Paulo, Ltd. | 154-154½ | +½ | 5 14 3 |
| 1,515,280 | Stk. | Feb. 25 | 5½ | Chester 5 p.c. Ord. | 106-108 | .. | 4 12 7 | 62,500 | 10 | " | 6 | Do. 6 p.c. Pref. | 113-115 | .. | 5 0 0 |
| 560,000 | " | | 5 | Commercial 4 p.c. Stk. | 106-108 | .. | 4 16 4 | 125,000 | 50 | Jan. 3 | 5 | Do. 5 p.c. Deb. | 51½-51½ | .. | 4 17 1 |
| 475,000 | " | Dec. 29 | 3 | Do. 3½ p.c. do. | 103-105 | .. | 4 15 3 | 135,000 | Stk. | Mch. 16 | 10 | Sheffield A. | 232-234 | .. | 4 5 5 |
| 100,000 | Stk. | Dec. 10 | 5 | Do. 3 p.c. Deb. Stk. | 81-83 | .. | 3 12 3 | 209,984 | " | " | 10 | Do. B. | 232-234 | .. | 4 5 5 |
| 200,000 | " | | 7 | Continental Union, Ltd. | 98-100 | .. | 5 0 0 | 523,500 | " | " | 10 | Do. C. | 232-234 | .. | 4 5 5 |
| 492,270 | Stk. | | 5½ | Do. 7 p.c. Pref. | 138-140 | .. | 5 0 0 | 70,000 | Stk. | Oct. 14 | 10 | Do. D. | 124-124 | .. | 7 16 11 |
| 55,000 | " | | 4 | Derby Con. Stk. | 121-123 | .. | 4 9 5 | 6,429,895 | 10 | Feb. 10 | 5/9/4 | South African | 120-122 | .. | 4 9 7 |
| 148,995 | " | Apr. 1 | 5 | Do. Deb. Stk. | 104-105 | .. | 3 16 2 | 1,895,445 | Stk. | Jan. 13 | 3 | South Met., 4 p.c. Ord. | 81-83 | .. | 5 12 3 |
| 426,099 | 10 | Jan. 27 | 12 | East Hull 5 p.c. Ord. | 96-98* | .. | 5 2 0 | 209,822 | Stk. | Mar. 16 | 8 | Do. 3 p.c. Deb. | 157-158 | .. | 5 1 3 |
| 351,060 | 10 | | 12 | European, Ltd. | 24½-25 | .. | 4 16 0 | 605,000 | Stk. | Feb. 25 | 5½ | South Shields Con. Stk. | 121-123 | .. | 4 12 0 |
| 16,199,671 | Stk. | Feb. 10 | 4½ | Do. £7 10s. paid. | 184-19 | .. | 4 14 9 | 60,000 | " | " | 5 | S'th Suburb'n Ord. 5 p.c. | 121-123 | .. | 4 12 0 |
| 2,600,000 | " | | 3½ | Gas 4 p.c. Ord. | 104-105 | +½ | 4 8 10 | 17,058 | " | Jan. 13 | 5 | Do. 5 p.c. Pref. | 121-123 | +1 | 4 1 4 |
| 4,000,235 | " | | 4 | light 3½ p.c. max. | 88-90 | .. | 3 17 9 | 502,310 | Stk. | Nov. 11 | 5 | Do. 5 p.c. Deb. Stk. | 122-124 | .. | 4 0 8 |
| 4,531,745 | " | | 4 | and 4 p.c. Con. Pref. | 104-106 | .. | 3 15 6 | 120,000 | Stk. | Feb. 10 | 6½ | Tottenham A 5 p.c. | 110-112 | .. | 4 9 3 |
| 258,740 | Stk. | Mar. 16 | 5 | Coke's 3 p.c. Con. Deb. | 81-93 | .. | 3 12 3 | 453,940 | " | " | 5½ | Tottenham B 3½ p.c. | 113-115 | .. | 5 1 9 |
| 82,500 | " | | 6½ | Hastings & St. L. 3½ p.c. | 93-95 | .. | 5 5 3 | 149,470 | " | Dec. 29 | 4 | and 4 p.c. Deb. | 99-101 | +1 | 4 13 6 |
| 74,000 | 10 | Sep. 29 | 11 | Do. do. 5 p.c. | 117-119 | .. | 5 9 3 | 182,380 | 10 | Dec. 29 | 8 | Edmonton 4 p.c. Deb. | 91-91½ | .. | 3 19 3 |
| 131,780 | Stk. | Mar. 16 | 7 | Hongkong & China, Ltd. | 17½-18 | .. | 6 2 3 | 149,900 | 10 | Jan. 3 | 5 | Tuscan, Ltd. | 99-101 | .. | 4 19 0 |
| 65,700 | " | | 5½ | Ilford A and C | 145-147 | .. | 4 15 3 | 236,476 | Stk. | Feb. 25 | 5 | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 7 9 |
| 65,500 | " | Dec. 29 | 4 | Do. B | 105-110 | .. | 5 0 0 | 255,636 | Stk. | Feb. 25 | 6½ | Tynemouth, 5 p.c. max. | 112-114 | .. | 4 14 0 |
| | | | | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 79,416 | " | Dec. 29 | 3 | Wands- B 3½ p.c. Deb. | 139-141 | .. | 4 18 0 |
| | | | | | | | | | | | | Do. 3 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |

Prices marked * are "Ex div."

† Next dividend will be at this rate.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The poor success which the Corporation of Glasgow have met with in their legislative proposals is being much discussed in gas circles. Subject to any reflections which there may be on the composition of the House of Commons Committee, as to which I am not in a position to form an opinion, I suppose that the Bill has been wrecked—as it virtually has been—upon the question of the annexation of outlying areas. The motto of the Glasgow Corporation includes the expression "Let Glasgow Flourish;" and to these words a section of the Corporation seem to be anxious to add "and no other place." At all events, the proposals in the Bill under consideration were so drawn as to make it desirable to be inside and undesirable to be outside Glasgow. This is the policy of the Corporation upon other questions. In the Tramways Department, the Corporation have endeavoured to woo outside localities by giving facilities for travel, and have declined to allow outside authorities to run cars of theirs into the city. This means that all tramway profits are to belong to Glasgow; and if outsiders wish to share in the profits, let them come inside. It has been the same with the Gas Bill; and the Parliamentary Committee have not sanctioned the proposals of the Corporation. Their decision may be interpreted as meaning that if annexation is proposed, it must come up for consideration without prejudice to either of the parties. There is, it must be admitted, the other side to the question—viz., that around Glasgow there is a cluster of smaller corporations and authorities who derive great benefit by their contiguity to the great city, but do not see their way to come in. I think it may be accepted that it would be better for all parties that the outside places should come in. But this is not their opinion, except upon terms; and the decision of the House of Commons Committee will have the effect of preventing the Corporation having the power to dictate terms in the important matter of gas supply. It will be a pity if, in their eagerness to secure annexation, the power of the Gas Committee should be so curtailed as to prejudice the supply of gas, which there is every appearance will be the case when comparison is made with other places where powers are possessed that have been denied to Glasgow, and also when compared with the powers conferred upon the rival Electricity Department. The decision has been a great disappointment to the members of the Corporation, who, it will be seen from a report of the remarks made at the meeting of the Town Council on Thursday [see *ante*, p. 196], do not yet know what their course of action will be.

The Edinburgh and Leith Gas Commissioners on Monday accepted tenders for 200,000 tons of coal for the forthcoming year. In intimating this decision (which had been arrived at in private) Judge Bryson, of Leith, the Convener of the Works Committee, stated that they had accepted, in almost every case, the lowest that had been put before them, and that there were good reasons for not accepting some of the tenders that were lowest. The prices are from 6d. to 9d. per ton higher than those of last year.

Out of the 113 applications for the post of Treasurer to the Edinburgh and Leith Gas Commission, the Special Committee appointed for the purpose first reduced the list to 19, and then to 10. These latter are to be interviewed by the Committee; and the appointment will be made on an early date.

A recommendation by the Gas Committee to contribute five guineas to the William Young Memorial Fund came before the Dunfermline Town Council on Monday. After a discussion, the recommendation was adopted by 17 votes to 4.

The unbusinesslike way in which corporations conduct their affairs is notorious. A most conspicuous instance of this occurred in the Town Council of Edinburgh on Wednesday, when the Cleaning and Lighting and Electric Lighting Committees recommended that the common stairs in the central part of the city should be lighted by electricity. It was explained by Mr. Stark that in the area involved, there are 245 stairs, with 856 lights; and one of the greatest arguments in favour of electricity was that the department could switch the lights on and off. The same speaker reminded the Council that they had entered into an agreement with the Gas Commissioners to light the common stairs by incandescent gas-lights at a cost of 17s. 6d. per light per annum. The rate for electricity per lamp of 5-candle power would be 21s. per annum. The speaker held that the adoption of electricity was a forward movement, from a sanitary point of view. Mr. Lyon, a member of the Gas Commission, pointed out that by the adoption of this policy they would be faced with an increase of 2000 lights. It was a serious question. The charge amounted to 50 per cent. more than was now being paid. He moved that the stairs be lighted by incandescent gas; and, by 37 votes to 6, the recommendation was adopted by the Council.

In the Hamilton Town Council on Monday, the Gas Committee reported that the Town Clerk had informed them that he had written to the Burgh Assessor, drawing his attention to two decisions by the Commissioners of Inland Revenue, in appeals by gas companies, in which deductions for depreciation were allowed; and that the matter was receiving the attention of the Assessor. The Committee also reported that they had resumed consideration of the complaints as to smoke and dust emanating from the gas-works, and had continued the remit to a Sub-Committee to take the best possible steps to avoid any nuisance. After discussion, the report of the Gas Committee was adopted.

On Monday, the Dean of Guild Court of the burgh of Inverkeithing passed plans for extensions to the works of the Gas Company. It is proposed to erect an additional gasholder, of 25,000 cubic feet capacity; a new retort-house (the present retort-house to be converted into a coal-store), and other buildings and plant, at an estimated cost of £1500. The Engineer for the proposed works is Mr. H. O'Connor, F.R.S.E., of Edinburgh. Negotiations have been in progress for some time with the Earl of Elgin, and other coterminous proprietors of ground, for the acquisition of land. The proposed extensions are being made in view of the large increase of population which is expected in the district consequent upon the construction of the Naval base at Rosyth.

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In the Arbroath Town Council on Monday, it was stated in the minutes of the Gas Committee that they had had a report before them by the Convener and the Manager upon the tenders for coal. Bailie Smith, the Convener of the Committee, explained that there was an increase all over of 6d. per ton, which would amount in the year to £250. The minutes were adopted.

The Stonehaven Town Council, who, in December last, appointed a committee to consider and report upon a proposal to acquire the transfer of the gas undertaking, have resolved that nothing be done in the matter of a transfer.

The recommendation came before the Town Council of Perth on Monday that a deputation be sent to Derby, Leicester, and Fulham to examine and report upon types of charging machinery in use there. Mr. Wright moved that the subject be delayed. They had, he said, during the past eight years, incurred £62,000 of capital expenditure, and he thought it was time that the Council tried to keep down outlay. The recommendation was adopted by 15 votes to 10.

The Committee of the Helensburgh Town Council who have been considering the subject of the extension of the Corporation gas-works have, it is announced, all but completed their labours. It is understood that the scheme which they have resolved to recommend will involve an expenditure of £11,000 or £12,000.

In the Glasgow Town Council on Thursday, Mr. D. M. Stevenson moved approval of the minutes of the Special Committee which had been appointed to make arrangements for the holding of an exhibition of up-to-date appliances for lighting, heating, and cooking. The minutes were adopted, and permission was given to name the exhibition the Glasgow Smoke Abatement Exhibition.

The Kirkintilloch Town Council have had before them a proposal to introduce a turbo "booster" for the improvement of the gas pressure. The new gasholder of 500,000 cubic feet capacity, it was stated, could be emptied to the extent of one-third only. An alternative proposal was made that a small holder should be erected; but it was pointed out that a booster would still be required. The Council resolved to instal the booster, which, it is estimated, will cost about £218.

Salisbury Water Supply.—The ceremony of opening the new water-tower on Bishop's Down, Salisbury, was performed a few days ago by the Mayor (Mr. F. Shepherd). When the boundary of the city was extended, some few years ago, the Corporation purchased three small sources of water supply. One was immediately discarded, another was abandoned nearly two years ago, and the recent ceremony marked the closing of the third, which was bought from the old Milford Water Company. The whole of the Corporation supply will in future be derived from the deep wells at the pumping-station. The new tank will hold 5000 gallons; and it stands 62 feet higher than the adjoining reservoir. The scheme was prepared by the City Engineer (Mr. W. J. Goodwin), who supervised the erection of the tower and laid the main in connection with it.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, April 16.

Demand has been fairly well sustained throughout the week, and prices have been about maintained; the closing quotations being £12 2s. 6d. per ton f.o.b. Hull, £12 5s. per ton f.o.b. Liverpool, and £12 5s. per ton f.o.b. Leith. Home demand has been particularly good, and in some districts prompt supplies have hardly been enough to meet it. The forward position has not attracted much attention, though at some points something under £11 17s. 6d. per ton would probably be accepted for July-December delivery.

Nitrate of Soda.

This article is easier on spot Liverpool; the quotations now being 9s. 7½d. per cwt. for 95 per cent. and 9s. 10½d. for refined quality, less 2½ per cent.

Tar Products. LONDON, April 18.

The markets for tar products have been firm throughout the past week. Pitch closes decidedly firmer; and there are indications that even a higher price will be paid before the present season has finished. Creosote is steady, but there is not much business doing. Benzol, 90 per cent., is very firm indeed for prompt delivery, but for the last six months in the year there is a tendency to sell at slightly lower prices. Fifty-ninety per cent. benzol is also very firm, and appears to be in particular request. Toluol is scarce, and there are eager buyers for delivery to the end of the year. Solvent naphtha is very firm indeed, and business is reported to the end of the year at excellent figures. Carbolic acid is quiet; but there is some desire to purchase for July-December on the part of Continental consumers. Crystals are still neglected, and are offering at low figures. Liquid carbolic is steady, and there is a fair amount of demand for same, especially for the summer months. Naphthalene is unchanged; and creosote salts are in good demand. Tar is fetching good prices.

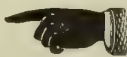
The average values during the week were: Tar, 16s. 9d. to 20s. 9d., ex works. Pitch, London, 34s. to 35s.; east coast, 34s. to 34s. 6d.; west coast, 34s. to 35s. f.a.s., 35s. f.o.b. Benzol, 90 per cent., casks included, London, 8d. to 8½d.; North, 7½d. to 8d.; 50-90 per cent., casks included, London and North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4½d. to 4¾d.; solvent naphtha, casks included, London, 1s. 3¾d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

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Sulphate of Ammonia.

The market for this article has been quiet during the past week, and closes dull. The principal Gas Companies quote £12 7s. 6d. for prompt, and £12 10s. for forward; while outside makes upon Beekton terms are £11 17s. 6d. to £12. Ordinary London f.a.s. terms are about £12. In Hull, the market is £12 2s. 6d. to £12 5s.; and in Liverpool, £12 5s. In Leith, £12 5s. to £12 7s. 6d. is quoted.

COAL TRADE REPORTS.**Northern Coal Trade.**

There is now a fuller demand for coal for export; but the starting of some of the collieries that have been idle has increased the production, so that the demand is well met. In the steam coal trade, the tone is easy, through the anticipation of a fuller supply. Best Northumbrian steams are from 11s. 6d. to 11s. 7½d. per ton f.o.b.; second-class steams are 10s. 6d. to 11s.; and steam smalls are steady at about 6s. 6d. to 7s. 6d. In the gas coal trade, the home consumption shows the falling off that is usual at this time of the year; but the exports are heavier. Durham gas coals vary in price from 10s. 3d. to 11s. 1½d. per ton f.o.b. for the usual kinds, according to quality; while for "Wear specials," up to 11s. 6d. is quoted. Some small contracts for export are reported, at prices that are near the current values. A contract for Aarhuus, for special kinds, is booked at about 14s. 9d. delivered there; and another for Randers is at about 15s. 3d., so that, after allowing for freight, &c., the price f.o.b. will not be very far short of the current quotation. Coke is steady, with gas coke from 14s. to 14s. 6d. per ton f.o.b.—the output of gas coke being now smaller.

Scotch Coal Trade.

The market has been quieter, and prices have had an easier tendency for the smaller sorts, the others remaining where they were. The quotations now are: Ell, 9s. 6d. to 10s. per ton f.o.b. Glasgow; splint, 10s. to 10s. 6d.; and steam, 9s. 6d. to 10s. The shipments for the week amounted to 319,533 tons—a decrease of 46,243 tons upon the previous week, but an increase of 20,726 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,814,435 tons—an increase of 671,962 tons compared with 1909.

Imperial Continental Gas Association.—The accounts to be presented at the half-yearly general meeting of the Association on the 3rd prox. show that the profit for the six months ended Dec. 31 last amounted to £213,853. This added to the balance brought forward (£33,445) makes a total of £247,298. As already announced, the Directors recommend a dividend of 4 per cent. for the half year, tax free.

Gas-Meter Testing in Bristol.—Of 584 gas-meters tested in Bristol during last quarter, 456 were found to be incorrect; 24 of these, or 5·26 per cent., registering in favour of the seller, and 432, or 94·74 per cent., in favour of the consumer. The average percentage of error in incorrect meters in favour of the seller was 3·65, with a maximum of 9·89; while the percentage of those registering in favour of the consumer was 9·43, with a maximum of 37·89.

Embezzlement Charge against a Gas Official.—Last Thursday, at Stratford-on-Avon, Ernest Clarke, an official of the Corporation, was committed for trial on charges of embezzlement and the falsification of accounts. The accused had been employed in the Gas Department for over twenty years, and was trusted implicitly. About £25,000 passed through his hands each year. It was alleged that defalcations exceeding £300 had already been discovered.

Holsworthy Water-Works.—A Local Government Board inquiry was held at Holsworthy last Friday with reference to an application by the District Council for power to borrow £2400 for works of water supply. It was explained that a loan of £4700 was raised for a water scheme; but the works cost more than £2000 beyond this sum. The main reason for the excess in expenditure was an increase in the size of the reservoir. Mr. Chadwick, the Engineer for the scheme, said the contract was £421 in excess of the original estimate, while additional mains had cost £623 and extra excavation on account of peat £564.

Primitiva Gas and Electric Lighting Company of Buenos Aires.—The accounts for the past year which will be presented to the shareholders at the annual general meeting on Friday show at the credit of profit and loss account a sum of £129,772; making, with the balance brought forward, a total of £156,675. After deducting interest paid on debentures, and the dividends paid on the preference and ordinary shares, &c., there remains £75,323, out of which the Directors recommend a final dividend of 4s. 6d. per share, tax free, on the ordinary shares; making 7 per cent. for the year. This will absorb £18,000, and leave £57,323 to be carried forward. The Company's mains, services, &c., were very considerably extended during the year, and the works kept in efficient repair. It is proposed to alter the Company's name to "Primitiva Gas Company of Buenos Aires, Limited," in view of the fact that some time ago they relinquished the electricity section of the business to the German Transatlantic Electricity Company.

Gas Profits at Rhyl.—At the last meeting of the Rhyl District Council, the Chairman of the Gas Committee (Mr. S. Perks) gave some particulars as to the progress of the gas undertaking. He said that the original works came into the hands of a private Company in 1869, when the output was about 3 million cubic feet of gas, and the net profits were £637. In 1882, the Council acquired the works under an Act of Parliament; and at that time the output was 22 millions, and the profits were £1900 per annum. The Council paid for the concern £35,000, or 18 years' purchase. During the past year the works had produced 60 million cubic feet of gas, and the Committee were able to hand over to the relief of the rates, after providing for the sinking fund, £1700. Further than this, while in 1892 the output of gas per ton of coal carbonized was 10,200 cubic feet, to-day it was 11,508 cubic feet. He considered that the works, as a commercial concern, were now worth £135,000, compared with the £35,000 paid for them 18 years ago, and the splendid paying concern they had proved to be was largely due to the careful management of the Engineer, Mr. L. G. Hall. Mr. Hall's services were acknowledged in a cordial resolution.



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Marseilles Water Supply.—According to some particulars in a recent number of the "Surveyor," the average daily consumption of water in Marseilles is 26,400,000 gallons, which is equal to 66 gallons per head of the population. There are four reservoirs—one being for storage and the rest for supply. The first is situated at the top of a hill, 243 feet above sea level; and it will hold about 440 million gallons. The largest supply reservoir will contain 330 million gallons; and the other two will hold 77 and 27½ million gallons respectively.

The Gas Committee of the Stalybridge Town Council have decided to hand out of profits a sum of £1944 in relief of the rates.

An inquiry has been held on behalf of the Local Government Board with respect to an application of the Rhondda Urban District Council for permission to borrow £11,000 for their gas undertaking and £2000 for works of water supply.

A project is on foot to form a company for supplying water to Chiddingfold, near Godalming; and the Hambledon Rural District Council have expressed their willingness to render the promoters such assistance as they reasonably can.

The Gas Committee of the Wells Corporation, having in view the results realized by the gas undertaking for the past year, propose that 5d. per 1000 cubic feet be deducted from the present discount price of 4s. 2d.; making the net price 3s. 9d.

Messrs. Davis Bros., of Manchester, have just placed on the market a new and improved machine, based on some novel principles, for measuring out and mixing together any number of dry powders. It is claimed for the machine that it performs in a reliable and continuous fashion a number of operations which hitherto have been done intermittently, and with the expenditure of much time and manual labour. The essential feature of the "Apportioner," as the appliance is called, is a tapered screw, or, more strictly, a helix on a tapered barrel, revolving in a cylinder forming the lower portion of a hopper. By the use of this screw to regulate the flow of each material, the separate weighing or measuring and mixing of the ingredients have been superseded, for the materials are here drawn simultaneously in continuous streams from their respective hoppers; the flow of each stream being regulated solely by the position of the screw relative to the hopper, which it is easy to adjust to the greatest nicety.

The Burton-upon-Trent Corporation Gas Department have placed with the Richmond Gas Stove and Meter Company, Limited, an order for 1000 cookers for use with prepayment meters.

It is estimated that the profits of the Gas Department of the Macclesfield Corporation for the year ended the 31st of March will amount to about £500 more than last year, when the net profits reached £6057. The Gas Committee have decided to allocate £500 to the maintenance fund; so that if the forecast is correct, there will be about £6000 available for the relief of the rates.

A poll has been taken of the parochial electors of Norwood Green and Coley on the question of the partial lighting of the two districts with gas. A previous proposal to use electricity had been rejected on account of the excessive cost; and now it was suggested that fourteen gas-lamps should be erected in the village street at Norwood Green and six at Coley, the cost being estimated at about £200, and involving a 6d. rate. In favour of lighting, there were 27 votes; and 56 against. It is expected that this experience will end for some time the agitation which has been in progress for lighting the streets of the combined villages.

A lecture on "Gas and Its Uses" was lately delivered by Mr. William Titley, F.C.I.S., the Secretary of the Guildford Gas Company, before the local Chamber of Trade. The author illustrated his remarks with a number of up-to-date appliances, samples of coal-tar products, &c. He said that upwards of 189,000 million cubic feet of gas were consumed annually in the United Kingdom; and to produce this, more than 15 million tons of coal were carbonized, in addition to a considerable amount of other raw materials. To convey the gas to the consumers, about 30,000 miles of trunk mains had been laid in the ground. The manufacture of such a large quantity of gas, and its distribution, provided employment for over 100,000 men. Dealing with the uses of gas, he spoke of their indebtedness to the inventor of the incandescent mantle, and mentioned that the first mantle used in the neighbourhood was installed at Charterhouse School, Godalming, and cost 15s. Mr. Titley produced a French journal, published in 1824, which contained a paragraph announcing that gas-pipes were being laid at Guildford. Comparing the price of gas in Guildford now with that of former days, he said that from 1824 to 1844 the net charge per 1000 cubic feet was 15s.; when he came to Guildford 32 years ago, it was 5s.; and to-day, it was 2s. 11d. During his connection with the Company, the manufacture had increased from 30 million cubic feet per annum to 200 millions. The lecturer was accorded a hearty vote of thanks.

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Telegrams: "UPRIGHT."
Apply, **THOMAS HORROCKS,**
Albert Chemical Works, BRADFORD,
MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
Naphtha, Carbolic, Sulphate of Ammonia.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS,
CONTRACTORS, &c.
RETORT SETTINGS, COAL-TESTING PLANT,
BOILER FIRING,
UNDERWOOD HOUSE, PAISLEY.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers,
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

SPENCER'S PATENT HURDLE GRIDS.
THE very best Patent Grids for Holding
Oxide Lightly.
See Illustrated Advertisement, April 5, p. 8.

GAS-WORKS requiring Extensions
should Communicate with FIRTH BLAKELEY,
SONS, AND CO., LIMITED, Dewsbury, who make a
Specialty of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
faction Guaranteed.

CAST-IRON Pipes. Spigot and Socket
or Flanged. Special Quality—9 feet or 12 feet
Lengths. When buying, Write us.
A. Lowcock, Limited, SHREWSBURY.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gas-holders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

SATURATORS made or Repaired
Reasonable Terms (workmanship guaranteed) by
a 30 Years' Saturator Maker (Labour and Plant only)
at per Hour or Contract. Saturators improved. Per-
fect Mixing and Noiseless.
DAVIES, General Chemical Plumber and Leadburner
117, Galloway Road, SHEPHERD'S BUSH, W.

WANTED, the Confidential Assistance
of a Skilled MANTLE CHEMIST, Midland Dis-
trict. Correspondence invited.
Apply, by letter, to No. 5225, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

TWO or Three Meter Repairers wanted
Must have Experience in all Branches. Wages
£2 10s. to £3 per Week.
Address Applications, with References, to the GENERAL
MANAGER, Consumers' Gas Company, Toronto, CANADA.

WANTED, a Gentleman with a Con-
nection among Gas Companies and Public
Lighting Authorities in Ireland to REPRESENT a
Leading Manufacturer. Liberal Commission given.
Apply, by letter, in first instance, to No. 5220, care of
Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, for Contractors'
Office, a First-Class DRAUGHTSMAN with
Good Experience in Retort-Settings and Structural
Ironwork.
Apply, by letter, stating Age, References, and Salary
required, to No. 5227, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, a Stoker for a Lancashire
Boiler in a Factory near London. Must be
steady and industrious. Preference given to a Man
used to Distilling and Condensing Plants. Wages 32s.
per week.
Apply, by letter only, to No. 5224, care of Mr. King,
11, Bolt Court, FLEET STREET, E.C.

GENERAL Foreman wanted for a Gas-
Works, in the North of England, making 120
Millions per Annum. Must be a good Carbonizer and
Capable of Working Carburetted Water Gas and Sul-
phate of Ammonia Plants. House provided on Works.
Applications, by letter only, stating Age, Experience,
and Wages Required, with copies of recent Testi-
monials, to No. 5222, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

REQUIRED, by a well-known Firm of
Gas Apparatus Manufacturers for London and
Suburbs, the Services of an up-to-date TRAVELLER
with a sound Connection among Gas Companies and
Good Class Ironmongers. Permanency. Salary no
object to the Right Man.
Apply, by letter only, stating full Particulars, in con-
fidence, in the first instance, to No. 5223, care of Mr.
King, 11, Bolt Court, FLEET STREET, E.C.

CANNOCK, BEDNESFORD, AND DISTRICT
GAS COMPANY, LIMITED.
WANTED, a Young Man to act as
WORKING FOREMAN, who is accustomed to
Generator and Regenerator Furnaces, General Yard
Work, Main and Service Laying, Fitting, and able to
Supervise the Works in the absence of the Manager.
Applications, stating Age, Wages required, and en-
closing copies of Three recent Testimonials, to be ad-
dressed to the MANAGER, Gas-Works, CANNOCK.

RAINHILL GAS AND WATER COMPANY.
THE Directors of the above Company
are prepared to receive APPLICATIONS for the
Position of MANAGER of the above Works.
Applications, stating Salary, Age, and Experience,
may be sent to the undersigned not later than Thurs-
day, the 21st inst.
Free House, Coal, and Gas.
Canvassing not allowed.
FRED. PRITCHARD,
Secretary.
Gas Office, Huyton,
Near Liverpool.

PITCH—12,000 Tons wanted. This
Season's delivery.
Firm Quotations f.o.b. English Port, stating Quantity,
to No. 5221, care of Mr. King, 11, Bolt Court, FLEET
STREET, E.C.

WANTED, a Set of Four Purifiers,
about 30 feet Square, with Valve and Con-
nections.
Full Particulars with Lowest Price to FIRTH
BLAKELEY, SONS, AND CO., LTD., Thornhill, DEWSBURY.

COUNTY BOROUGH OF SMETHWICK.
(GAS DEPARTMENT.)
SECOND-HAND EXHAUSTERS AND STEAM-
ENGINE.

THE Gas Committee of the Corporation
of Smethwick have for DISPOSAL Two DONKIN
EXHAUSTERS, with STEAM-ENGINES Combined,
including Disc Valves, nominal capacity 40,000 and
60,000 Cubic Feet per hour respectively; also a HORI-
ZONTAL HIGH-PRESSURE STEAM-ENGINE
14-inch Bore, 20-inch Stroke, to work at 80 lbs. Steam-
Pressure.
For an Immediate Sale, a low Price will be taken.
The Plant can be seen at the Gas-Works, Rabone
Lane, at work during the next Two or Three Weeks;
and any further Particulars can be obtained on Ap-
plication to Mr. Vincent Hughes, Engineer, at the Gas-
Works.
W. J. STURGES,
Secretary.
Gas Department, Council House,
Smethwick, April 12, 1910.

GAS HOLDERS—Splendid 45 feet diameter and New STEEL TANK, fixed Complete Plan and Specification; also 14 feet and 16 feet diameter GAS HOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale.
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

FOR SALE—A Station Meter in Square Cast-Iron Case, to pass 60,000 Cubic Feet of Gas per Hour. Can be fitted with New Drum if necessary and made equal to a New Meter. A low Price will be accepted.
Address R. LAIDLAW AND SON (EDINBURGH), LIMITED, LONDON AND EDINBURGH.

COUNTY BOROUGH OF BLACKPOOL.
THE Gas Committee are prepared to receive TENDERS for the Supply of GAS COAL COBBLES to May 1, 1911.
Tenders to be endorsed outside, and addressed to the Chairman, by the 24th day of April, 1910.
Forms of Tender may be had from the undersigned.
JOHN CHEW,
Gas Engineer.
Gas Office, Princess Street,
April 7, 1910.

RHYL URBAN DISTRICT COUNCIL.
TENDERS FOR TAR AND LIQUOR.
THE Rhyl Urban District Council are prepared to receive TENDERS for all Surplus TAR and AMMONIACAL LIQUOR produced at their Works during the Year ended June 30, 1911.
Full Particulars may be obtained from Mr. Leonard J. Hall, Assoc. M.Inst.C.E., Engineer and Manager, Gas-Works, Rhyl.
Sealed Tenders, endorsed "Tender for Residuals," must be delivered to me not later than April 27, 1910. The lowest or any Tender not necessarily accepted.
ARTHUR ROWLANDS,
Clerk to the Council.
April 7, 1910.

ULVERSTON URBAN DISTRICT COUNCIL.
TO TAR DISTILLERS.
THE Gas and Water Committee are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works during the year commencing the 1st of July next.
Further Information and Forms of Tender may be had on Application to the undersigned.
Sealed Tenders, endorsed "Tender for Tar," and addressed to the Chairman of the Gas and Water Committee, to be sent in not later than Thursday, the 25th inst.
The Committee do not bind themselves to accept the highest or any Tender.
JNO. SWAN,
Engineer and Manager.

BRIDGEWATER COLLIERIES COKE-WORKS.
(THE EARL OF ELLESMERE.)
TENDERS are invited for the Crude BENZOL produced at the above Works (estimated at 9000 to 10,000 Gallons per Month) testing 80 per cent. at 120° C., during the next Three, Six, Nine, or Twelve months, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Middleton and Hindley Branch of the Lancashire and Yorkshire Railway, or at the Brackley Siding on the Little Hulton Mineral Branch of the London and North Western Railway.
Tenders, endorsed "Tender for Crude Benzol," to be addressed to Mr. Thomas M. Brown, Bridgewater Colliery Offices, 4, Chapel Walks, Manchester, not later than the 25th inst.
Manchester, April 5, 1910.

MONTROSE GASLIGHT COMPANY.
TENDERS FOR COAL.
THE Directors invite Tenders for the Supply of about 3000 Tons of Best Quality screened GAS COAL, and WASHED NUTS f.o.r. or o.b. Firth of Forth Ports, in such Quantities as may be required till the 31st of May, 1911.
Sealed Tenders, addressed to the undersigned and endorsed "Tender for Coal," to be sent in not later than Wednesday, the 27th day of April.
The Directors reserve to themselves the right to divide the quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any tender.
By order,
A. MAC KAY,
Engineer and Manager.
Montrose Gas Offices,
April 14, 1910.

PAIGNTON GAS COMPANY.
TENDERS FOR GAS COAL.
THE Directors of the Paignton Gas Company are prepared to receive TENDERS for the Supply of 5000 Tons of best approved GAS COALS, to be delivered in such Quantities and at such times as may be required, and to weigh 20 cwt. to the Ton over the Gas Company's Weigh Bridge.
Tenders to be accompanied by Practical Working analysis, stating the Price of Coal delivered at Paignton Station, Great Western Railway, free of all Charges.
Forms of Tender are not supplied.
The Directors do not bind themselves to accept the lowest or any Tender.
Further Particulars may be obtained from Mr. C. G. Dawson only.
Sealed Tenders, endorsed "Tender for Coal," specifying the description and quality of Coal, to be sent in before the 7th day of May next addressed to the undersigned at the Gas Offices, 1A, Victoria Street, Paignton.
F. W. PUDDICOMBE,
Secretary.
Paignton, April 14, 1910.

BOROUGH OF MOSSLEY.
THE Gas Committee of the Borough of Mossley invite TENDERS for the Supply of Screened GAS COAL.
Specifications and Forms of Tender may be obtained from the undersigned.
Sealed Tenders, endorsed "Gas Coal," and addressed to the Chairman of the Gas Committee, Gas-Works, Mossley, must be delivered not later than the first post on Monday morning, May 2, 1910.
JAMES TAYLOR,
Engineer and Manager.
Gas-Works, Mossley,
April 18, 1910.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)
THE Gas Committee invite Tenders for the Supply and Erection of a TWO-LIFT GAS-HOLDER, 100 feet in diameter, required at their Bloom Street Works.
The Drawings may be seen, and copies of the Specification and Form of Tender (for which a charge of £1 is. will be made, to be returned on receipt of a bona-fide Tender) obtained on Application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Gasholder," to be delivered to me not later than Three p.m. on Thursday, the 28th of April, 1910.
L. C. EVANS,
Town Clerk.
Town Hall, Salford,
April 15, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.
MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Executors of the late H. J. Rydon, Esq.
GAS STOCKS AND SHARES,
of the CAPITAL VALUE of upwards of £10,000
IN THE
HARROW AND STANMORE GAS COMPANY,
SOUTHEAST GAS COMPANY,
CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY,
HORLEY DISTRICT GAS COMPANY,
WALTHAM ABBEY AND CHESHUNT GAS AND COKE COMPANY.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 3, at Two o'clock, in Lots.
Particulars of H. W. RYDON, Esq., Solicitor, 77, Cornhill, E.C., and of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LEA BRIDGE DISTRICT GAS COMPANY.
ISSUE OF £14,000 NEW CAPITAL COMPRISING:
£1000 Four per Cent. Perpetual Debenture Stock,
£5000 Five per Cent. Preference Stock,
£5000 Consolidated Ordinary Stock.
MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 10, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

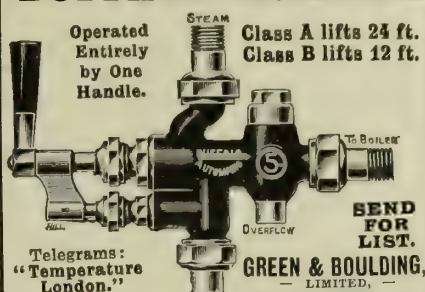
A HANDSOME F'CAP VOLUME GIVING AN ACCOUNT OF THE
GRANTON GAS-WORKS
of the Edinburgh and Leith Corporations' Gas Commissioners,
Their Design, Construction, and Equipment, with Illustrations, Plates, and Details of Costs.
By W. R. HERRING, M.Inst.C.E., &c.
Bound in Cloth, price 16s. net cash, free delivery in United Kingdom.
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

THE SECOND EDITION OF
GAS COMPANIES' BOOK-KEEPING.
A Practical Treatise on the Keeping of Gas Companies' Accounts.
By
JOHN HENRY BREARLEY, and
BENJAMIN TAYLOR.
Price Net: Complete, Cloth Bound, 12s. 6d.; Morocco Gilt, 18s.
LONDON:
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TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY and CAREFULLY EXECUTED.
LONDON OFFICE: E. C. BROWN & Co., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

'BUFFALO' INJECTOR



Operated Entirely by One Handle.
Class A lifts 24 ft.
Class B lifts 12 ft.
SEND FOR LIST.
GREEN & BOULDING, LIMITED,
28, New Bridge St., LONDON, E.C.
Telegrams: "Temperature London."
Tel. No. 12,455 Central.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

LUX'S
Gas Purifying Material
Is now used in many Gas-Works throughout Scotland with gratifying success.

FRIEDRICH LUX
Ludwigshafen-am-Rhein
Sole Agent for Scotland:
DANIEL MACFIE
1, North Saint Andrew Street, EDINBURGH
Telegrams: "GASLUX, EDINBURGH"
Descriptive Pamphlet on Application.

BENZOL.

To Collieries having Bye-Product Recovery Coke-Ovens, or to Tar-Works capable of delivering for Export to the Continent 3000 Tons per Annum (more or less) of 90 per cent. Commercial Benzol under Contract covering a number of Years.

Offers are invited from Firms only who are *bonâ-fide* in a Position to enter into a Contract for the above quantity.

Address, in first instance, No. 5226, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THOMAS DUXBURY & CO., 16, DEANS GATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
**THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.**

**CASES FOR BINDING
QUARTERLY
VOLUMES OF THE "JOURNAL."**
(GREEN CLOTH, GILT LETTERED.)
Price 2s. each.

MIRFIELD GAS COAL. UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the
**MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.**

THOMAS TURTON AND SONS, LIMITED,

**SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.**

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:
90, CANNON STREET, E.C.

ADDITIONAL REVENUE FOR GAS-WORKS.

**COKE SELLING . . AT 11/6 A TON
COALEXLD SELLING AT 20/- A TON
IN THE SAME TOWN.**

X

COALEXLD, LIMITED.
LANCASTER.



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THE GAS HOLDERS AND OTHER OUTSIDE PLANT IT IS FALSE ECONOMY TO USE A CHEAP PAINT WHICH LOSES COLOUR AND DOES NOT PROTECT THE IRON FROM CHEMICAL FUMES.

"SHELL BRAND" (Pure) PAINTS

POSSESS ALL THE PROPERTIES WHICH CHEAP PAINTS LACK.

Prices and particulars on application.

A. H. HAMILTON & CO.,

Possilpark, Glasgow.



WATER SUPPLIES.

ARTESIAN BORED TUBE WELLS,

Norton's Patent "Abyssinian" Tube Wells.
Deep Well Pumps and Patent Air Lift Pumps.

LE GRAND & SUTCLIFF,

Artesian Well and Waterworks Engineers,

MAGDALA WORKS, 125, BUNHILL ROW, LONDON, E.C.



**OVER 600
ROTARY
Station Meters
IN COMMISSION.**

Particulars from—
**T. G. MARSH,
28, Deansgate,
MANCHESTER.**

GAS COAL AND CANNEL.

WILSON CARTER & PEARSON, LIMITED.

Gas, Steam, and other Fuel for Home and Export.
GAS COKE CONTRACTORS.

Chief Offices: **50, NEW STREET, BIRMINGHAM.**

Telegraphic Address: "CARTER PEARSON, BIRMINGHAM."
Telephone Nos.: CENTRAL 3013 and 3014.

S. S. STOTT & CO., ENGINEERS, HASLINGDEN, nr. MANCHESTER.

**LIME & OXIDE ELEVATORS & CONVEYORS.
COAL AND COKE STORAGE PLANTS.**

Coal and Coke Elevators and Conveyors.
**STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.
DETACHABLE CHAINS AND SPROCKET WHEELS.
HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.**

GRAETZIN LIGHT

Important Improvements.



BURNERS.

- 1. 20-Candle Power more light without increase in the consumption of gas.
- 2. Patent Gas Adjuster; cannot get out of order.
- 3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
- 4. Accurate Regulation of the Air Supply.
- 5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
- 6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

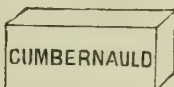
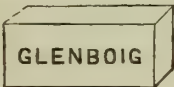
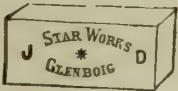
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE MARKS.



The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS,
BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

Works: GLENBOIG, LANARKSHIRE.

Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas of Honour.

Highest Award wherever exhibited.

CHEMICAL ANALYSIS.

| | Raw. | Fired. |
|--------------------------------|--------|--------|
| Silica, free | 3.03 | 3.49 |
| Silica, combined | 43.20 | 49.77 |
| Alumina | 36.55 | 42.16 |
| Ferric oxide | 1.80 | 2.08 |
| Titanic oxide | 1.30 | 1.50 |
| Lime | trace | trace |
| Magnesia | trace | trace |
| Alkaline oxides | trace | trace |
| Sulphates as trioxides | 0.32 | 1.06 |
| Loss on Ignition | 13.20 | — |
| | 100.00 | 100.00 |

PHYSICAL RESULTS.

| | |
|-------------------------------------|-----------------------------|
| Density | 2.65 |
| Volume weight | 1.90 |
| Porosity | 15.4 % |
| Linear shrinkage at 100° C. | 3.70 % |
| " " " 1050° C. | 4.76 % |
| " " " Total | 8.46 % |
| Volume shrinkage at 100° C. | 10.7 % |
| " " " 1050° C. | 12.6 % |
| " " " Total | 23.3 % |
| Plasticity | 20.0 % |
| Fire Stability | 1850° C. equiv. to 3362° F. |

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,

JOHN T. NORMAN,

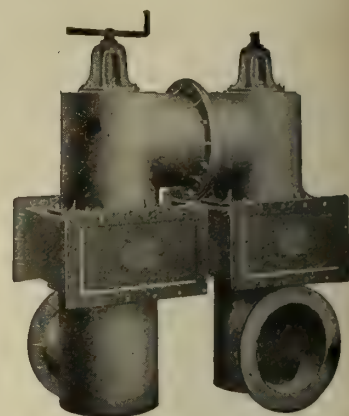
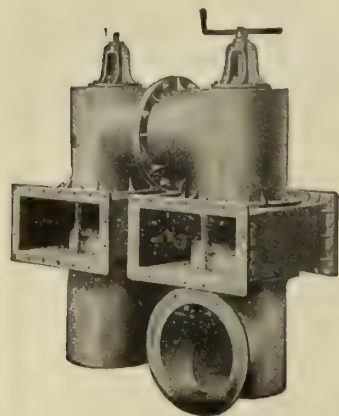
MILBOURNE'S PATENT
**Purifier
 Valves**

fixed inside or outside the Purifiers.

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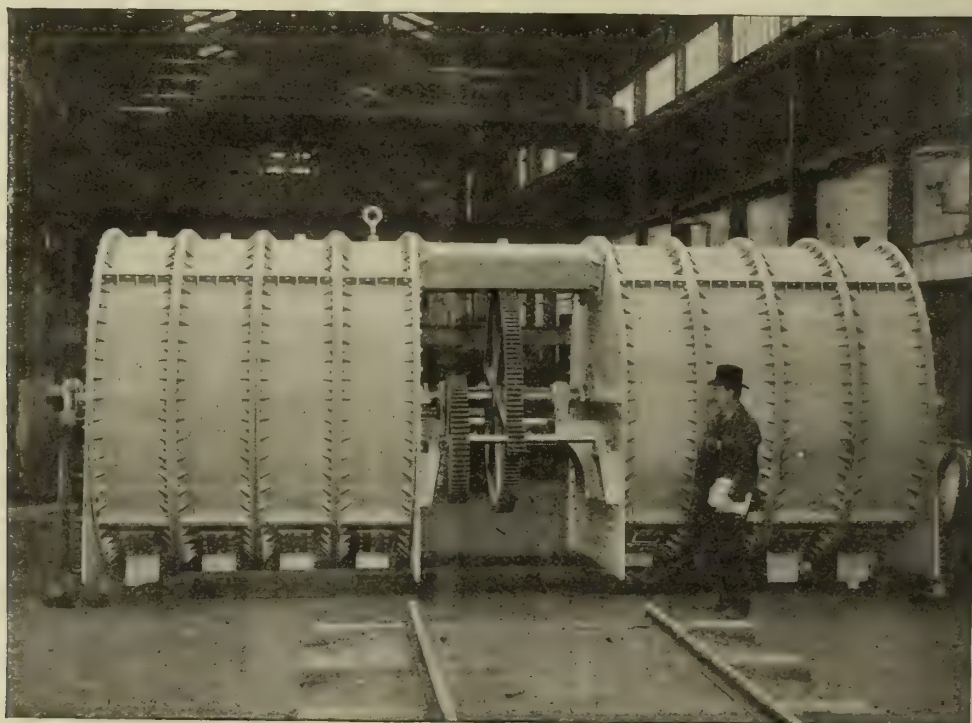
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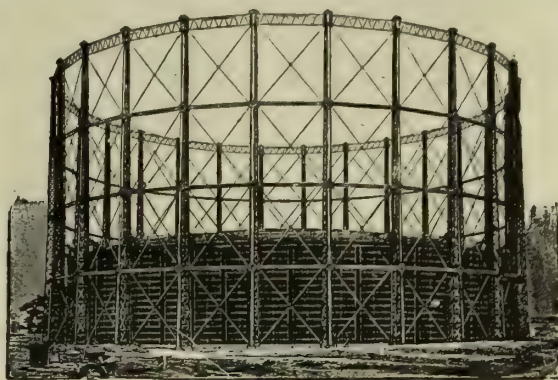
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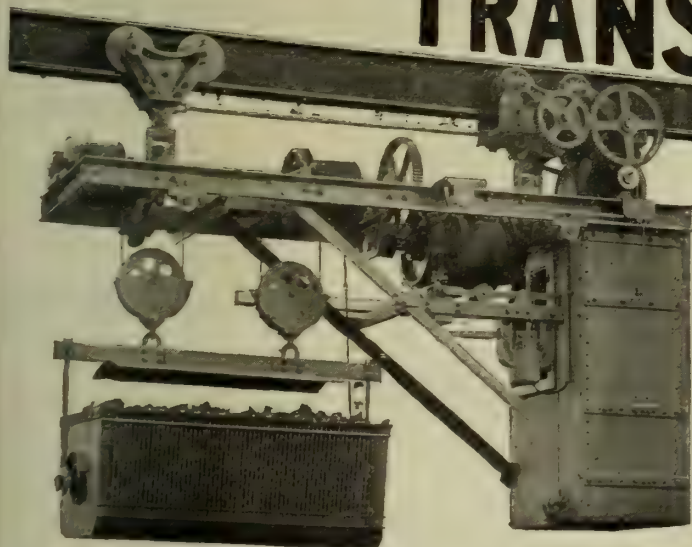
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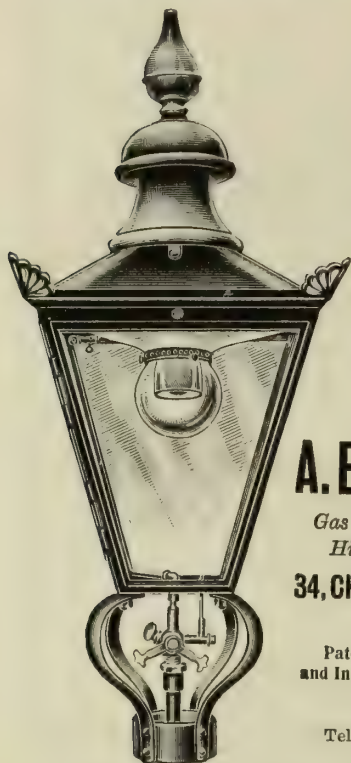
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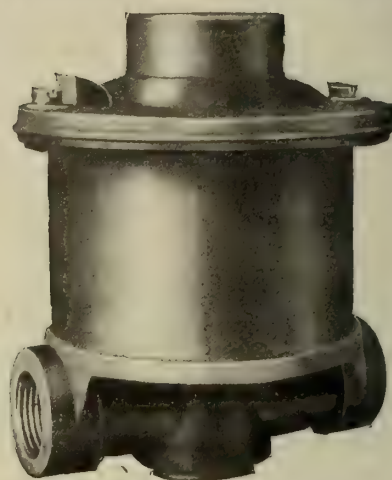
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Inverted Arc Lamp, Fig. 623.

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| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in. |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

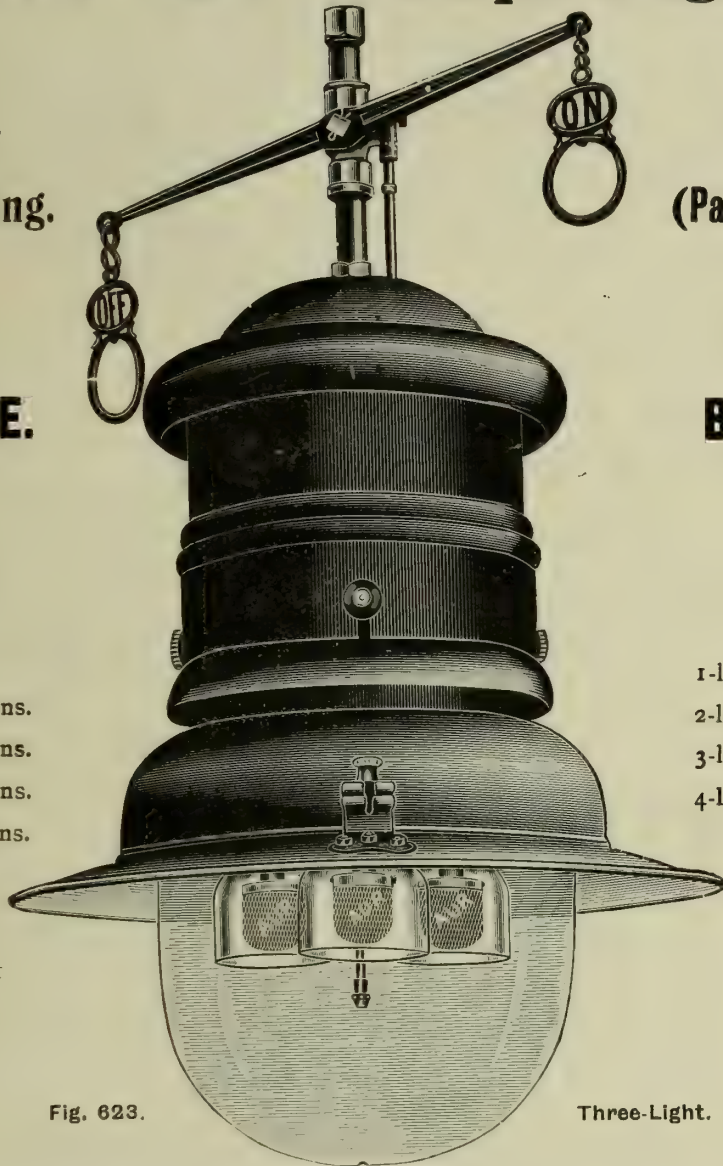


Fig. 623.

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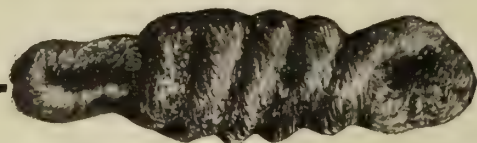
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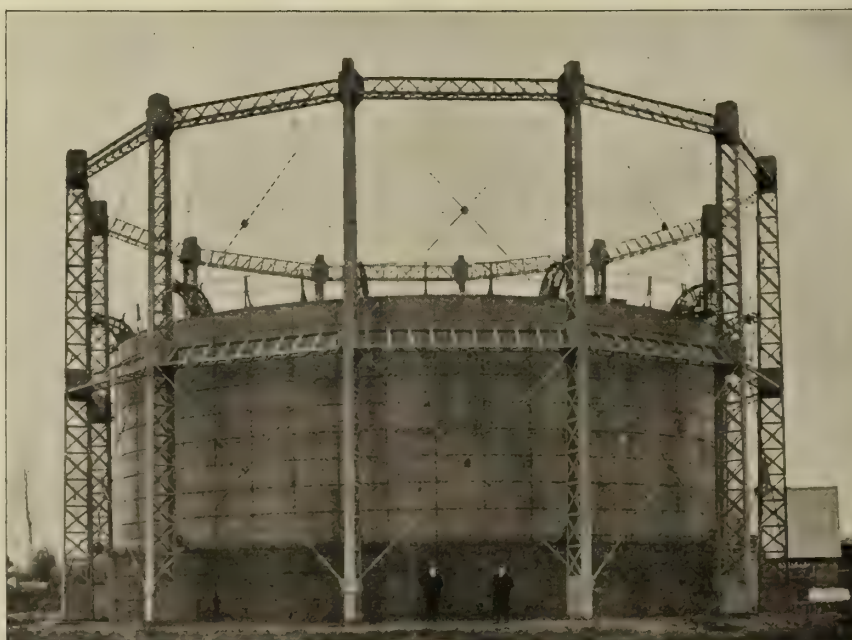
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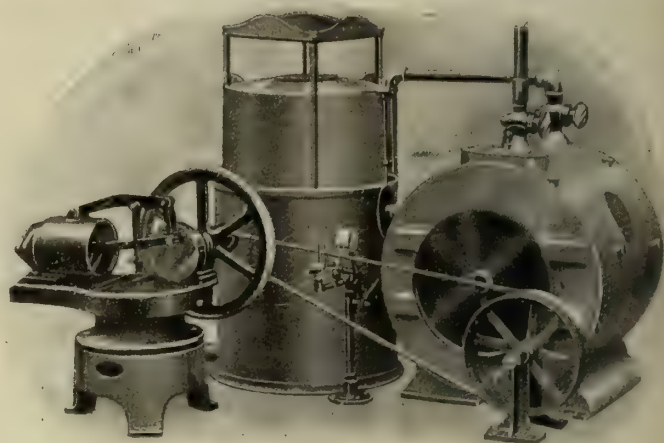
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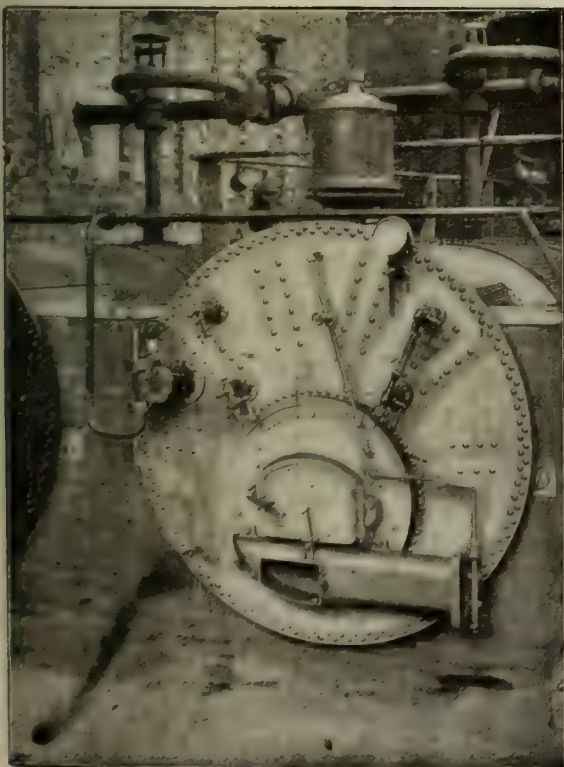
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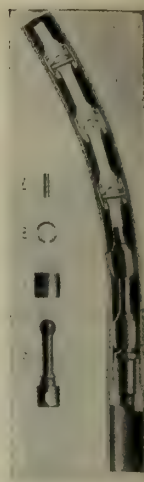


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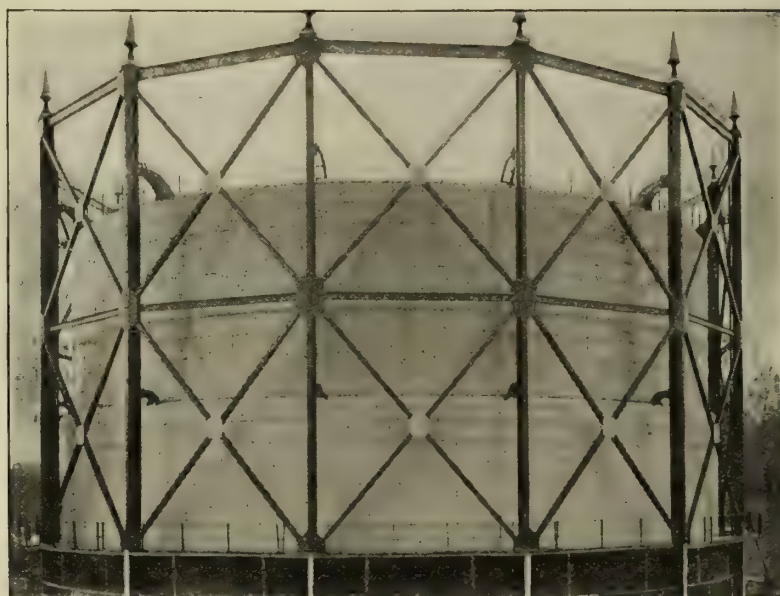
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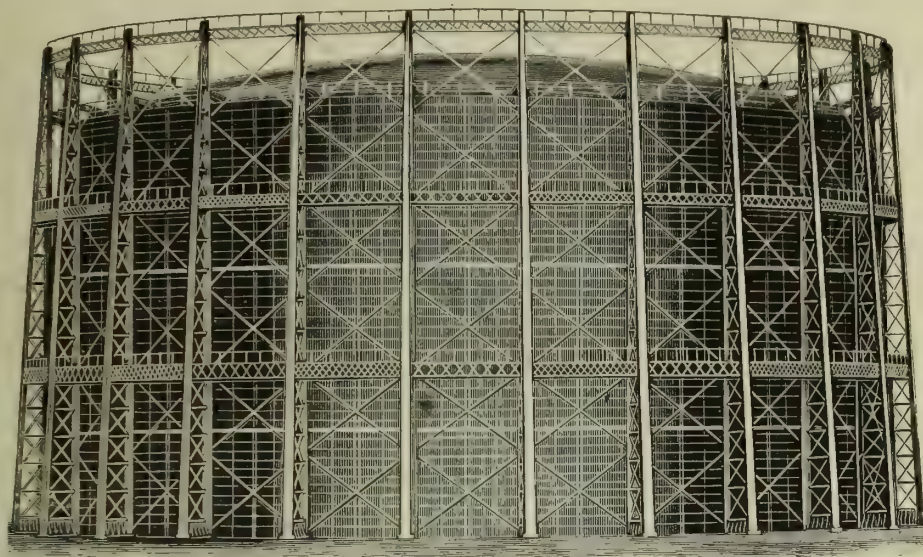
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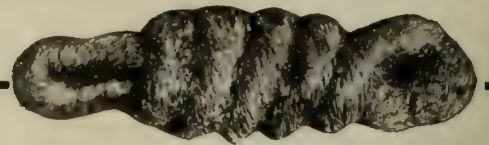
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Fig. 703. "SINGLE RAM"
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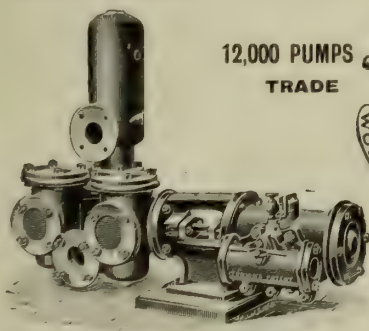


Fig. 598. "CORNISH" STEAM-PUMP FOR
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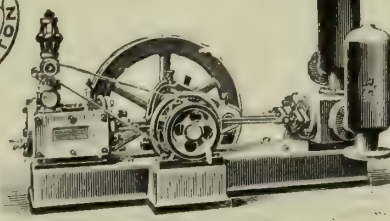


Fig. 685. "RELIABLE" STEAM PUMP FOR
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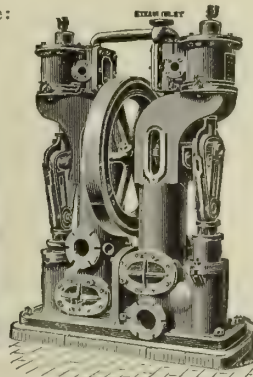


Fig. 712. "DOUBLE-RAM"
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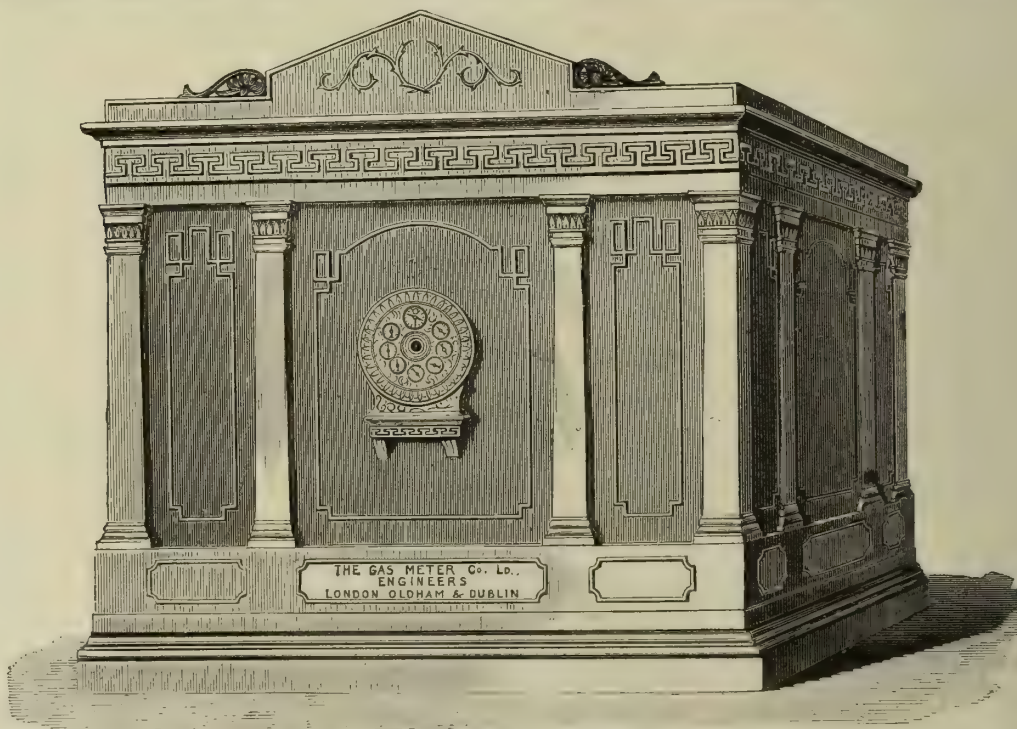
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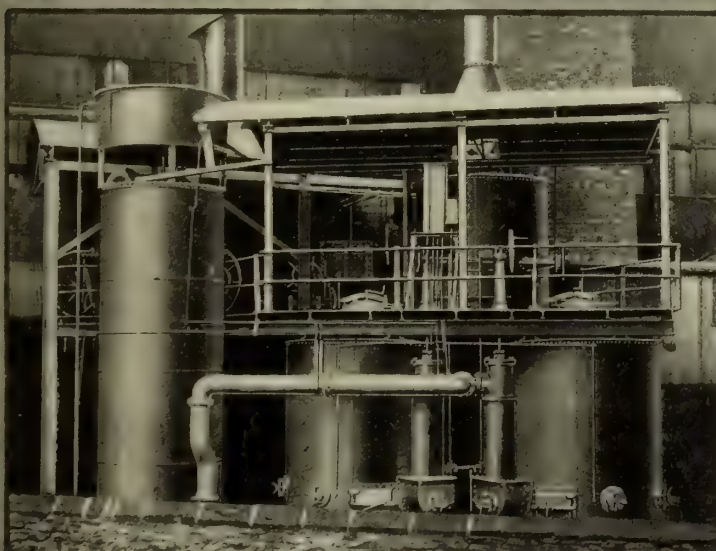
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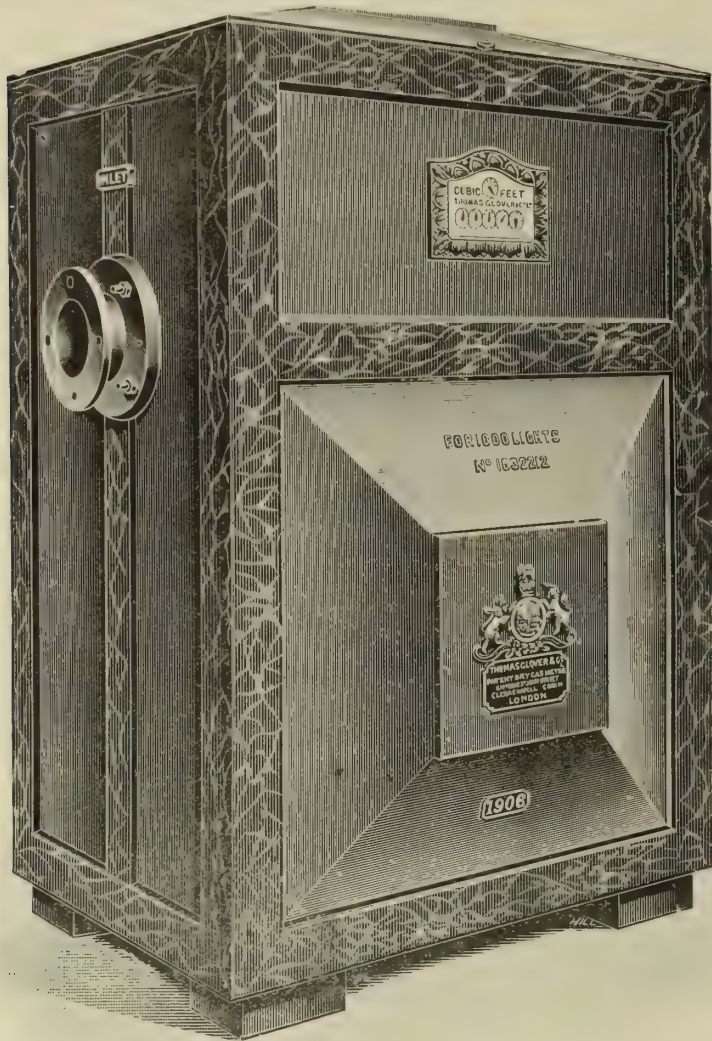
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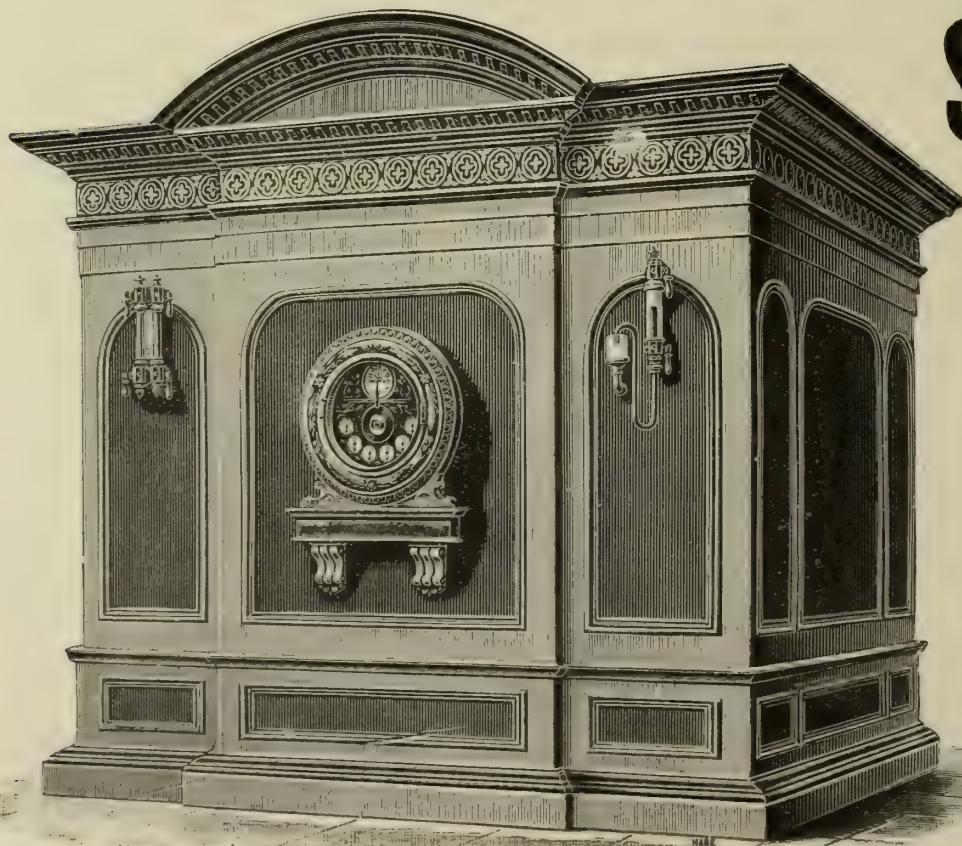
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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CX., No. 2450.—TUESDAY, APRIL 26, 1910.

EDITORIAL NOTES—GAS, &c.

Humiliation and Resentment.

As expected, there was great weeping, wailing, and gnashing of teeth in the electrical press last week anent the Westminster street-lighting contract, which the Gaslight and Coke Company have secured, on a penalty-protected illumination basis. Never before have the Gaslight and Coke Company been painted as so arrantly foolish as on this occasion. They do not know their business; their electrical engineers know it much better than they do. And if the Company do not listen to reason (as supplied electrically), the consequences will be somewhat tragic for the proprietors. Quite elaborate calculations are made (particularly by the "Electrician") to show that the Company are playing a losing game; and our friends—ungenerous in the hour of their vexation, and in that of the Gas Company's initial backsliding— withhold congratulation to the Company on the "tactics" they have adopted on this occasion. But unfortunately for all the caustic criticism of our contemporaries, they have based their figures and assumptions on ancient costs, and have taken no account of the subsequent advances of gas lighting. We need not therefore follow them through their wasted labours. The lighting will be done on the high-pressure system with modern lamps, by which at least 60 candles per cubic foot of gas consumed per hour can be realized. As to the price of gas for public lighting, it is not the 2s. 8d. per 1000 cubic feet now charged by the Company for private lighting, but a lower figure controlled by the Act of Parliament; and, under the new authority to the Company to supply gas of reduced grade in illuminating power, the maximum authorized charge for public lighting has been brought down to a point that has never before been reached in the history of the concern. Moreover, it must not be forgotten that in inverted, and not upright, burners will be used; nor that, by a single inverted burner and mantle under the high-pressure system, anything (according to burner used) from 100-candle power up to 1500-candle power can be obtained. From all of which the electrical critics will see that the bases of their calculations are in every respect antiquated. They have, in their calculations, ignored entirely the conditions of modern gas progress. For their own credit sake, they ought to have been better posted, so as to have saved them from displaying their ignorance in such an extraordinary fashion. The "Electrician" thinks that the Company are supplying an article at 4d. per 1000 cubic feet which costs them 2s. to produce. In other places, 5½d. per 1000 cubic feet is mentioned. The figures and argument are humorous, not to say grotesque. Our contemporary could make itself acquainted with the real cost of gas into the hands of the holder, as well as the net cost. On the whole, the little mark of sympathy expressed in the words "we cannot help feeling that the Gas Company has set itself too hard a task," is misplaced.

We will not make too critical an examination of other points in the "Electrician" article, except a reference to show our readers how little our contemporary knows about the subject it ventures to expatiate upon with an unwarranted assurance. It is feared by it that the Gas Company will have considerable difficulty in obtaining and maintaining a unit of 3000-candle power. Then we read: "Even with the most modern arrangements, they will probably have to erect three lanterns on one post for the purpose; the great amount of heat given out by large mantles makes it impossible to use more than a certain number of mantles in one lantern." After such a revelation, the Gas Company surely ought to shuffle out of the contract in the most dignified manner possible, unless, of course, they happen to know that our contemporary is rather behind the times in his knowledge of gas-lighting matters. Following the cobweb of assumptions and figuring, there is a tirade in regard

to the immorality of the Company in the matter of price-cutting. The writer must have had his tongue in his cheek when he started on this track. Even had our contemporary's computations not been based on unsound foundations and had been right, it should not be forgotten that the Company have, in this matter of public lighting, a very difficult fight against municipal traders with the purses of the ratepayers at hand to dip into. When there is talk of "tactics" in a vein that suggests the hopeless depravity of the Company, surely what they have had to meet in the way of "tactics" at Marylebone, Hampstead, and other places in connection with public lighting, must have already escaped memory. But we do not recollect that the "Electrician" withheld its congratulations to, for instance, Marylebone, when the Borough Council, at all capital and other costs, determined to oust the Gas Company from public lighting work in their area, nor that it trounced the Council heartily for what they did, though their action was twice condemned by the Finance Committee of the London County Council. From the published statistics, we see that Metropolitan electricity purveyors (municipal and company) practise price-cutting on public lighting to a degree never yet imitated in the gas industry. Several charge an average of 1d. per unit, and between that and 2d., for public lighting; while costs (ignoring capital expenses) amount to a higher figure. This sort of thing is winked at; but the Gas Company must not—we do not admit they are proposing to do this public lighting at a loss—use the same weapons as their competitors. What is right for electricity suppliers (according to electrical theory) is wrong for the Gas Company. Assuming, however, the Gas Company were not recovering total costs in this street lighting contract, what has that to do with anyone? They can certainly do what they please with their own money. It is not the same thing as playing with the ratepayers' money and interests.

The "Electrical Times" goes in for a little arithmetical exercise likewise in their attempt to prove that the Gas Company have undertaken the contract at a loss. But it does not indulge in the flights of imagination of the "Electrician." The "Electrical Review," on the other hand, instead of expending powder and shot over the Gas Company, turns and rends the Electric Company for quoting figures so much in excess of the Gas Company, and figures that are higher than obtain at present in the area for street electric lighting. Perhaps the Electric Company are tired of public lighting at a non-paying price. We do not know; but the idea passes through the mind.

However, when a Borough Council ask for tenders for specified quantities of illumination or anything else, it is for them to accept the lowest offer, providing the tenderer is in a substantial position. In the interests of ratepayers, their duty is to get the best possible service at the lowest possible price; and in this case they have protected the ratepayers by heavy penalties for any violation of the contract. If this had merely been a contract improving present gas lighting by the adoption of a more efficient gas system, then less would have been heard of it in the electrical papers. But in the very heart of the West End, 71 electric arc lamps have to go. The humiliation is what has angered our contemporaries.

Mr. Balfour Browne on Municipal Trading.

WHEN Mr. Balfour Browne, K.C., D.L., unfettered by professional responsibility, speaks as he did in the lecture delivered yesterday week before the British Constitution Association, on the question of State and municipal trading, he scourges unsparingly an evil that is insidiously winding its way into our social system, and threatens to sap much of our individual vitality, to the degeneration of personal effort, responsibility, and character, and to the hurt of the country generally. No one can attack the breadth and the depth of the experience from which the argument and

submissions of Mr. Balfour Browne are deduced. His experience may almost be described as unique; and it has not been obtained from any one-sided or contracted view, but has been built up from exceptional opportunities for investigating the effects, actual and potential, of private enterprise as compared with municipal adventure, with which personal effort and responsibility have no particular ties. Mr. Balfour Browne is firm for individualism and private enterprise as opposed to collectivism. The former is a greater effective force than the latter; and the pity of it is that while the latter is less effective, those who acclaim and foster it are the prime-movers in placing (as the lecturer expressively describes the obstructionist process) spokes in the wheels of progress. Municipal trading can, by no stretch of the imagination, lay claim to initiative in enterprise. The municipalizers are usurpers pure and simple. In relation to gas affairs, municipal authorities have put many "spokes" in the wheels of progress; but the curious thing is that directly they become owners of that which was formerly privately owned, they are very prompt in securing the removal of the obstacles that they themselves were instrumental in placing in the wheels of their predecessors. It is a singular thing, too, that so long as private ownership prevails, the local authority are absolutely blind to progress that changes fundamental conditions. They persist in archaic enactment when the incandescent burner, the gas-engine, the gas-cooker, the gas-fire, the industrial furnace, the tool heater, and the crucible, have rendered ineffectual a requirement that ought, from economic, scientific, and practical points of view, no longer to exist. In all these things, science and individual effort might just as well have stood still for all the aid our non-gas-works owning municipal governors have accorded to the spread of the material advantage yielded by scientific progress. One thing that can be said for the municipal ownership of gas undertakings is that such owners, in these latter years, when change has been so rife in the gas industry, have not done anything to prevent the full benefit of the change being reaped by the section of the gas industry represented by private enterprise. On the other hand, we do not see, by example, that municipal owners of gas undertakings have done anything to assist municipal authorities who are not gas-works owners to see the errors of their repressive and oppressive ways. They may take this as a suggestion of means by which the common interests of the gas industry may be furthered by their intervention.

One thing is very desirable; and it is that the law relating to the trading branch of municipal activity should be thoroughly revised in the light of experience. Fundamentally, the general legislation governing municipal trading remains much what it was at the advent of parliamentary sanction to local authorities stepping outside their legitimate sphere. And it is the old tale—for every inch of privilege then allowed, a full ell has since been taken. As in most cases in parallel, we do not believe that it was ever anticipated that what was done at the beginning would have supplied such fertile ground for the growth of the doctrines of Socialism, and would yield such a crop of evil as has been witnessed. Therefore, there is complete agreement with Mr. Balfour Browne that some further consideration of our present position in relation to State and municipal trading might be useful. But there have been inquiries, and condemnation has followed. There, however, the matter seems to have a consistent ending. It signifies not which political party is in power, it appears to be nobody's business to put the needful stop to these blighting influences. Directly there is the slightest indication of greater control by Parliament or by some Central Government Department, the municipal traders squeal out as if suffering fearful pain. Only the other day, Mr. Harwood Banner, M.P., in his presidential address to the Association of Municipal Corporations, deplored the increasing desire on the part of Government departments to obtain more or less absolute control over local authorities; and he described it as one of the greatest dangers threatening municipal life at the present time. We find it far easier to appreciate the necessity for this control than to see the great danger. The necessity for greater control, for a better definition of powers, and for a larger degree of restriction, is the product of excesses, and of an unreasonable interpretation of the powers already possessed. For this reason, in addition to the fact that the policy of profit appropriation in aid of the rates is repugnant to our ideas of the true purpose of civic direction of trading concerns (to which system, it is hardly requisite to say, we

are altogether opposed), it is gratifying to see that Parliament is setting-out—as instanced by Salford, Oldham, and Glasgow—to produce reform in this respect. "The policy 'of 'use,' " says Mr. Balfour Browne, "as contrasted with 'profit,' is going to have its way." It is the only justification for municipal trading. But it cannot be admitted that, when municipal undertakings are worked for the service of the community, as distinct from profit-making, the element of profit is altogether absent; for the money required for interest and sinking fund in respect of the capital invested has to be earned by the business. Real advantage from State and municipal trading is all a myth; and the lecturer shows, with that clear perception and vigorous diction of his, that, far from advantage accruing, the system supplies the ground for much noxious growth.

Eighteen Vertical Retorts in One Setting.

THE publication in last week's issue of the lecture by Dr. Geipert, of Berlin, on the Dessau settings of eighteen vertical retorts will not fail to have attracted the attention of all who are keeping abreast of the advances in practice of those who have taken upon themselves the work of developing the vertical retort processes. In the forefront of the lecture, we are shown that the most profitable part of all gas-manufacturing operations that the gas manager can explore in the search for economy, is that of carbonization. The first thing to be done is to make a judicious selection of retort-setting; and the next is to work the setting in the most rational manner. In both respects, the gas manager is faced by an extent of discretionary scope that is at times rather perplexing. In respect of choice, Dr. Geipert says our forefathers were better off, because they had none, and so were not worried by philosophical considerations as to relative pretensions, and as to future operation and result. If, however, our forefathers were with us to-day, and viewed their position from the standpoint of the enhanced result of the present times, we doubt whether they would subscribe to the suggestion that, in their circumscribed state in the matter of choice, they were better off than their successors. But of course, Dr. Geipert has no desire to have the passing remark taken too literally; for he proceeds to welcome the tremendous progress that has been made in the art of gas manufacture by the development of more efficient carbonizing plant, which has resulted per unit of output in economy of labour, fuel, and expenditure, and in increased product from the raw material. It is the latest form of the Dessau vertical retort-setting that Dr. Geipert naturally regards as pre-eminent among the rivals. In this setting, eighteen retorts are nested in the space formerly occupied by twelve; and the presentation of the results derived from the change is the primary object of the lecture.

We had been led by prior information to look upon the new setting of eighteen retorts as marking a distinct advance in the matter of the balance of advantage as compared with its immediate precursor; and there is now the substantiation. One important feature of the new design of setting is based upon an idea borrowed from the designers of carbonizing chambers, in that there is an increase in the ratio of the retort heating surface to the quantity of coal carbonized. This is one direction in which the experimenters with the Dessau system are now not only confident, but satisfied that there is realizable economy. The retorts are described as being "specially narrow, so that the heating surface is 'relatively very large.'" It is not observed that mention is made of the point in any part of the lecture; but it would be interesting to know whether this narrowing of the retorts has any effect upon the quality, or, perhaps we should say, the density, of the coke. Apart from this, in other respects the duty of the setting—not the duty per retort—is augmented by the change in design. The four points on which it is found that the new setting greatly excels the old in economy, are in increased make per setting on the same ground space, in the considerable reduction of fuel in relation to the coal carbonized, in respect of the cost of installation, and in wages per unit of production. These points require no elaboration to emphasize their importance; and, as between the old and the new types of Dessau setting, they mark a distinct economic advance. In one set of results cited in the lecture, it is remarked that the make of gas on the same ground space, or in an eighteen-retort setting of like over-all dimensions to a twelve-retort setting, was increased by no less than 38 per cent. The make per ton was approximately the same, as was also the gross calorific power.

The coke used as fuel was very considerably reduced—by as much as 3.2 (15.0 to 11.8) per cent. by weight of coal carbonized, or to only 19.2 lbs. per 1000 cubic feet of gas made, which low figure compares with 28.7 lbs. in the case of the Munich carbonizing chambers. We could have wished that Dr. Geipert had supplemented his figures by stating the illuminating power of the gas, as though Germany in many places can ignore this quality, we cannot afford to do so while the British gas industry is under the domination in that regard of statutory standards and penal testings. This omission apart, the conversion of the twelve-retort Dessau setting to one containing eighteen retorts has been completely vindicated by the excellence quantitatively of product and other working results.

In the concluding part of the lecture, Dr. Geipert replies to some of the points raised by Mr. A. T. Harris in the paper which he read at the recent meeting of the Midland Association of Gas Managers.

Radiation.

WHEN we realize that our most efficient systems of lighting are still inefficient, and that our methods of heating still leave much to be desired, then it will be recognized that all serious discussion and work on the various aspects of thermal and luminous radiation, with special reference to the uses of town gas, must be valuable both in instruction and in suggestiveness. It must be confessed that, although the fortunes of the gas industry are founded so largely on thermal and luminous radiation efficiencies, there has been a lamentable lack of relevant knowledge in the industry's general technical ranks. And the industry's technical ranks are not above acknowledging the truth of the impeachment. For this among other reasons, we welcome the paper on the subject that Mr. J. G. Clark read at the meeting of the London and Southern Junior Gas Association last Friday. It may be that he soared somewhat above the heads of some of his hearers; but for such a body—in fact, for any technical body—there is little use in keeping down to the highest level of the present knowledge of members, and never going beyond. For by doing so, the work would get into a stereotyped condition, or into a rut; and the members would never make any real advance in the knowledge they are organized expressly to accumulate and assimilate. But touching the paper. Without a proper understanding of basic principles—among them the theory of radiation—there can be very little practical advance made in the economy and efficiency of the appliances of the gas industry in which temperature is a power of primary importance. In the gas industry, we have in the last few years had the truth of this enforced in a very practical manner by positive successes. Appliances have in the past been subjected to too much speculative design; but now, in every direction of gas utilization, the spread of scientific knowledge and rule is making material impression on the intrinsic values of productions that are offered for use—to the advantage of both user and industry.

Among members of Junior Associations are those who require to have their knowledge of principles expanded so as to stimulate them to seek, and assist them in seeking, to produce progress on correct scientific lines. But it is essential that what are called "correct scientific lines" do not belie the description. There are words in the paper that suggest to us the necessity of impressing upon the juniors the importance of investigation work aimed at achieving advancement being governed by really accurate scientific method, and many a worker has been misdirected through this, and has thus wasted much precious time and labour. There is nothing wrong about this statement; it only serves to remind of a case in point: "Comparing the radiation from the argand flame, and that from an incandescent gas-burner, the proportion of thermal to luminous radiation is found to be larger in the former case than in the latter." But what that proportion is may be considerably varied by the method by which the tests are carried out to determine it. For instance, in papers published in 1902-3 on the theory of the incandescent mantle, careful as the experimenters believed themselves to be in conducting the research on which the papers were founded, Professor Vivian B. Lewes detected weaknesses which went to corrupt the results that were published. For example, in taking mantle temperatures, the experimenters employed a burner intended for use with a chimney; but

the chimney was discarded by them on the ground that it interfered with the manipulation of the thermo-couple. This did away with the draught round the mantle; and instead of the flame burning as it should on the surface of the mantle, it had its outer zone of combustion thrown outside the mantle. That this is so (remarked Professor Lewes in his criticism) is shown by a Welsbach mantle only giving 15.7 candles per cubic foot of gas, instead of 19, as it would probably have done with a chimney on. Under these faulty conditions, the experimenters took the temperatures of the mantle and the hottest part of the flame outside it; and they found the flame considerably hotter than the mantle.

Mr. Clark's paper is not one giving room for criticism; and in the main, for our purposes, it merely offers points that may be emphasized. One point that should be particularly noted by those investigating temperature and radiation problems with the view to practical application is this: "We find in practical work that we cannot produce luminous effect without accompanying thermal effect; and we cannot produce any great thermal effect without accompanying luminous effect. What is possible, however"—this is the important point—"is to vary the proportion of the luminous and thermal effects, so that the required effect is made the more prominent." Then we go on to see the results of observations made simultaneously with a photometer and a thermopile directed to an incandescent mantle fitted upon a burner. The observations were made at various gas pressures; and, as one would expect, both the luminous and the thermal effects were found to increase with the pressure—the former advancing more rapidly than the latter. The cause of this, of course, is the higher flame temperature produced at the higher pressures. This is precisely what Mr. A. W. Onslow has found in regard to the thermal efficiencies of industrial furnaces heated by high-pressure gas. Not only, as he was telling the Society of Chemical Industry recently, does he get, by using high-pressure gas, greater heating effects, with more uniformity throughout the furnace, but they are more constant, and are reproducible at will. The value of the use of reflectors in connection with lights is a point that was also demonstrated by Mr. Clark in the paper; but it is an essential condition that they must be properly designed for the particular work that the lamp concerned has to do. Reflectors are made and applied at the present time in much too haphazard a way; and the sooner manufacturers realize this the better. With the advance of the system of purchasing for street-lighting purposes specified illumination, photometrically tested at defined angles and distances, this question of the proper scientific design of reflectors will become a highly important one.

Dealing with the subject of thermal radiation, we find that Mr. Clark has only a qualified appreciation of the thermopile—finding it useful for certain purposes on account of its handiness and low thermal capacity, but quite unsuitable for the commercial evaluation of gas-fires. In view of this, he has designed a form of radiation calorimeter, which he believes to possess novel features. If Mr. Clark has succeeded in producing a dependable, or even an approximately correct, radiation calorimeter, he will deserve the cordial thanks of all gas managers who are wanting some readily applied means of making comparative testings of the radiation values of the gas-fires that are brought before them by the makers. Reading the description of the new radiation calorimeter, it appears to be right in principle; and certainly from the point of view of simplicity, it is to be recommended. But beyond this, it is too early to go in speaking of the arrangement *pro et con*. It will be observed from one of the diagrams, that there is no positive relation between the values obtained by the calorimeter and those obtained by the use of the thermopile—this, as explained by Mr. Clark, being due to the fact that the thermopile intercepts a much smaller quantity of the radiation than the calorimeter. But Mr. Clark has struck out into a new line in radiation valuation; and we hope that, from an attitude of interest, there may soon be a change to complete conviction as to the practicability and usefulness of the invention, which supplies, in our opinion, the central feature of a paper that has been most carefully prepared, and bears even indication of extended study and research.

Gas Exhibit at the Japan-British Exhibition.

The special attention of readers is asked to the communication that it is our pleasure to publish in the "Correspondence" columns this week from Mr. D. Milne Watson, the Chairman, and

Mr. F. W. Goodenough, the Hon. Secretary and Treasurer, to the Gas Companies' Joint Exhibit Committee in connection with the Japan-British Exhibition. This Committee has been constituted from the chief officials of London and Southern Gas Companies who, being in close, or comparatively close, touch with the Metropolis, can render personal, and thus effective, aid by their counsel in furthering the work of organizing an exhibit (see "JOURNAL," Feb. 22, p. 487). It will be seen by the letter from the Chairman and the Hon. Secretary and Treasurer that the plans and work are well advanced; and that now all that the Committee are anxious to secure is a fairly large guarantee fund. Twenty-three gas undertakings in London and the suburbs have already guaranteed £2285; but the Committee would be glad to have at least £3000 at their disposal. The bulkier the guarantee fund, the better; for the Committee would like to feel that their liberty was not restricted for the sake of a little extra money, and at the same time they would prefer that the guarantee fund should be of such an amount that there would be no necessity to call upon the individual guarantors for the full amount of their guarantees. The constitution of the Committee is a sufficient surety that the money will be expended wisely and well in demonstrating to the large and representative public that will be drawn from all quarters of the country, some of the most modern improvements in the application of gas. There is no doubt the Shepherd's Bush Exhibition this year is going to be a highly popular one; and our "allies" of the Far East are doing their best to make it so. Therefore, on all grounds, we have pleasure in supplementing the appeal of Mr. Watson and Mr. Goodenough for an immediate generous consideration and decision, on the part of Boards of Directors and Committees, regarding the question of entering the names of their undertakings on the list of guarantors, with the amount of the sum for which there is willingness to be responsible, in respect of the expenditure that will be incurred over this excellent project.

The Gas Fight at Warsaw.

The Warsop Urban District Council evince keen disappointment at the refusal of the Local Government Board to sanction a Provisional Order which would have enabled them to manufacture and supply gas. The disappointment will not, however, be anything like universal among the ratepayers; for keen opposition from influential quarters was shown to the scheme at the time of the holding of the local inquiry into the application—a lengthy report of the proceedings at which will be found in another part of this issue. And not only have the Local Government Board declined to give their sanction to the Order, but apparently efforts made to induce the President of the Board to receive a deputation from the Council to discuss the matter have likewise proved unsuccessful; for we learn from a local paper that "all influence possible has been brought to bear upon Mr. John Burns in order to persuade him to receive a deputation, but the efforts of Mr. Markham and Mr. Hume-Williams in this direction have proved futile." It is unnecessary to go into the details of the question here, for they are clearly set forth in the statements of Counsel and the evidence of the witnesses who were called at the inquiry. But it may be remarked that a strong point was made by the several large ratepayers who opposed the scheme of the fact that there is already a Gas Company (who also strongly opposed the granting of the Order) supplying a portion of the parish, who are willing to take over the remainder. This is the Shirebrook and District Gas Company, from whose mains, it was argued, prospective consumers would be able to get a cheaper supply of gas than they were likely to obtain if the Council's proposals were carried out. At the subsequent ratepayers' meeting, a member of the Council who gave evidence at the inquiry in favour of the application for the Provisional Order, said that "for some reason it was thought by the Local Government Board best for the Council not to have control of the gas supply. It appeared they believed the Shirebrook Gas Company could bring gas much cheaper than the Council could supply it." This is how the decision strikes a supporter of the Council's case; and there is no sufficient ground to accuse him of having gone astray in his reasoning. In all likelihood the question of probable price was taken into consideration by the Board; but as in giving their refusal they said that, looking at all the circumstances, they had come to the conclusion that they ought not to grant the Order, it is only fair to assume that there were also other matters which

influenced them. Having thus failed in their attempt to provide a gas supply under their own control, the Council have now been authorized by the ratepayers to take steps to secure the best protective clauses possible in the Shirebrook Company's Bill.

Gas Consumers and the Standard Burner Bill.

An article with the capital heading "The Standard Burner Bill," and with the sub-titles "What it Means," and "The Consumers' Point of View," has appeared in the "Liverpool Courier." The article does not tell with truth what the burner really means; and what it does say is not from the consumers' point of view, but is obviously written by a technical antagonist in a specious way for the express purpose of creating some alarm among gas consumers, or an agitation for some *quid pro quo*. There is an insinuation that the promoters of the Bill are, by their proposal, doing something craftily, and doing it secretly, with the object of deceiving consumers. The Bill, we read, is one "for reducing the illuminating power of the gas supplied in several areas named in the schedule, without the knowledge and consent of the consumers." If all the asserted evils that accompany the use of the burner were real and not phantoms, the consumers would soon be made aware of what had been done; and there would before this have been a terrible outcry in those eighty or so gas-supply districts where the burner has already been applied. The readers of the article are told that "a depreciation in candle (or lighting) power, estimated at from 10 to 20 per cent., will certainly follow in all towns and districts served by the companies named in the schedule of the Bill." There is nothing like having a good impressive margin; and the 10 to 20 per cent. gives it. But the shocking degradation of illuminating power predicted only refers to that small portion of the gas used in flat-flame burners; and it must surely have been a slip of the pen when "A Correspondent" wrote what is tantamount to a warning to consumers not to use gas at all for its own illuminating power. He says: "The old batswing burner, with its flat flames exposed to the cold air on both sides, is now generally admitted to be a most defective burner." So what is the use of having a gas of high illuminating power merely for consuming by the aid of what are admitted to be defective appliances? The logic of the writer in the "Liverpool Courier" is as defective as the flat-flame burner. The consumers, too, who are foolish enough to continue to use flat flames will "dread" a further reduction of 2 to 4 candles in the illuminating power of the old, defective batswing burner. Why "dread" it, when the incandescent gas-burner offers nearly a tenfold increase of illuminating power for a given consumption of gas? Why suffer any torture when cheap relief is at hand? The article has a close alliance with the ineffectual bogeys recently raised in the Parliamentary Committee rooms.

What is Wanted.

The writer, however, is good enough to express the opinion that it is useless to expect that the opposition to the present Bill will prevent the adoption of the improved burner for testing purposes. The real intention of the writer's labours, however, is found in the concluding lines of the article. He says: "The change ought to be accompanied by a *quid pro quo* to the public either in the shape of a reduction in the price of gas, or in the acceptance by the gas companies of maximum and minimum calorific tests for the quality of gas supplied. What consumers can do in the present case is to insist, through their representatives in the Council and in Parliament, that a clause defining the nature and character of these concessions to the public shall be inserted in the Bill before it passes the House of Commons Committee, and receives the Royal Assent. It is to be hoped, therefore, that the various corporations and local authorities who are opposing the Bill will leave no stone unturned to obtain the addition of the proposed clause to it." It is not mentioned in the article that the local authorities left no stone unturned in the House of Lords; and a pretty mess they made of the whole business, as was shown by Mr. Honoratus Lloyd, K.C., whose view was endorsed by Lord Ritchie and his colleagues.

In the "JOURNAL" for the 22nd of March (p. 811), we described and illustrated a mounted cubic foot bottle which had been brought under the notice of the members of the New York Section of the Society of Chemical Industry. We learn that this was done by Dr. E. G. Love, the Gas Examiner for New York, and not by Mr. E. C. Uhlig, as stated.

NOTES FROM WESTMINSTER.

FROM the extraordinary interest distinguishing the Committee work of the preceding week, we have been precipitated into a period of comparative dulness. Gas matters have been confined to a few measures before the Unopposed Bills Committee, and to the small gas section of the Bradford Corporation Bill. For the rest it has been all water and railway affairs. As to progress, the most interesting point is that the Standard Burner Bills have finished their course through the House of Lords, and have been transferred to the Commons, where it is hoped they will receive just as wise treatment as in the Upper House. There will be a little repose for them, and for those who are actively hostile to them, and those who are prepared in their defence, inasmuch as there is close at hand the long-promised holiday for our legislators which will take us well into May. It will be an unkind thing if it should happen that the Bill reaches the Committee stage in Institution week.

A Long-Standing Agreement.

In pursuance of their policy of becoming the sole purveyors of gas within their administrative limits, the Bradford Corporation have had for the past three years among their schemes one for the purchase, under an agreement entered into in 1907, of the private gas-works in the city owned by the Trustees of Sir Henry W. Ripley, who supplied gas to an area in its entirety part of the Ripley estate. The matter of getting the sanction of Parliament to the purchase, and of giving effect to the agreement, has been previously incorporated in a Bill, which, for other reasons, the ratepayers rejected; and this deferment raised the question in the minds of the Local Government Board, on the Bill of this session coming before them, as to whether the works may not have depreciated in value since the agreement was signed and sealed. The query supplied a point for discussion when the gas section of the Bill was before the Local Legislation Committee the other day; but Mr. Charles Wood had no difficulty in assuring the members that the Corporation, for the £15,000 they are going to pay, will get full value for their money. The section proceeds; so that the Corporation are now fairly on the way to the execution of this long-standing agreement.

Unopposed.

The Unopposed Bills that were before Mr. Emmott's Committee during last week, included the Bishop's Stortford, Farnham, Exmouth, and Egremont gas measures. The point that seemed to agitate the Committee most about these Bills was in the first two, and had reference to the proposed electricity supply powers. There is ample precedent for conferring such powers upon gas companies; and the Committee have not departed from the precedent. In the case of Bishop's Stortford, there are still in existence electricity supply powers, originally secured by the Council, and transferred by them to a Company, but still unexercised; and the Gas Company have pledged themselves not to exercise the powers that may be conferred upon them until the Board of Trade revoke those still existing. The Unopposed Bills Committee are anxious to have before them the views of the new Council on this question of electricity supply before granting the powers to the new Gas Company, constituted by the Bishop's Stortford, Harlow, Epping, and other Companies. The preamble of the Bill has been passed; but this one matter of electricity supply stands over for the present. There is, however, every prospect of the electricity part of the scheme going through, seeing that Mr. Cooper, one of the members of the Council, says he knows of nine members out of fifteen who are in favour of the Gas Company supplying electricity. One thing the Council have to consider is whether the Company can, through their special facilities, supply cheaper than an independent electricity concern. If the Council do so consider, then their duty is clear. The application for electricity supply powers was also the subject of a little discussion in connection with the Farnham Bill; but nothing came of it beyond evoking information. The preamble of the Bill was passed. The Exmouth Gas Bill also went through, with the Mountain Ash stand-by clause in it. The Egremont Gas Purchase Bill likewise met with the approval of the Committee.

Water.

As remarked in the opening paragraph, the week has been notable for the consideration of water measures. The principal Committee was the joint one of the two Houses on the Water Supplies Protection Bill, who commenced their sittings last Wednesday, and had a most interesting lecture from Mr. J. Lithiby, the Legal Adviser to the Local Government Board, on various matters pertinent to the measure. We were taken back to the ancient law of Rome as laid down by Justinian, and had the well-known information repeated as to the law of underground water supplies. The powers of the Local Government Board were traced; and then the clauses of the Bill were examined and criticized—sometimes not altogether favourably. It may, for instance, be a very good general sort of rule (as laid down in clause 5 of the Bill) that, when an authority goes a distance for a water scheme, it should supply not only the county district from which the water is drawn, but if required the towns and villages through which the pipe-line conveying the water passes. But such a rule may be, in extreme cases, absolutely absurd. We know what has been done in connection with some other important places; but imagine the rule being applied (say) to a pipe-line bringing water to London from Wales. London might fare badly. The information laid before

the Committee by Mr. Lithiby has been followed by a good rest on the part of the members; but it is expected that they will soon be heard of again.

The South Hants Water Bill has been the subject of a big discussion before Mr. Armitage's Committee in the Commons. The Bill, as our notice on Feb. 22 (p. 494) showed, is mainly for empowering the construction of new works and for capital powers. Numerous technical and local witnesses were called before the Committee in support of the measure, and to back the opposition of the Corporation of Southampton. The most important news connected with the fight has been that the preamble of the Bill has been approved; but certain clauses have been modified. The Committee thought that the basis of the water-rate should be assessable value, and that there should be a new scheme arrived at on that basis. The capital, it was decided, should be reduced to £60,000, with borrowing powers of one-fourth. The rest of the Bill was passed; but the Committee, realizing that the Company and the Corporation draw from the same source of supply, considered that, in the general interests of the community, the water supply should be under the control of one authority. They did not, however, express an opinion as to the composition of the authority. The last-named matter is one for the future. The Corporation were not represented on clauses, so they will no doubt put in an appearance in the Upper House.

Among miscellaneous matters, the Mountain Ash new reservoir scheme has been before the Local Legislation Committee. The reservoir, it is proposed, shall have a storage capacity of 120 million gallons; and it is estimated that it will cost £74,765. The Bill is to proceed; but the Committee decided that the District Council should make full compensation for all expense reasonably incurred through the bursting of the reservoir at any time. The Exmouth Water Bill has been before the Unopposed Bills Committee; and the preamble has been declared proved. The Aberdeen Corporation new water scheme has been under the consideration of a Committee of the House of Lords; but the time since consideration commenced has been protracted owing to the unfortunate illness of the Chairman, Lord Gorell. Earl Camperdown has taken his place; and the conclusion of the hearing of the evidence is now at hand.

Personal.

Mr. J. F. WEST, the Manager of the Stamford Gas-Works, has resigned, and Mr. H. GREEN, the Secretary, has been appointed Manager as well. Mr. Green was trained under his father, the late Mr. Charles Green, at the Market Rasen Gas-Works, was afterwards an assistant to Mr. R. G. Shadbolt at Grantham, and six years ago became Secretary to the Stamford Gas Company. He holds a first-class certificate in the ordinary grade in "Gas Manufacture."

Obituary.

The death occurred last Tuesday, in his eightieth year, of Sir SAMUEL BLACK, who filled the positions of Town Solicitor and Town Clerk of Belfast from 1871 till March last year, when he retired. A few years after his official connection with the Corporation, the purchase of the undertaking of the Belfast Gas Company, of which he cordially approved, was effected.

Annual Meeting of the Italian Gas Association.—We learn that, under the presidency of Sig. Ing. Luigi Chavannes, the thirty-ninth annual meeting of Italian gas and water engineers will be held in Naples on the 6th of June and two following days.

Southern District Association of Gas Engineers and Managers.—The spring meeting of the Association will be held, on the invitation of the Directors of the Bath Gas Company, and the President (Mr. C. Stafford Ellery, the Engineer and Manager of the Company), at Bath on the 12th prox. An interesting programme has been drawn up; and arrangements are being made for a saloon carriage from Paddington for the London members. During the day, a short business meeting will be held for the purpose of filling the office of Hon. Secretary and Treasurer, which has been rendered vacant by the retirement of Mr. James Paterson.

Eastern Counties Gas Managers' Association.—As briefly announced in the "JOURNAL" last week, the half-yearly general meeting of the Association will be held at Great Yarmouth on Friday; the business being transacted at the Royal Assembly Rooms, under the presidency of Mr. John Young. According to the programme issued by the Hon. Secretary and Treasurer (Mr. T. A. Guyatt, of Ely), the report and accounts for the past year will be submitted, two new ordinary members and one associate member will be proposed for election, and discussions will be opened on "Purification" and "Free Maintenance," by Mr. F. Prentice and Mr. F. L. Wimbush respectively. Subsequently, the officers for the ensuing twelve months will be elected, and the place of next meeting fixed upon. The members will be entertained at luncheon by the Chairmen and Directors of the Great Yarmouth and the Gorleston and Southtown Gas Companies; and in the evening they will dine together at the place of meeting. On Saturday, they will visit the Great Yarmouth Water-Works, and be entertained at luncheon by the Chairman and Directors of the Water Company.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 266.)

ALL markets on the Stock Exchange were completely dominated last week by the power of the great speculative centres. The size to which this had grown, the enormous amount of money involved, and its potentialities for mischief gave it an influence that could not be avoided or disregarded. Consequently, the check it sustained last week was felt everywhere to some extent. The first sign of a change came on the opening day, when Rubber fell. The leading departments remained quiet, but were inclined to give way. There was some fair buying of gilt-edged issues; but Rails were less supported. Tuesday was under the influence of the fall in the big speculation, and exhibited dullness to a degree, though the close was better than the worst of the day. Consols fell $\frac{1}{8}$. On Wednesday, the weakness in the speculative market dominated all departments. The gilt-edged class moved irregularly, Rails drooped for lack of support, and American and South African were weak. Thursday opened uneasy, in view of the pressure to sell in the Rubber Market, and the leading departments kept very quiet. But when the atmosphere had cleared somewhat, a little recovery set in here and there, but not uniformly. Friday was better; the improving state of things in the speculative lines relieving the apprehension, and the general attitude of the leading markets being steady. Saturday was a quiet day, and devoid of exciting features; and no particular change was observable. In the Money Market, the earlier tendency was in favour of easier conditions; but later on the market hardened and closed very firm. Business in the Gas Market was pretty brisk (some issues coming in for a good deal of attention); but movements were irregular. A few quotations were put back to a slight extent, although it would be hard to say why. On the other hand, there were quite as many that were put up. In Gaslight and Coke issues, the ordinary was brisk and busy, and prices realized were every bit as good as those the week before—viz., 103 $\frac{3}{4}$ to 104 $\frac{5}{8}$; but the quotation was lowered $\frac{1}{8}$. In the secured issues, the maximum was done at 89 $\frac{1}{2}$, the preference at from 104 $\frac{1}{2}$ to 105 $\frac{3}{8}$, and the debenture at from 81 $\frac{1}{4}$ to 82 $\frac{3}{4}$. South Metropolitan was rather quiet but very steady at from 121 $\frac{1}{4}$ to 122. The debenture marked from 81 $\frac{1}{4}$ to 82 $\frac{1}{2}$. Nothing was done in Commercial, except one deal at 104 in the 3 $\frac{1}{2}$ per cent. Among the Suburban and Provincial group, Alliance and Dublin realized 83 $\frac{1}{4}$ and 84 $\frac{1}{2}$ (a fall of 2), Brentford old 251 special, British from 44 to 44 $\frac{1}{4}$, Bromley "A" 117 $\frac{1}{2}$ (a rise of 2), North Middlesex 13 $\frac{3}{8}$, South Suburban preference 122 $\frac{3}{8}$, and ditto debenture 123 $\frac{1}{2}$. On the local Exchange, Tynemouth was done at 114 (a rise of 1). In the Continental companies, Imperial was a good deal more active, and was firm at figures which ranged between 181 $\frac{1}{4}$ and 183, while ditto debenture marked 95 $\frac{1}{2}$. European fully-paid marked from 24 $\frac{1}{2}$ to 24 $\frac{3}{8}$, and ditto part paid 18 $\frac{1}{2}$, both issues being put down $\frac{1}{2}$. Malta was done at 41 $\frac{1}{8}$. Among the undertakings of the remoter world, Bombay changed hands at 6 $\frac{1}{2}$ and 6 $\frac{1}{8}$, Oriental at 142 $\frac{1}{2}$ and 143, Primitiva at from 7 $\frac{1}{2}$ to 7 $\frac{1}{8}$, ditto preference at from 5 $\frac{3}{8}$ to 5 $\frac{1}{2}$ (a fall of $\frac{1}{8}$), ditto debenture at 99 $\frac{1}{2}$ and 99 $\frac{3}{4}$, and San Paulo preference 12.

ELECTRICITY SUPPLY MEMORANDA.

Profits and the Rates—Distinction between Gas and Electricity Undertakings—Apathy or Parsimony?—Ignoring Tendering Conditions—Eternal Life—Information Wanted.

THE decision of the House of Commons Committee in connection with the Glasgow Corporation Consolidation Gas Bill, depriving the Corporation of all right to appropriate money in relief of the rates, has come as a heavy blow to those city and town councillors who look upon such trading undertakings as a source of revenue for the municipal treasury. They found it bad enough when Parliament last session, in both Houses, pronounced, in the cases of Salford and Oldham, in favour of the limitation of profit transference to the common funds of towns; but this Glasgow decision is, indeed, practically unbearable. It will no doubt be said, by those looking for some consoling point, that the decision after all only removes the Glasgow Corporation from the (practically unexercised) powers that they possessed under their Private Acts to the general Scotch law, under which surplus gas profits have compulsorily to be applied not to the relief of ratepayers, but to the relief of the gas consumers, who provide the money to meet capital interest and sinking fund, the rates levied on the undertaking, and the expenses of maintenance, working, and administration generally. The principle is a correct one. It is to be feared that Parliament itself is largely responsible for a time-honoured and unrighteous fostering of the rule of profit transfer to the municipal treasury by the perpetuation, in municipal financial enactment, of the right to transfer (if thought proper) the residue of gas profits to the district funds. This condition dates back to a time when there was some doubt as to the financial results of municipal trading; and it would be a very good condition if it were limited to the repayment of all (and nothing beyond) expense incurred by the local funds on behalf of the undertaking concerned. But in regard to municipal gas undertakings, the concern that has become indebted to the local funds in any way is an exception rather than a rule. It is not the same

with electricity undertakings. Though thirty years have passed since the advent of general electricity distribution, there are not a few municipal electric undertakings that are a burden on the common funds. In such cases, we would make the full discharge of the obligation to represent the boundary-line to profit transfer. The ratepayers, *quâ* ratepayers, have in equity no right to anything more.

The matter has become of considerable moment in these days, when many municipalities are running both gas and electricity concerns; and the gas undertakings are being made to bear a disproportionate part of the contributions to rate alleviation. It is not a general experience that a municipal electricity undertaking can afford to contribute anything towards the general rates; and when one can so afford, the contribution invariably looks trifling in contrast with that from the gas undertaking. In many cases, the boot, too, is on the other leg—the electricity undertaking begging for assistance and relief from the district funds. But there are electricity undertakings that do contribute what may be termed substantial sums in aid of the rates; and some of the committees in charge of the concerns prate boastfully of what they are doing in helping to ameliorate the conditions of the ratepayers. There are other committees who do not like making contribution, and are of opinion that the true guiding principle of municipal trade enterprise should be the best service to the community at the lowest cost. That is the principle for which we have been fighting practically from the dawn of gas-works transfer from private to municipal ownership. And now that the contest is so keen between gas and electricity, some local electric supply departments are anxious to have every penny of profit residue to assist them in bringing down the prices of current. But they cannot very well contend for this without recognizing that what is not good for them is not good for the gas department; and it has also to be recognized by them that their own release from contribution will mean, generally speaking, the release of larger sums now monopolized in aid of the rates to the benefit of reductions of gas prices. This will be a highly desirable condition from the gas suppliers' standpoint.

There cannot, however, be any difference in the policy in this respect applied to the two classes of undertaking. Gas consumers cannot, or ought not to, be the victims of shameless municipal pilferers, while electricity consumers go scot free. There must be equality; and therefore electricity departments should join hands with gas departments opposed to profit appropriation for rate relief to put an end to the practice, if not to get the law altered. The votes of two such important committees should count for much in a municipal council. We see no reason why, for instance, the Electricity Committee of the Manchester Corporation should not unite with the Gas Committee in endeavouring to put an end to the robbery of the gas consumers, and to the designs of those who are looking to handling surplus profits of the electricity undertaking for purposes other than those for which they should be utilized. The report given in the "JOURNAL" last week, under the heading of "Profits and the Rates at Manchester" (p. 196), shows that the Chairman of the Electricity Committee (Mr. Haworth) holds very sensible views on the subject, and is just as much opposed to the Gas Committee handing over £50,000 per annum (last year it was made up to £60,000, by taking away practically the remnant of the reserve fund) as he is to the handing over of £12,000 from the profits made by the Electricity Department. There are some members, however, who are not satisfied with what the Electricity Department are doing in the way of profit provision for the City Exchequer. What brought Mr. Haworth to the front in regard to the matter was that Alderman Holt, on a proposal to spend an additional £40,000 on the electricity concern expressed the opinion—more for the purpose of impressing the fact than anything else—that some 2 millions sterling having been expended on the concern, it was about time there was a return of profit in aid of the rates. The "Electrician" mentions that the Manchester Tramways Department has handed over to the City Fund £320,000 during the past six years; but since the gas-works have been in possession of the Corporation, Mr. J. G. Newbigging was telling us last November, the extractions from the gas consumers in aid of the rates total to £2,918,585. This is a shameful condition of things, and as defenceless in one department as another. Committees trading in gas and electricity should combine to make a stubborn and general fight against a system that favours indirect taxation, is prejudicial to the best interests of the undertakings and to the supply to the community of the two essential commodities at the lowest possible prices, and is hostile to the uniform treatment of gas and electricity consumers.

There is a little fear on our part that many gas undertakings are not doing all they might in offering resistance to the inroads of electricity in public lighting. The cause of this slackness we do not know. Is it apathy, or a disinclination to spend a little in preserving the public lighting for gas? It passes our comprehension when we read of a resolution to convert some 125 gas-lamps in a borough from gas to electricity, with the result that the illuminating power will be increased per lamp from 15 to 60 candles. Such a number of gas-lamps must be (seeing also that the electricity supply cables are in their neighbourhood) somewhere near the centre of the town; and yet their illuminating power is reported to be only 15 candles, which power raises visions at once of flat-flame burners. We cannot understand this. Many a gas undertaking might take a leaf in this connection out of the book of the South Metropolitan Gas Company. Their policy through long years has been not to wait to

be asked to make improvements, but to submit an offer themselves, and to include inducements that command the attention of the local authorities, and, as a rule, with favourable result. To this we attribute the comparatively small extent of public lighting by electricity in the area of the Company. At the present time, the Company are, on very acceptable terms, pushing the inverted burner for public lighting; and wherever one travels in their extensive gas-supply area, evidence of success in this direction is found—the improvement in illuminating effect being very marked.

Speaking of public lighting, we cannot refrain from strongly protesting against the grossly unfair treatment that has been meted out by the Chichester City Council to the local Gas Company in connection with the public lighting contract, and which there is no doubt the latter have lost solely through the preferential treatment of the Electricity Supply Company, by allowing them to depart from the advertised conditions of contract, and not extending a similar concession to the Gas Company. The Council's invitation for tenders was "for one year and upwards." The Gas Company complied with the request; while the Electric Supply Company's tender was conditional on the Corporation entering into a firm five years' contract. On learning this, the Gas Company naturally requested to be allowed to tender in the same way—for five years certain. But a majority of the Council absolutely refused to let them do this; their excuse being that it would be unfair after the Gas Company had learned the amount of the tender of the Electric Supply Company. It lies ill in the mouths of a majority of the Council to talk of unfairness in this way, when they themselves originated the whole of the unfairness with which the contract is surrounded, by not compelling adherence to the terms of the invitation to tender. The Gas Company, complying with these terms, submitted a tender which left the option of duration of contract entirely in the hands of the Council; the Electric Lighting Company, by not conforming with the conditions of the invitation and making their offer solely conditional on a five years' contract, removed all option as to duration from the jurisdiction of the Council. And the Corporation submitted to this, reducing the terms of their invitation to a perfect farce, and laying themselves open to a charge of undue preference and gross unfairness, against which charge their own dignity and sense of justice ought to have shielded them. There having been one infraction of the terms was quite sufficient to justify another for the sake of equality. In this matter, however, both dignity and sense of justice appear to have been entirely absent. If tenderers cannot rely on a firm adherence to terms by public bodies, then things have come to a pretty pass in local administration.

There is rather an amusing reference to the life of tungsten lamps in the "Installation Notes" of the "Electrical Times," in which the writer apparently takes the minimum life of tungsten lamps at 3000 running hours—in fact, in his extravagance, he says their life may be "anything" from that figure "upwards"—suggesting the possibility of eternal life. The whole object the writer appears to have in view is to advise users to have wire lamps in place of carbon filament ones, on the ground that their longer life pays, quite apart from the question of efficiency. From our way of thinking, to take isolated examples of extraordinary longevity of tungsten lamps, and use their life performance for general application, is "not cricket." In considerable installations under fairly representative conditions, what with early collapses of filaments, and blackening of bulbs, the average life of metallic filament lamps has been found by us to represent a period somewhat distant from 3000 hours; and it is the average life that has some relation to the out-of-pocket expense of the consumer in the matter of renewal, and not the life of lamps that are fortunate enough to escape for a long period the besetting perils and dangers of this wicked world.

A paragraph, having a common origin, has appeared in the "Electrical Review" and the "Electrician." It is headed "Rinking by the Osram Light." The first words of the paragraph in the first-named paper are: "We have in several recent issues referred to the success of the metal filament lamp in ousting high-pressure gas . . . for the illumination of streets." The paragraph in our other contemporary commences with the words: "We have in several recent issues given evidence of the manner in which the metallic filament lamp is rapidly ousting high-pressure gas for the illumination of the streets." We have tried to find in both instances those "several recent issues" in which references and evidence appear of the ousting of high-pressure gas from streets by the metallic filament lamps, and have to plead failure. Perhaps the Editors of the "Electrical Review" and the "Electrician" will assist us by furnishing the dates and folios of the "several recent issues" referred to, in order to satisfy our natural curiosity and remove our ignorance of the reported ousting. Perhaps, however, it will be easier to quote the pages on which references appear to the ousting of arc lamps by high-pressure gas in the area of the Westminster City Council. The references in the "JOURNAL" last week will be found on pp. 159 and 192. By the way, too, the Jandus flame arc lamps that were experimentally installed in Victoria Street, Westminster, were being removed a few days since.

At the meeting of the Society of Engineers (Incorporated) next Monday, Mr. R. O. Wynne-Roberts, M.Inst.C.E., will read a paper in which he will deal with the application of tar to roads.

HORIZONTAL CARBONIZING CHAMBERS

FOR THE WHOLE GAS SUPPLY OF A TOWN.

A REPORT has been given in a recent number of the "Journal für Gasbeleuchtung" by Herr O. Peischer, the Manager of the Innsbruck Corporation Gas-Works, as to the results of three months' experience with the town supply of gas exclusively by manufacture in large horizontal carbonizing chambers or ovens. The author stated that so far as he was aware this was the first instance of a town being solely supplied with gas from such carbonizing chambers, though at Rotterdam and elsewhere part of the gas supplied was manufactured quite satisfactorily in such chambers.

At Innsbruck the former carbonizing plant is being replaced by new plant of a productive capacity of 15,000 cubic metres (529,724 cubic feet) per diem. The new plant is to consist of six beds of horizontal carbonizing chambers or ovens on the Koppers system. Up to the present time four beds, each containing three chambers, have been erected. The chambers have an extreme length of 5 metres (16 ft. 5 in.), and an available length of 4.11 metres (13 ft. 6 in.). They can be filled with coal to a height of 2.5 metres (8 ft. 2½ in.), and thus hold 74 cwt. 90 lbs. of Saar coal per chamber. The time required for carbonization is 24 hours. The new beds started work on the 27th of October, 1909, and up to the end of January produced 4,215,750 cubic feet of coal gas; the maximum daily production being 525,133 cubic feet, and the minimum daily production 261,330 cubic feet. During this time all four beds of chambers were in action; but, in order to accommodate the make to the consumption, one bed was at times left for 48 hours without drawing the charges. The consumption of fuel for the bed when the charge was left in for 48 hours amounted to 43 cwt. 34 lbs. of coke, compared with 31 cwt. 55 lbs. per charge when the carbonization is completed in 24 hours. The walls of the chambers are heated uniformly, and the regulation of the heat presents no difficulties. One bed of three carbonizing chambers was capable of readily producing 3500 cubic metres (123,600 cubic feet) of gas per diem.

An eleven days' trial carried out with care, when the plant was taken over from the constructors, gave the following results: The make of gas at 60° Fahr. and 30 inches barometer amounted to 11,788 cubic feet per ton of Saar coal; the gas having an average gross calorific power of 633 B.Th.U. per cubic foot. Hence the calorific valuation figure is 7,461,804 B.Th.U. per ton of coal carbonized. The consumption of ash-free and dried coke in heating the chambers amounted to 12 per cent. by weight of the dry coal carbonized.

Three months' working of the chambers gave the following average results: The make of gas per ton of wet or air-dried coal as charged into the chambers amounted to 10,980 cubic feet at 60° Fahr. and 30 inches; and the gas had a gross calorific power of 633 B.Th.U. per cubic foot at 60° Fahr. 30 inches and moist. The production of coke was 70 per cent. by weight with about 5.5 per cent. of slack and breeze. The tar obtained amounted to 5.6 per cent. by weight of the coal carbonized, and was of a thin freely fluid character and free from pitch. The ammonia produced amounted to 0.22 per cent. by weight of the coal carbonized. The fuel consumed in heating the chambers amounted to 16.41 parts by weight of coke (including ash) per 100 parts of coal as charged into the chambers; so that 53.59 parts of coke per cent. of coal remained for disposal. It should be remembered, in considering these figures, that the carbonizing plant was not utilized throughout to its full capacity. It is to be observed that the working of the carbonizing chambers depends on regular exhausting of the gas according to the make and the calorific power required. The latter should be subject to continuous control during working. The calorific power of 633 B.Th.U. per cubic foot is high compared with Professor Bunte's suggested standard of 5200 calories per cubic metre at 0° C., 760 m.m. and dry (543 B.Th.U. per cubic foot at 60° Fahr., 30 inches, and moist); and it would be easy to obtain a larger make of poorer gas. But, having regard to the high position of Innsbruck and the low atmospheric pressure (averaging 27.95 inches), it is considered desirable to supply a better gas than usual, in order that the consumers may not be prejudiced.

The fact that the carbonization extends over 24 hours is advantageous, as the stokers cease work at 6 o'clock in the evening, and only one attendant remains at night to keep the producers charged, and to look after the exhausters and seals. On Sundays and holidays work ceases at 3 o'clock in the afternoon—sometimes even at 12 o'clock. In such case, although the charging extends over only five hours, and gasification proceeds without attention for nineteen hours, the make of gas and its calorific power show very small variations from time to time. The fluctuations in the make are greater with any system of retorts than with the carbonizing chambers; and the variations in calorific power of the gas distributed are not with the last-named system ordinarily more than about 16 to 22 B.Th.U. per cubic foot.

The fears expressed by opponents of the large chamber system of carbonizing, as to the great variation in the make and quality of gas from such chambers, have been found by practical experiences at Innsbruck to be without foundation. There has been no difficulty in ejecting the slabs of coke from the chambers;

though serious difficulty was not anticipated, owing to the fact that in coke-works the charge is ejected from chambers 33 to 50 feet in length without trouble and without injury to the walls of the oven. There is practically no formation of scurf; so that it is unnecessary to burn it off. There has been no trouble from stopped ascension pipes. Each pipe is burnt out, and cleared with the auger, before the chamber is re-charged. A pipe is attached to the top of the ascension pipe when the deposited tar is about to be burnt off from the pipe, so that the smoke produced is carried up to a considerable height.

Practically, no thick tar is deposited in the hydraulic main; but what there is—amounting to perhaps a bucket-full—is removed once daily from the four mains. This good result is partly due to the fact that the hydraulic mains are flushed with tar instead of water. Though the settings and hydraulic mains stand in the open, exposed to the cold and rain, stoppages and deposits of pitch have been conspicuously absent. This is the more remarkable as the gas passes to the exhaustor house through an exposed 20-inch main, 250 feet in length; and it is consequently often cooled to as low a temperature as 46° Fahr. The tar is thin and clean, and will be used in place of oil as fuel, though investigations are in hand as to its value for other purposes.

In regard, generally, to the exposure of the bench of chambers (without any roof) to the weather conditions prevailing, it would be premature to express a final opinion until a longer experience has been had—particularly as the past winter has been comparatively mild. There have, however, been heavy snowfalls, and the temperature has fallen as low as 4° Fahr. without the working of the chambers having been affected. If the coal used is very wet, it is necessary to increase the vacuum on the chambers by about 1-10th inch. Speaking broadly, the experience has been wholly favourable as compared with the working of retort-settings; and the open position of the installation has been beneficial to the health of the stokers.

The cost of the plant—including foundations, flue, chimney, and gas outlet main, coal preparing and conveying plant, and coke stage—amounted to £14,875. Allowing a reserve of one-sixth, the make of gas would average about 618,020 cubic feet per diem; so that the cost of the carbonizing plant per 1000 cubic feet of gas made per diem would amount to £24 1s. 4d. In the same conditions, the cost of inclined retort-settings amounted to £21 12s. 6d. per 1000 cubic feet; of vertical retorts, £31 9s. 4d.; of inclined carbonizing ovens, £40 2s. 3d. There is a great economy in wages compared with horizontal retort-settings; but the lowest figure quoted for wages for vertical retort plant has not been attained, partly because self-closing doors have not been employed. In this installation, the doors are luted with clay just as in coke-oven works. At present the four beds of three carbonizing chambers require eleven men, including the foreman, per 24 hours, which does not include the removal of the coke from the coke stage. But the same number of hands could quite well operate five beds of these carbonizing chambers; and the make of gas per diem per man would then be 56,500 cubic feet.

The new works is noteworthy in that tar and liquor wells have been dispensed with, and the condensation products are collected in three exposed tanks. The condensed products from the hydraulic main and exposed foul main flow direct into the separating tank, while the tar and liquor condensed in the apparatus house are pumped from a small receiver into the same separating tank. No difficulty has been experienced from the effects of cold upon the products. The exhaust steam from the works' steam-engines has sufficed to prevent freezing of the liquor or thickening of the tar; and the overhead tanks have the advantage that they are accessible and can be kept absolutely sound, while the tar and liquor can be removed from them by gravitation. The overhead tar and liquor tanks did not cost more than tar and liquor wells.

Mr. W. J. Livingston, the Chief Clerk in the Chemical and Gas-Testing Department of the London County Council, desires to retire as from the 30th of June next. Mr. Livingston, who is now sixty years of age, entered the service of the Metropolitan Board of Works in February, 1868, and has therefore completed 42 years of service. The Establishment Committee, whose report which is to come before the Council to-day contains the foregoing statement, are advised that during his long official career Mr. Livingston has carried out his duties in an able and zealous manner; and in view of his faithful service, they cordially recommend the Council to grant him a retiring allowance of 40-60ths of his present salary.

In the "JOURNAL" for the 5th inst. (p. 49), we reproduced from "John Bull" a story to the effect that the City of London Electric Lighting Company, while advertising their electric radiators for heating purposes, had had their own offices fitted up with hot-water pipes. Our contemporary remarked that no doubt there was another side to the question, and expressed a desire to hear it. This has been gratified; for the current issue contains the following paragraph: "The City of London Electric Lighting Company wish us to understand that the reason why a portion of their Bankside works are heated by hot-water pipes, notwithstanding that they are advertising electrical apparatus for the purpose, is that they desire to utilize a considerable amount of heat in the boiler flues. Being a waste heat, it is cheaper than anything else—even electricity," they say."

STATE AND MUNICIPAL TRADING.

By J. H. BALFOUR BROWNE, K.C., D.L.

[Abstract of a Lecture delivered before the British Constitution Association, April 18, 1910.]

In his opening remarks, the author laid down the proposition that one of the serious evils of state trading is that it puts a gradual end to private trading. As this is not only the life of a country, but the means by which trade is expanded, methods are improved, and enterprise developed; consequently the loss of this great spring of private endeavour and adventure is both serious and irreparable. He thought it was quite obvious that the results of this process of transfer of various enterprises from the nervous and muscular hands of individuals into the fat and flabby hands of the state or the town, would inevitably produce less employment for the people, lower wages for the workers, increased cost of the necessities of life to the consumers, and in the end put a tragic close to the personal freedom which we had enjoyed in the past. He then proceeded to give instances of municipal trading and state interference in support of his proposition. He pointed out that though there is a marked desire on the part of corporations and local authorities to get paying concerns into their hands to relieve the rates, there has never been any indication of a wish on the part of such authorities to adventure in a new field of enterprise. In almost every direction, public wants had been met and catered for by private adventurers. Gas, water, tramways, and electricity for lighting and power were in private hands in their early days, and the risk of the enterprise was taken by individuals; all that the local authorities did being to put spokes in the wheels of their progress. They closely watched these undertakings; and when a gas company went to Parliament for further powers, the corporation would insist on the new capital being raised at the cheapest possible rate—gas of the highest illuminating power being supplied at the lowest price, and clauses being inserted in the Bill preventing the presence of sulphur compounds in the gas. It had, however, been more recently discovered that the insistence on the part of local authorities of a high candle power and on the absence of sulphur compounds was a mistake.

Referring next to the action of the State in acquiring the telegraphs, by which the country had lost £10,000,000, Mr. Balfour Browne said the fact of there being in 1906 a deficit of £439,000 in this respect was evidence of non-success. The State was, however, incapable of learning by its own failures; and it was to take over the telephones, after crippling the early progress of this enterprise, and was to purchase on a certain "appointed day." Another illustration of fumbling and inept management of such undertakings in public hands was that of the London Water Companies, whose property was acquired by the Metropolitan Water Board on certainly reasonable, and in some respects advantageous, terms after a careful arbitration. But the result of the public management of these undertakings was that in 1904 the Board had to go to Parliament for authority to increase the charges; and the people of London had been called upon to pay more for their water than they would have done if they had kept the much-abused Companies as their servants. He suspected that the history of the Port Authority which Parliament substituted two years ago for the various London Dock Companies would run lugubriously parallel. Private enterprise was being shouldered out everywhere by corporate or state encroachment; and this furnished the reason for money now seeking investment not remaining in this country, but being tempted away by enterprises over the sea. The result was that the benefit of the initiative and adventure characteristic of individual or company speculation was lost, and we had in its place the steady, stagnant, and not very successful plodding in old ruts which was characteristic of public bodies.

The lecturer went on to point out that other important questions have emerged in this controversy. To-day the hope of the Fabian Socialists is to accomplish their malign ends through the municipality or the state. They see that the appropriation of certain great instruments of production by the country or by the town is a step in the direction of socializing all the means of production, distribution, and exchange; and they strive to further this process by every means in their power. On the other hand, there are many well-disposed persons who see that certain social reforms are called for by the real necessity for improvement in the conditions of life in various directions—people who have been hesitating as to whether they should proceed along the lines of what some have regarded as recent advances, lest we should go too fast and too far towards the accomplishment of the Socialist ideal. In this connection, the lecturer thought some further consideration of our present position in relation to state and municipal trading might be useful. He pointed out that there are two schools of Socialism—one which seeks to reach its deplorable ends by means of revolution; and the other which desires to attain the same objects by evolution. One is the impatient, the other the patient, school. He went on to show that one of the objections of the revolutionary Socialists to the tamer methods of the Fabians is that in municipal and State adventures the object is "profit" and not "use." But he pointed out that there are cogent indications that the policy of "use" as contrasted with that of "profit" is going to have its way. It had, he said, been stated that what seemed to be a profit was in some cases only one

in appearance, and was secured merely by a nimble method of keeping municipal accounts. If, for instance, a municipality ignored the fact that machinery depreciates, and that there ought to be a fund created to replace it at the end of its life, it was easy to show a profit. No commercial undertaking in the hands of a company could continue to exist for long with such a method of securing dividends; but it was different in the case of a municipality. In this connection, the lecturer cited this case:

A corporation embarked on a great water scheme for the supply of the town and surrounding district with pure and wholesome water. It was a great enterprise. But to-day it has to supplement the amount it receives from water charges by rates upon the occupiers within the municipal area, which bring in £64,000 a year. Here we see that the ratepayers in the town bear the loss, while the consumers of water outside have their water at less than cost price. But this great town is content; and when it gets eloquent, it says it gets its dividend in health and not in cash. In many cases, municipalities are forbidden to make any profit out of their water undertakings; and where a surplus does accrue, they are bound to apply it in the reduction of the water charges. Here, then, we have a change from the commercial undertaking which is worked for a profit to the social undertaking which is worked for use; and by means of evolutionary Socialism the ideal of the revolutionary Socialists is being attained.

The lecturer cited the case of a certain gas undertaking last session to show that the same tendency is seen in other directions. There a Committee of the House of Lords refused to pass a Bill unless it was so modified as to compel the promoting Corporation to run the gas-works for use and not for profit. The same thing was done by a Committee of the House of Commons in the case of the Oldham Corporation Bill of 1909, and by another Committee of the same House only a week or two ago in the case of the Glasgow Corporation Gas Consolidation Bill, 1910. He said his view was that the Committee really did this because they disapproved of municipal trading; but their protest came too late. He pointed out that if their action had been embodied in an Act, it would have had the effect of socializing the undertaking, to the delight of the advanced Socialists. But, as a matter of fact, the Bill was withdrawn.

After a few remarks explanatory of the sliding-scale in operation in connection with gas undertakings, the lecturer said this would be a perfect system if the increase or reduction in the price of gas all depended upon the care or the carelessness displayed in the conduct of the business. But it did not. He thought a fair standard price could not be fixed. He explained that he referred to the principle of the sliding-scale to show the suspicion with which profit is now looked at; and that was the Socialists' point of view. They did not want to see undertakings worked for profit, which, according to them, meant that the employees are sweated slaves, but for use, which meant that all the means of production, distribution, and exchange are to be enjoyed by the people, and are not to be worked by a system of profit and wages, but by one of equal division of the fruit of labour. "But what is profit?" asked the lecturer; and he answered his question thus: "It is the driving-wheel of all real industrial enterprise." Under the New Socialism, however, we are on the way to abolish profit all round, and work our undertakings for use. But where does the argument for municipal trading stop? Not at gas, water, electricity, or tramways. "Why," asked the lecturer, "is it not as true of boots, clothes, bread, and beer? This is what social reformers on their glassy slide will not open their eyes to; but it is thoroughly appreciated by the Socialists who are achieving."

The lecturer then proceeded to consider in some detail what this social reform or this Socialism means; and he showed that where there is no longer an incentive before a man, as there is in the existing capitalist system, there must be some stimulating force behind him. The paramount question was: "Which of the two systems is the best for the man and the nation?" The answer he would unhesitatingly give was: "The one which induces men to put forth their best energies with a hope, instead of that which makes them put forth their reluctant energies under fear." It was impossible to get good work, even of the lowest kind, out of slave labour; but the best work, and of the highest kind, could be obtained from individual enterprise. The Socialist system, to which municipal trading tends, was, in his opinion, the death-knell of character. If there was no character, there could be no achievements; and the nation which had for long been in the van of progress would "sink into a nation of barrack-yard slaves drilled by officials, oppressed by a system, and in the end obliterated from the face of a smudged earth."

In the next portion of the lecture, Mr. Balfour Browne considered at some length the injurious effect upon the individual by the removal from him of responsibility, and transferring it to the State. He pointed out that the State can only take these burdens upon its Atlas-bent shoulders while it is prosperous. When we come to the down-grade "the ghastly difficulties will face us, and the means of meeting these enormous obligations will fail us." The wealth of the country depends upon the productiveness of its labour. In the lecturer's opinion, "we are putting a saddle on the back of labour which may be too heavy for it to bear; and when it falls beneath its load, then we are in the hurly-burly of revolution."

Some other aspects in which Mr. Balfour Browne considered it worth while to review the tendencies of the times, especially in connection with the Labour Party, were next submitted to his audience; and the lecture closed with the following remarks: "In all these respects we have, by our municipal and state trading, been here coaxed on to the down-grade. We are in

every direction playing at Socialism, and the comedy is very apt to become a real tragedy; for I cannot regard anything as more tragic than the stagnation, the decay, the disintegration of a nation. These catastrophes would result from the death of Individualism, from the injury to national character which is being brought about by our present apotheosis of the State."

A TAR AND AMMONIA WORKS ABLAZE.

By WILLIAM KEY.

Formerly Manager of the Tradeston Gas-Works, Glasgow.

In a moment, daylight seemed to disappear; and glancing upwards, a fearful pall of densely black smoke was rising skywards and spreading over the City from our very vicinity. The sight was an appalling one; and the author at once perceived that his best neighbour over the road was in trouble. Hurrying from the gas-works into the yard of the Company who received and worked up the secondary products, he was alarmed to find that the whole stock of pitch was ablaze. Not one of the Company's employees could be seen; and, hastening into their offices—thinking that someone might be securing valuable effects to remove to a place of safety—to his surprise the author found himself the sole occupant of these extensive works, and in possession of a huge furnace of blazing pitch, which was melting, and spreading, and spluttering over the yard.

Every second seemed to increase the dimensions of the blaze; and one instantly recognized that the officials and workers who had disappeared knew best the nature of the possible dangers from which they had escaped—there being on the works large stocks of refined oils, naphthas, crude oils, and tar, stored in circular brick tanks under the surface of the yard, in positions unknown to outsiders.

At present, without doubt, the most alarming prospect was of what might happen within the unoccupied upper portions of these tanks, where any possible explosive mixture of atmospheric air and spirit vapour, by being ignited, would explode and, blowing up the yard under foot, lift us higher up. The need for immediate action was imperative, and the author summoned a large number of men from the yard of the gas-works, and ordered them to bring with them twenty or thirty pails. The men were set to remove from the tar-works fifteen or more empty barrels; and these were ranged on end along the outside of the tar-works wall, nearest to the greatest volume of burning materials. Planks were placed on these; and men were stationed on the planks in readiness to handle the pailfuls of fire extinguisher.

Leading the remainder of men with pails to the ammoniacal liquor stored in a number of old Lancashire steam-boilers raised on brick piers, each having a draw-off cock at one end, the pails were filled as rapidly as possible, and the author directed the application of the liquid by delivering it with a spreading motion. The result was that, although the flames were blazing up most furiously, every pailful on alighting as instantly extinguished the flames over the area covered. Every pailful told; and where applied the flames at that spot remained suppressed.

In this way, we were making good progress when the Captain of the Fire-Brigade, with his men, and several engines, came thundering alongside. The Captain issued his orders for applying water through his hose-pipes, when the author informed him that he it was who was in charge of the fire, and held himself responsible for whatever occurred, and would certainly never permit a single stream of water to be applied to the flames—explaining to him, seriously, what would occur should great volumes of water be directed into the blazing works. The water would, he pointed out, pour down into the underground stock tanks, and up would come the spirit, oil, and tar; so that the second condition of the fire would be a thousand times worse than the first, besides the danger to all around from explosions. After serious demur at interference with his own department of duties, the Captain finally withdrew with his brigade.

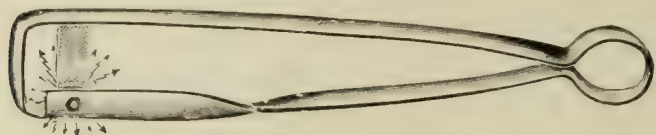
Having extinguished the whole burning pitch within reach of the pailfuls of liquor from outside the walls, the author led the men to attack the remainder, which was approachable only from within the yard. In doing this, it was necessary to tramp through thin flowing and partly burning pitch—thus getting one's boots and clothing splashed with it. But the success of the application of the ammoniacal liquor had given such confidence that every man valiantly faced the flames, knowing they would instantly go down before their well-aimed discharge from the buckets.

Had these works been totally destroyed, the gas-works for a time would have had to cease gas-making operations; for, excepting the 12-inch pipe through which all the secondary products flowed into the chemical works in a steady stream, day and night from the gas-works, there was no other provision by underground tanks within the gas-works, or of pumps, or sets of railway rails, on which might have been brought in railway tank-waggons by which to remove the secondary products as these accumulated.

Hence to the author the serious predicament of the gas-works through the probable destruction of the tar-works by fire was incentive enough to use every effort to extinguish the blazing pitch, and save the works; and by the success of the voluntary service which he undertook, he was sensitive that his effort was "twice bless'd"—to those who gave, and those who received (the secondary products).

A CHEAP GAS-LIGHTER.

ATTENTION has been drawn by Messrs. J. & W. B. Smith, of Farringdon Road, E.C., to a patent gas-lighter which is so moderate in price, and withal so simple in action, that it should speedily win its way to popularity. A neat little appliance which will spark on being merely treated as though it were a pair of sugar tongs, and which can be purchased retail for the sum of about sixpence, should surely find a ready demand, if reliable in operation; and the one that has been sent in for inspection



A Simple Gas-Lighter.

certainly does do what is desired of it. As to the "life" of the sparking arrangement, it is too early to speak from personal knowledge; but if it is anything like as long as is claimed, the use of the appliance should prove economical as well as convenient. It would be impossible to describe the lighter in any more detail than is conveyed by the accompanying illustration; and therefore, with these few introductory remarks, we will leave the drawing to "speak for itself."

THE "VISO" GAS-BURNER.

READERS cannot fail to be interested in the "Visso" burner, the exploitation of which in this country is being carried on by Messrs. Marse and Co., Nos. 45-46, Imperial Buildings, Ludgate Circus, E.C. The burner is of French origin; and having put to visual test practically the whole range of sizes in which the burner is constructed, we are not at all surprised that it has achieved considerable success in the land of its birth. It is an upright burner; and why it is that it, when lighted (without a mantle), gives a splendid, silent flame of bulbous form, and, when fitted with a slender mantle, the whole of the latter to every particle is rendered incandescent, and a brilliant light is thus obtained—giving, in terms of consumption and illuminating power, a high efficiency—is not apparent at first glance. But, on examination, the main secret appears to be that there is a double mixing of gas and air, which produces a thorough admixture, and consequently perfect combustion. We would suggest another reason; and it is that the cone-shaped cap on the gas-injector at the bottom of the burner, and the slight constriction in the centre of the bunsen tube, together increase the velocity of the uprising mixture to the point of combustion. Supplementing these features are the well-made character of the burner, and the proper proportioning of the parts for the work the burner is designed to perform. Looking at the bottom of the burner, there is the gas-nipple with a single hole; and we may pause here to remark that the firm prefer that, in ordering burners, both gas pressure and quality should, if possible, be stated, so that they may supply the nipple that is best suited to the conditions. Only by having the proper nipple can the best economy and efficiency be assured. There is a circular casing round the nipple perforated with air-admission holes; and upon this casing is screwed a cone-shaped cap with outlet at its apex. At the bottom part of the bunsen-tube are rectangular air-admission slots, with a vertically sliding regulating-collar. Now the result of this construction is that, in the small interior chamber formed by the nipple casing and cone, there is a preliminary mixing of the air and gas; and this mixture, issuing from the top of the cone-shaped cap, sucks up a further supply of air through the annular passage formed by the air-regulating collar and the cone cap, and the mixture is completed, and the velocity (so we think) of the supply is augmented through the special construction. And in these features is the secret of success, and of the economy in producing a high efficiency. The burner head is constructed with a removable cap topped with gauze; and caps can be obtained for renewal at quite trifling cost. The burner itself is turned out of the solid; so that, with the only part likely to be affected by the heat being so readily and cheaply renewable, the burner may be said to be practically everlasting. The mantle is suspended by a side hooked wire, which is held in position by a thumb-screw; and by it the mantle is maintained centrally over the burner.

There is novelty in the sizes of the burners, and in the mantles required for them. The burner is at present made in seven sizes; and an eighth size is being arranged for. The smallest burner at present made consumes about $1\frac{1}{2}$ cubic feet an hour; and the largest size about 10 cubic feet. Of course, the consumption and the efficiency vary with the pressure and the composition of the gas. It is found that the best efficiency is secured with gas at about 2 inches pressure; but the burners work quite well under pressures ranging between 7-10ths and (say) 5 inches. The smallest burner will, we are informed, return an efficiency of 30 candles per $1\frac{1}{2}$ cubic feet of gas consumed; and a fair average figure to take would be the equivalent of 250 candles with an hourly consumption, in the large burner, of 9 to 10 cubic feet of

gas. According to the results of some tests made by gas experts in Paris, and received only a few days since, with a pressure of just under 2 inches, and a consumption of 2.8 cubic feet, an illuminating power of 92 candles was realized, using the No. 3 burner. There are the five intervening burners; but the novelty and usefulness of the smaller sizes, with their pencil-diameter mantles, are features that are creating a big demand. They are quite sufficient for landings, lavatories, small bedrooms, and so forth; and in their production, the same care is exercised to secure the best service as is the case with the larger sizes. There is a demand for yet a smaller size; and, at the present time, the firm are working on what will be known as the No. 00 burner, with a consumption of just over $\frac{1}{2}$ cubic foot, and giving an illuminating power of (it is computed at present) about 17 candles. This descent to such small size is an aid to domestic economy. It is a point that the electricians are constantly making in connection with incandescent electric lamps, that a good range of sizes of lamps suited to any particular purpose and position is helpful to economy. The "Visso" gas-burner claims to meet all the commendation in this respect of the electric incandescent lamp, with much more economy to the householder. The No. 4 burner, using about 5 cubic feet of gas, is specially recommended for street and other outside lighting.

The mantles used are specially made for the burners. They are of smaller diameter than the ordinary ones; and a coarse thread is used in the production of the fabrics, which feature, it is claimed, gives an increased stability and therefore longevity to the mantles. But for factories and places where the mantles would be subjected to strong draughts and vibration, an exceptionally neat and flexible mantle is made with a silk base, but the cost is more than the ordinary form. The mantles it is seen fit the flames perfectly; and about them, as already said, there is no waste—every part being incandescent, which accounts partly, though primarily the degree of intensity of the incandescence is responsible, for the high efficiency obtained by these burners. The light appears rather more yellow than that from the ordinary incandescent mantle—an effect of the chemicals that are used in the impregnating fluid.

CARBONIZING IN HORIZONTAL

RETORTS AT WORCESTER (MASS.).

It may be remembered that the "JOURNAL" for Nov. 9 last contained some extracts from a paper read by Mr. C. D. Lamson, the President and General Manager of the Worcester (Mass.) Gas Company, before the New York Society of Gas Lighting, in which he gave the results obtained from Westmorland coal carbonized in horizontal retorts in the new retort-house of the Company. At the request of the Technical Committee of the American Gas Institute, the author read the paper at the annual meeting in October. Some additional data in regard to the house referred to were furnished by Mr. DANA D. BARNUM, of Worcester, in a paper read at the annual meeting of the New England Association of Gas Engineers held at Boston (Mass.), a short time ago.

Although considerable information in regard to the Worcester retort-house has been published, there is still much of interest that may be discussed. When we began to get the results which have since been confirmed by a year's working, it became apparent it would be necessary to check the simplest operations, to make sure we were not deceiving ourselves or anyone else.

Coal.—The question of the weighing of the coal was one of the difficult problems. The coal comes all-rail from the mines, is unloaded by a grab bucket, and placed either in the store or passed directly through a breaker, from the outlet of which it is taken to the storage bin in the retort-house, and is drawn from this bin into the hoppers of the charging-machines. It is weighed in the cars at the mines, also in the cars on scales on our siding; and the coal as used is weighed in the charging-machines in the retort-house. In order to check these weights, we ran for nearly two months, and obtained three separate weighings of the coal on different scales. To do this, each carload of coal was placed either entirely in the storage or in the bin in the retort-house; and, by starting and ending the test with this bin and the bins on the chargers in the same condition, we were able to check all coal used. These figures were very satisfactory, and agreed to within 2.2 per cent. In addition to the above, we made a survey of our coal pile, and this checked to within 0.5 of 1 per cent. of the coal paid for in twelve months. In doing this work, we obtained the weight of a cubic foot of coal as it lay in our store, by loading coal-cars with the coal from the store, and getting the weights and cubic contents of the cars.

Carbonization.—In order to study the conditions in the retort, a number of temperatures were taken. One set of readings of the pyrometer was taken by placing the end of the instrument through the mouthpiece, and extending it into the coal for about 10 or 12 inches. The gas leaves the retort at an average temperature of 1165° Fahr., as found by readings. As the temperature of the coal rises from 700°, the gas at first comes from the surface. This becomes carbonized and forms a crust or carbon skin, and with the retort at 2000° Fahr. the crust attains appreciable thickness about 30 minutes after charging. As carbonization continues, the crust increases in thickness, and fractures vertically near the

middle. This main fracture extends the length of the charge. Most of the gas is driven off through this fracture in an irregular sheet, and travels along the roof of the retort to the end. There are, of course, minor breaks in the coke; but the bulk of the gas goes off through the main fracture after it is formed. The expansion of the coal and the contraction of the coke depend to a large extent upon the temperature and rate of carbonization. With a charge of about 900 lbs., the coal will be from 8½ to 9 inches in depth. If the temperature and rate of carbonization are such as to just carbonize it in seven hours, the depth of the charge will reach its maximum in this time; but if the coke is allowed to remain in the retort another hour, it will contract about 30 per cent. of what it expanded.

Two charges, one of 900 lbs. of coarse coal and one of 1000 lbs. of fine coal, were left in for eight hours, and measurements of the space above the charge were taken every 30 minutes. The 900 lb. charge was thoroughly carbonized in less than seven hours, and the 1000 lb. charge in a little more than eight hours. These factors—viz., temperature, rate of carbonization, and pressure in the retorts—are the fundamental principles to which study and attention must be given, in order to obtain future increase in the candle-feet and heating power of the gas.

In studying the temperatures in the mouthpieces and the stand and bridge pipes, it became apparent that if the temperatures in the stand-pipes could be kept above the point at which the tar condensed out, there would be no subsequent baking of the resultant pitch; and by covering the pipes with insulating material, we have been able to carry all the tar over into the hydraulic main—leaving only a small amount of lampblack, which can be easily removed.

Producers.—In Mr. Lamson's paper entitled "A Pound of Coal," there is the following table:—

| | Feet of Gas from Producer to Comb. Chamber. | Feet of Gas from Comb. Chamber to Retort. | B.Th.U. per Pound of Fuel. |
|--|---|---|----------------------------------|
| Not breaking up CO ₂ | 135 | 185 | 12,496 |
| Breaking up CO ₂ | 113 | 174 | 12,688 |
| 0.42 lb. of water per pound of fuel | 75 | 140 | 12,453 |
| 1 lb. of water per pound of fuel | 70 | 146 | 12,609 |

Columns 1 and 2 show the relative amounts of gas available for conveying the heat from the producer to the combustion chamber and to the retorts; column 3 shows the B.Th.U. per pound of fuel. The first case is an actual accomplishment in the Worcester producer. We know that, in the second case, in order to get the reaction given, it is necessary to have a temperature considerably above the temperature used in the calculations—viz., 1877° Fahr. We also know that as the temperature increases, the liability to clinker also increases. Now, if the producer is run at a higher temperature than 1877° Fahr., it will take more fuel to maintain the higher temperature in the producer, and the economy must be necessarily less, as no more heat can be obtained per pound of fuel than is shown in the table; and the same reasoning applies to the conditions when steam is used.

An important factor in the running of the producers is the removal of the ash as quickly as it is formed. It is as important to keep the fuel active as far down near the grates as practical, as it is to keep the producer filled with fuel. The theory is as follows: There is a central zone in the fuel bed which naturally has a tendency to assume the highest temperature. If the ashes are allowed to mount up so that the initial reaction takes place in this central zone, then the combination of the two tends to give a higher temperature; otherwise, if the ashes are kept low and the initial combustion takes place as near the grate-bars as is practicable, then the heat is more evenly divided, the temperature is lower, and a cooler producer is maintained. In checking the fuel results, we analyzed the coal and coke, and measured the amount put in the producers and that which was taken from the retort-house. This is regular routine work, and gave an average of 15.3 lbs. of coke per 100 lbs. of coal carbonized. To check this, a thermal balance of the stack was made, using 15.3 lbs. of fuel. In making this balance-sheet of heat units, the difficult figure to determine was the loss by radiation and convection. The radiometer could only be attached at certain places, owing to lack of room; and to determine the loss on the surfaces, where the instrument could not go, we made a curve of radiation for all points that we could determine, and then, by means of the curve and the skin temperature, which could be taken at all points, we were able to get the radiation of the entire surface. The following is the balance-sheet of heat units:

| | B.Th.U. | Per Cent. |
|---------------------------------------|---------|-----------|
| Expended 15.3 lbs. of coke | 195,519 | 82.6 |
| Heat formation (plus). | 40,539 | 17.4 |
| | 236,058 | 100.0 |
| Accounted for— | | |
| Carried up the chimney | 41,165 | 17.3 |
| In ashes | 134 | 0.06 |
| Carried by gas | 14,586 | 6.0 |
| Carried by tar | 4,230 | 1.7 |
| Carried by hygroscopic water | 3,759 | 1.5 |
| Carried by water formed | 8,979 | 3.7 |
| Lost by radiation and convection . . | 82,643 | 35.0 |
| In the hot coke | 33,396 | 14.1 |
| Heat of formation (minus). | 3,966 | 1.7 |
| Balance—gross heat of carbonization . | 44,779 | 18.9 |
| | | 100.0 |

Net heat of carbonization per lb. of coal, 82.06 B.Th.U.

A study of the table will show that the only material loss is in radiation and convection. The loss up the chimney is not large, and any reduction in the radiation and convection will give some gain in this item, as the loss up the chimney is directly proportional to the amount of fuel used; and we see from the figures that further economy in the operation of producers for heating retorts must be obtained by reducing this factor of radiation.

Yield and Candle Power.—The station meter is 14 feet diameter, and was first tested by the gas company, then by Mr. C. W. Hinman, and finally tested and calibrated by the Nathaniel Tufts Meter Company. These tests, like all station-meter tests, were made at comparatively slow rates—15 cubic feet per minute; but we were able to check the meter by using a million-feet holder. This was emptied, the water-gas apparatus shut down, and all valves leading from one system to the other were tested. Coal gas was made and run into the holder until full. The temperature of the gas as passed through the meter was noted, and readings of the holder were taken before sunrise, when the temperature of the air was 5° below and 5° above the average reading at the meter. At 5° below, the holder showed 0.7 of 1 per cent. less than the meter, and at 5° above it showed 1.2 per cent. more. Having filled the holder, we had an opportunity to test the gas. It gave, with the new "F" argand burner, 16.25-candle power; calorific power, 624 B.Th.U.; sp. gr., .439. We had made a number of tests in various ways. But those of the gas in the holder are what we relied upon to check all others; and they also prove that our regular method of sampling and testing gave correct results.

The daily testing of the gas is done in a photometer-room newly fitted up with modern apparatus specially for this purpose. Samples are taken from the inlet of the rotary scrubbers, and passed through a small purifier into a 5 cubic feet holder. To get an average sample, we proceed as follows: One-fourth of the retorts are charged every 1 hour 43 minutes; each charge thus remaining in 6 hours 52 minutes. Curves were made showing the rate of make for the 1 hour 43 minutes between each charging. The 103 minutes were divided into three parts, and a sample taken at the middle of each. These three samples gave tests which when averaged gave the correct value of the gas.

The following tables will show the rates of make for 1 hour 43 minutes, and the candle power with different burners:—

Yield 5.96 cubic feet per pound (corrected), after charging fourth elevation; seven benches; "F" argand burner.

| | 1st. | 2nd. | 3rd. | Average. |
|----------------------|------|-------|------|----------|
| Candle power | 17.9 | 17.35 | 14.4 | 16.5 |

Yield 5.96 cubic feet per pound (corrected), after charging second elevation; seven benches; "F" argand burner.

| | 1st. | 2nd. | 3rd. | Average. |
|----------------------|------|------|------|----------|
| Candle power | 18.5 | 17.2 | 15.0 | 16.9 |
| Per cent. | 34.4 | 33.3 | 32.3 | — |

Yield 6 cubic feet per pound (corrected), after charging second elevation; ten benches; new "D" argand burner.

| | 1st. | 2nd. | 3rd. | Average. |
|--|-------|-------|-------|----------|
| Candle power | 18.78 | 18.66 | 17.37 | 18.27 |
| "Metropolitan" argand No. 2 | 19.53 | 19.48 | 18.50 | 19.17 |

It will be noticed that the amount of gas for each third of the time is very nearly equal to one-third of the whole, and that the test of the gas midway between the charges is close to the average of all the tests.

Candle Power with Different Burners.

| | |
|--------------------------------|-------|
| New "F" | 16.25 |
| Old "D" | 17.18 |
| New "D" | 18.30 |
| "Metropolitan" No. 2 | 19.20 |

Conclusions.—(1) The generating of gas from coal is a heating problem, and resolves itself into the science of making producer gas. (2) This producer gas must be utilized in such a manner as to give uniform temperatures throughout the entire retort surface; and to do this a fire material of high conductivity must be used. (3) The charge of coal must be large, loosely laid, and evenly distributed, in order that the heat may penetrate evenly and quickly to the centre of the charge. (4) The gas as evolved must be taken from the retort immediately, and with as little pressure in the retort as possible.

The above factors, together with proper apparatus for their adjustment and close regulation, are the essential and salient features of the Worcester retort-house.

The Secretary for Scotland has appointed Mr. William S. Curphey to be Chief Inspector in Scotland for the purposes of of the Alkali Works Regulation Acts, 1881 to 1906.

At the monthly ballot for membership of the Institution of Civil Engineers last Tuesday, Mr. Stanley H. Jones, the Engineer of the Commercial Gas Company, was admitted a member.

At a meeting held at Hanley last Wednesday of several of the Committees of the Council of the new county borough of Stoke-upon-Trent, Mr. T. Mitchell (Burslem) and Alderman J. Shenton (Fenton) were chosen as Chairman and Vice-Chairman respectively of the Gas Committee, whose meetings will be held at Stoke. According to the "Staffordshire Sentinel," it may possibly be decided to connect the gas-works at Stoke, Longton, and Fenton, and use only two of them, except in particularly heavy seasons. With regard to the Burslem undertaking, it is thought that, from its position, it may require separate management.

SOME PRACTICAL ASPECTS OF RADIATION: HAVING REFERENCE TO THE USES OF ILLUMINATING GAS.

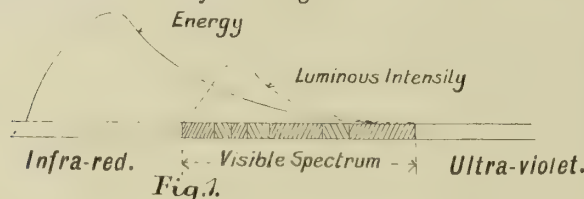
By J. G. CLARK.

A Meeting of the London and Southern District Junior Gas Association was held last Friday evening at the Cripplegate Institute, E.C.—Mr. W. J. LIBERTY, President, in the chair.

Mr. J. G. CLARK, of the Gaslight and Coke Company, read the following paper, entitled "Some Practical Aspects of Radiation: Having reference to the Uses of Illuminating Gas;" and in doing so, he amplified some of the points which might perhaps otherwise not have been quite clear to those of the members who had not previously given much thought to the subject dealt with.

Radiation.

Radiation is a form of energy which is believed to consist of vibrations of the ether, emanating from a source at which energy is produced by heat; and the study of radiation phenomena is therefore one essential to the education of those interested in the gas industry. It is a matter of common knowledge that if a ray of solar light is directed to a glass prism, its direction is changed, and it is said to be refracted. If the refracted ray is examined carefully, it will be seen that not only has its direction been changed, but it has undergone decomposition. The ray as it enters the prism appears but a simple mono-chromatic (*i.e.*, a single-coloured) ray, but on emerging, it is found to have been resolved into the primary colours—namely, red, orange, yellow, green, blue, indigo, and violet. This array of colours is known as the solar spectrum. Without going into the optical details of the phenomenon of light decomposition, it may be briefly stated here that the solar ray was not in reality mono-chromatic, but a compound of the primary colours in a certain proportion, all of which were refracted in passing through the prism, but in different degrees, causing the observed dispersion or separation to take place. By the use of special refracting media, a still higher dispersion of the colours may be brought about.



A spectrum is shown graphically in fig. 1; and a point in which we, as suppliers of light, are especially interested is the photometric value of the different colours. Starting at the red, it will be seen that the photometric value or luminous intensity of the colours increases to a maximum at the yellow and green, and ultimately vanishes at the violet. I do not propose on this occasion to deal with the subject of the colour composition of the various sources of light; but it has some very important practical aspects, and may very well serve as a subject for discussion at some future date. The "luminous" curve in the diagram indicates roughly by its height the photometric value at the various points.

It should be stated that the spectrum is not limited to the rays which are visible, but can be shown by suitable methods to extend beyond both extremities. The invisible portions of the spectrum are known as (a) the infra-red and (b) the ultra-violet. If the spectrum is explored by means of a thermopile (which responds to thermal effect only) indications will be found in the invisible infra-red and in the visible regions; but none in the invisible ultra-violet. If a spectrum is explored by a sensitive plate (which responds to chemical effect only), indications will be found in the visible and ultra-violet regions, but not in the invisible infra-red. The spectrum may therefore be regarded as made up of three sections:—

- (1) The infra-red (non-luminous but thermal) region.
- (2) The visible or luminous and thermal region.
- (3) The ultra-violet (non-luminous but chemical) region.

This classification must not be looked upon as scientific, because in all probability all three effects exist in some degree in every part of the spectrum. What is meant is that the particular effect specified is predominant at a certain part of the spectrum.

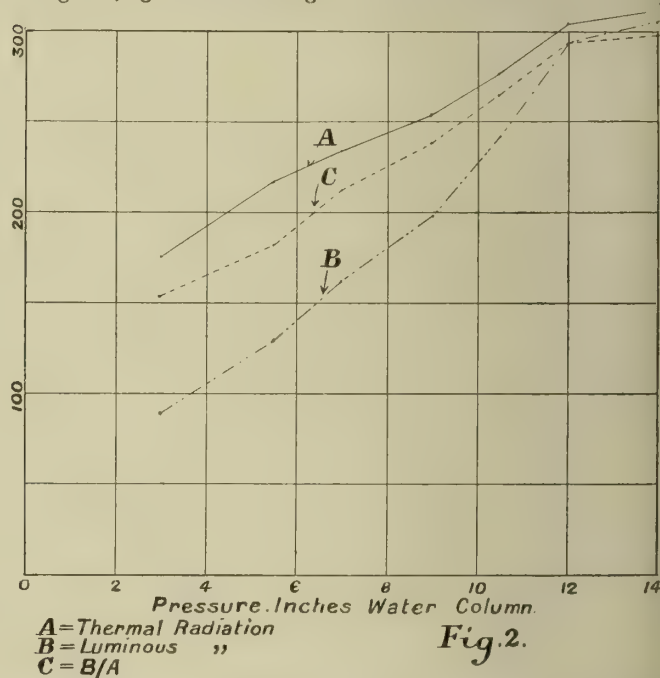
It is interesting to note that the proportions of the various effects vary very considerably with different sources of the radiation. Comparing, for instance, the radiation from the argand flame and that from an incandescent gas-burner, the proportion of thermal to luminous radiation is found to be larger in the former case than in the latter. The distribution of the thermal effect represents the distribution of energy in the spectrum; and it is a noteworthy fact that but a comparatively small amount of the total radiant energy of the best artificial sources of light lies in the visible region. Fig. 1 shows roughly how the thermal and luminous effects are distributed in the spectrum of artificial sources of light produced through the agency of heat—*i.e.*, gases, oil, electricity, &c.—and indicates how inefficient are even our most efficient methods of producing light. It is interesting to note, in passing, that, whereas the efficiency of the firefly, as a light-producing machine, is about 99 per cent., that of our most

efficient commercial light-producing methods is probably only about one-tenth of this amount.

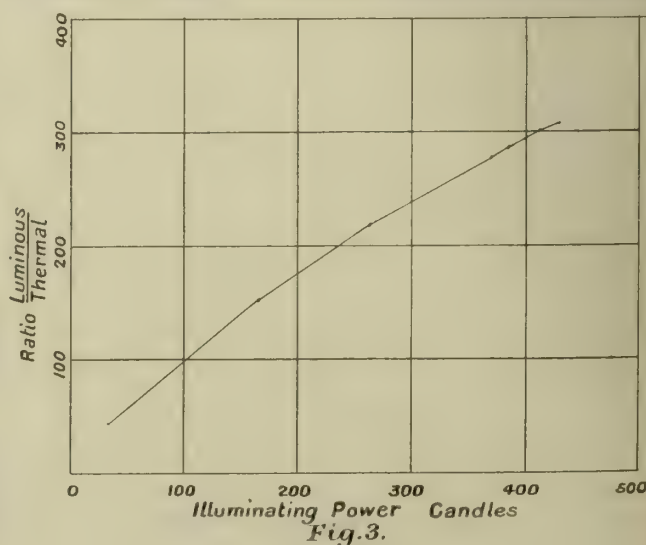
What are the practical aspects of radiation in regard to the uses of gas? By far the larger portion of the gas burnt is used to produce light and heat, and as, in producing heat for many purposes, endeavours are made to produce a large proportion in the radiant form, it is at once seen that the thermal and luminous aspects of radiation are important matters. No special endeavour has, so far as I am aware, been made to produce specially high actinic or chemical effects by means of gas, so that this need not now concern us.

We have seen that the three effects, thermal, luminous, and actinic, are different aspects of the same form of energy—*i.e.*, radiation. They have certain characteristics in common. For instance, they may be refracted, reflected, and polarized, and, for point sources, they obey the law of inverse squares. All these matters are adequately dealt with in the text-books, and need not be further considered here.

In dealing with the spectrum, it was mentioned as probable that all three aspects of radiation—*i.e.*, thermal, luminous, and chemical—exist in all parts of the spectrum; and we find in practical work that we cannot produce luminous effect without accompanying thermal effect, and we cannot produce any great thermal effect without accompanying luminous effect. What is possible, however, is to vary the proportion of the luminous and thermal effects, so that the required effect is made more prominent. As illustrating this, fig. 2 is interesting. These results were obtained by



observing simultaneously a photometer and a thermopile which were directed to an incandescent mantle fitted upon a burner. The observations were made at various pressures; and it is seen that both the luminous and the thermal effects increase with the pressure. But the former increases more rapidly than the latter. This is, of course, due to the higher flame temperature at the higher pressures, and is a practical example of the phenomenon of selective radiation. The reduced slope of the "thermal" and



"luminous" curves beyond 12 inches pressure, is due to the gas consumption exceeding the efficient limit for the mantle. For consumptions at pressures higher than 12 inches with the particular burner used, a larger mantle would have to be employed to develop the full lighting efficiency. Fig. 3 is similar to fig. 2, except that the pressure of gas was kept constant, and the temperature of the flame was varied by adjusting the air-ports. The proportion of luminous to thermal effect increases with the aëration of the flame.

LIGHTING ASPECT OF RADIATION.

Lighting may be described as consisting in the production of luminous radiation at the lowest possible cost and its distribution to the best possible advantage. The methods of distribution of light are by direct radiation, reflection, and refraction, or (as is usual) by a suitable combination of these methods. I propose now to deal with the use of a few typical reflectors and their effects as distributors of light.

If a source of light is enclosed in a sphere, the whole of the radiation will be intercepted by the spherical envelope, and the photometric value of the light included within any angle will be the product of the candle power and the area of the sphere in that angle. For example, let the sphere be divided into latitudinal angles of 10°.

If the lines of latitude be drawn for each of the angles, the sphere will be divided into a series of zones, each of which is the surface corresponding to the respective angles; and if we assume the candle power of the light source to be equal in all directions, the photometric value in each direction will be proportional to the area of the zone. Although the angles are equal, the areas of the zones included in them are by no means equal, but can be shown to be related, as follows:—

| Angle of Latitude. | Area of Zone Included Within Angle. | |
|--------------------|-------------------------------------|---|
| 0° to 10° | 1736 | |
| 10° to 20° | 1681 | |
| 20° to 30° | 1580 | |
| 30° to 40° | 1428 | See foot-note* for method of calculating these figures. |
| 40° to 50° | 1232 | |
| 50° to 60° | 1000 | |
| 60° to 70° | 737 | |
| 70° to 80° | 451 | |
| 80° to 90° | 152 | |

Comparing, for instance, the zone included within the angle 0°-10° with that included within the angle 60°-70°, it is seen that the area of the former is 2.36 times that of the latter; so that if the distribution of the light over the sphere is uniform, the photometric value at 0°-10° will be 2.36 times that at 60°-70°.

For many purposes, the rays at and near the horizontal are not required in that direction; but as their photometric value is so high, it is obvious that if they can be redirected to an angle where they are required, a material advantage can be obtained. For

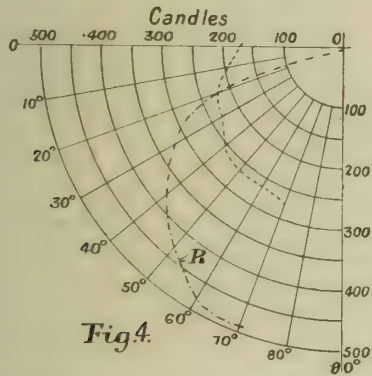
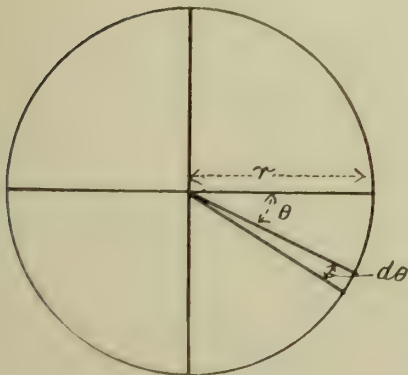
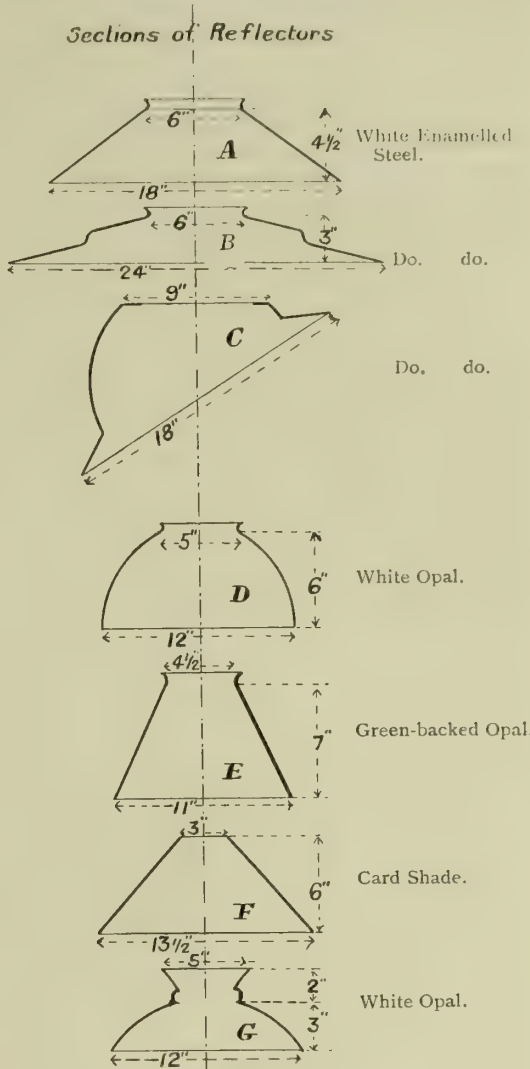


Fig. 4.

* Let A = area of sphere,
then
 $dA = 2\pi r^2 \cos \theta \cdot d\theta$
 $A = 2\pi r^2 \int_{\theta_1}^{\theta_2} \cos \theta \cdot d\theta$
 $= 2\pi r^2 \left[\sin \theta \right]_{\theta_1}^{\theta_2}$
 $= 2\pi r^2 (\sin \theta_2 - \sin \theta_1)$



instance, if a flux of 100 candles between 0°-10° could be reflected without loss to the zone included within 60°-70°, the increment at the latter zone would be 236 candles. We cannot in practice reflect with 100 per cent. efficiency; but the important value of the horizontal rays is obvious. As a practical illustration, fig. 4 is interesting. This represents the polar distribution of light from a cluster of inverted burners with and without an enamelled iron reflector A (see key diagram of reflectors). The reflector was arranged to intercept the rays to an angle of about 20° below the horizontal; the intercepted rays being reflected to the lower



Key diagram of Reflectors.

angles. Note the large increase of candle power there is at the lower angles, compared with the comparatively small loss near the horizontal. Fig. 5 represents the performance of a similar

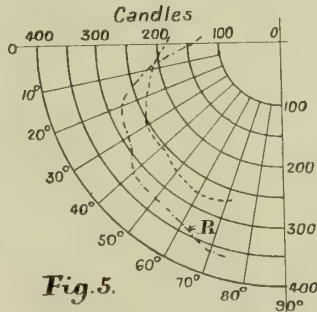


Fig. 5.

[See Foot-note.*]

cluster with the shallower reflector B. In this case, the light was intercepted to within about 7° below the horizontal, with the result that the increase in candle power at the lower angles due to the reflector is not so great as with reflector A.

In passing, we may just note the difference between regular and diffused reflection. An example of the former is a polished mirror surface. A large quantity of light is reflected from such a surface; and, as the reflection is quite regular, images can be seen. An example of diffused reflection is a whitewashed wall. Although a large quantity of light is reflected, the reflection is

* The two curves in each polar diagram indicate the result with and without the reflector; that marked "R" being the result with the reflector fitted.

irregular; and, the light being scattered in all directions, no images are visible. A porcelain reflector is really a compound of a diffused and a regular reflector. The transparent glaze reflects regularly; while the matt surface of the porcelain beneath the glaze is responsible for the diffusion. I am not prepared on this occasion to deal with the phenomenon of diffused reflection; but it may form another subject for future discussion.

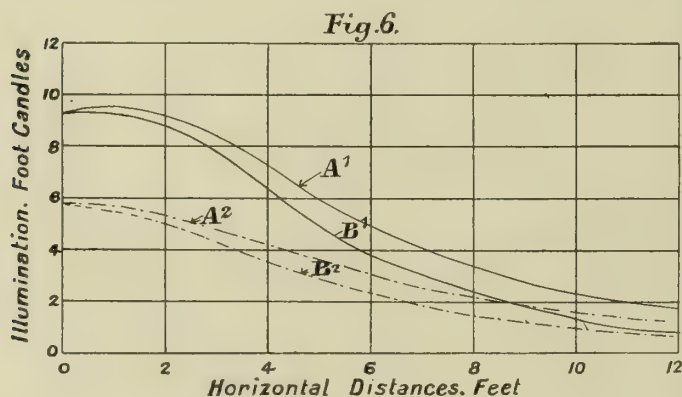
There is another aspect of lighting. I need hardly remind you that illumination has reference to the quantity of light falling upon a surface, and that the unit of illumination is the candle-foot. The candle-foot is the illumination that is produced when a light of 1 candle falls normally on a surface placed at a distance of 1 foot from the light source. It is an obvious inference from the law of inverse squares that the illumination in candle-feet is numerically equal to $\frac{\text{candles}}{(\text{distance in feet})^2}$, assuming that the rays fall

normally on the surface. If the surface is inclined to the direction of the rays so that the angle of incidence is θ , then the illumination will be less than the normal in the proportion of 1 to $\cos \theta$. The complete expression, therefore, for illumination is:

$$\text{Illumination in candle-feet equals } \frac{\text{candles}}{(\text{distance})^2} \times \cos \theta.$$

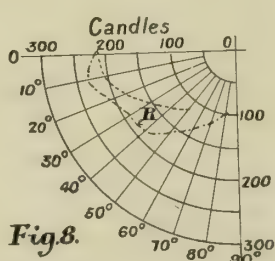
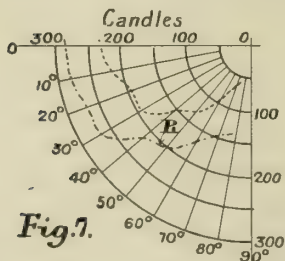
Illumination is a very important aspect of the art of lighting; and it may be considered in regard to three surfaces—i.e., (1) the normal surface, (2) the horizontal surface, (3) the vertical surface. The particular surface chosen in evaluating a system of lighting will vary with the circumstances; but for many purposes the horizontal surface is referred to.

Further, it must be known whether the horizontal surface is to be coincident with the floor, or an imaginary surface at a given height above the floor. This will vary according to circumstances. Fig. 6 shows the horizontal and normal illumination calculated from the polar curves in fig. 4, and having reference to a plane 7 feet below the lamp—i.e., a plane 3 feet above the floor if the lamp is 10 feet high.

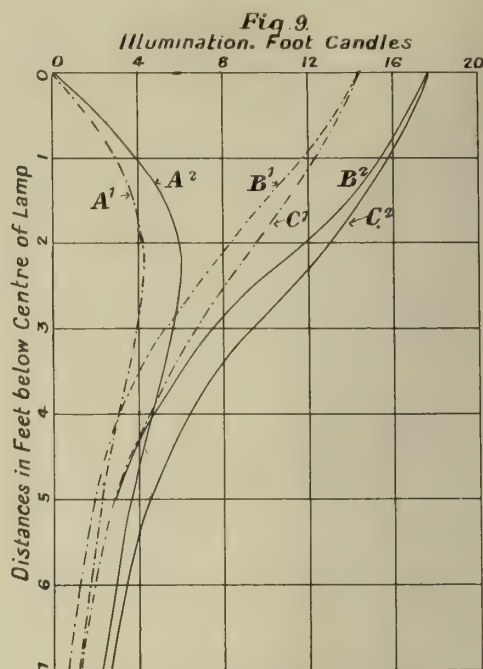


A₁ and A₂ represents the normal illumination.
B₁ „ B₂ „ „ horizontal „
In each case, the full line represents the result with the reflector,
and the dotted line the result without the reflector.

A very useful type of reflector for shop lighting is that known as the parabolic reflector. The effect of such a reflector on the light distribution, when used with a four-light upright cluster, is shown in figs. 7 and 8. Fig. 7 shows the effect of the reflector directly in front, and fig. 8 the effect at the sides.



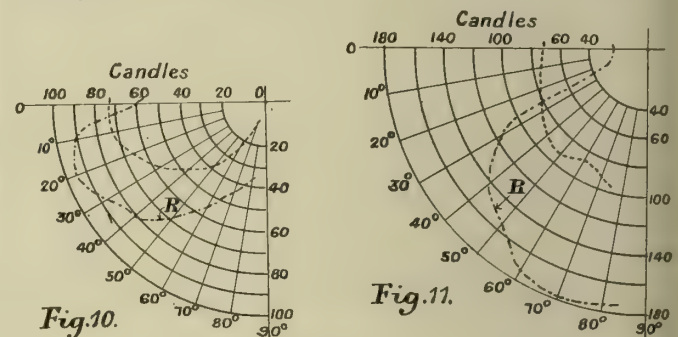
In calculating the illuminating effect produced by such a lamp when used to light a shop window, we have to consider three possible surfaces. If a shop window is observed, it will usually be found that the articles displayed in the upper part of the window are arranged vertically; those near the centre (a little below the line of vision) are inclined; and those at the bottom are nearly horizontal. To ascertain, therefore, the value of the parabolic reflector, the following values have been calculated for a vertical line 4 feet from the centre of the lamp, and directly opposite the reflector—i.e., the illumination of the line is calculated with reference to the curve in fig. 7. (1) Horizontal illumination, (2) vertical illumination, (3) normal illumination. These effects are shown in fig. 9. Figs. 10 and 11 show the effects of the reflector D when used first with an upright, and secondly with an inverted, burner. In the case of the inverted burner (fig. 11),



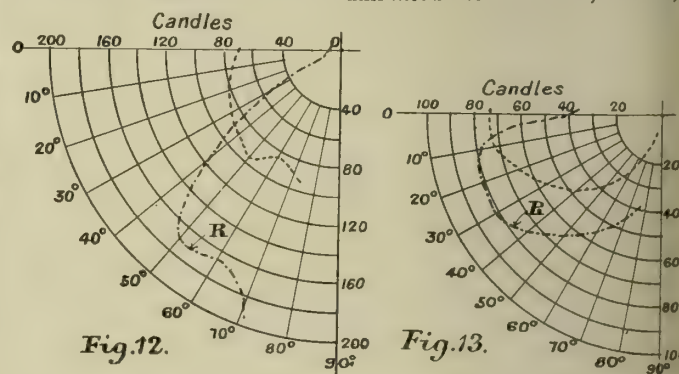
A₁ and A₂ represent horizontal illumination.
B₁ „ B₂ „ „ vertical „
C₁ „ C₂ „ „ normal „

In each case, the full line represents the result with the reflector,
and the dotted line the result without the reflector.

the direct rays were obscured to about 25° below the horizontal; while with the upright burner (fig. 10) they were obscured to about 5°.

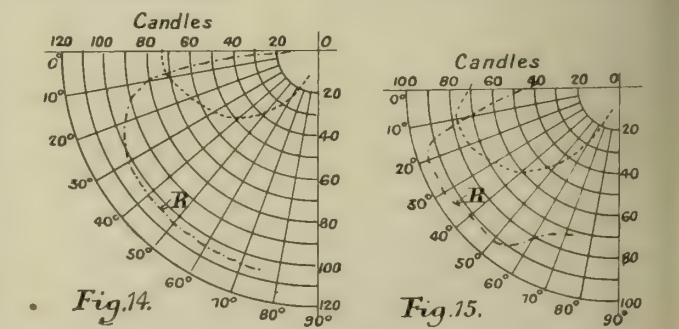


Figs. 12 and 13 show the effect produced by reflector E when used with, first, an inverted, and secondly, an upright burner. This type of reflector is much employed when a comparatively small surface has to be well illuminated—for instance, a table,



desk, or drawing board. Fig. 14 shows the effect of an ordinary 12-inch card shade (reflector F), when used with a "C" burner. Fig. 15 shows the effect of an ordinary opal shade (reflector G), when used with a "C" burner.

In concluding my remarks on lighting, I may say that all the photometrical measurements were made by a Simmance-Abady "Flicker" photometer.



THERMAL RADIATION.

Having dealt with a few practical aspects of luminous radiation, we may conveniently pass on to the consideration of thermal radiation—i.e., the thermal effect of the radiation.

The subject of thermal radiation is a very important one in regard to the gas-fire, and deserves the most careful consideration from the point of view of its economic production and distribution. A convenient method of exploring the distribution of thermal radiation from a gas-fire is by means of a thermopile and galvanometer, as was, I believe, first suggested and used for this purpose by Mr. J. H. Brearley, of Longwood. This apparatus is used to indicate the thermal effect of the radiation in various directions, just as a photometer is employed to ascertain the distribution of light from a lamp. It is used in connection with the researches carried out under the auspices of the Gas Heating Research Committee of the Institution of Gas Engineers; and the results obtained are, by previous calibration of the thermopile and galvanometer, converted into heat units, which are calculated to a percentage of the total heating value of the gas.

After a somewhat extensive experience with the thermopile, I am convinced that, although it is a useful apparatus for certain purposes on account of its handiness and low thermal capacity, it is not suitable for the commercial evaluation of gas-fires. Rather more than a year ago, I made a form of radiation calorimeter which, so far as I know, has some novel features. Before describing the apparatus, however, it will perhaps be interesting to discuss what is to be measured when evaluating the radiant efficiency of a gas-fire.

It has already been mentioned that thermal radiation behaves in many respects exactly as light; and it may be taken that thermal radiation issues from a fire in every direction in which the incandescent surface can be seen. Hence, to get the total radiation from the fire, it is necessary to ascertain the heat that would fall upon a hemisphere so arranged that its surface intercepts all the radiation. Such a method is correct for certain scientific purposes; but it does not afford an index to the practical value of a fire as ordinarily used. The lines I have pursued are as follows.

Assume a fire standing upon a glazed tile hearth; then the radiation that would fall upon a semi-cylinder of 24 inches radius and 4½ feet high, when so arranged that its diameter is coincident with the surface of the fire, is all that should be placed to the credit of the fire. It will be seen that such a method takes no account whatever of some of the radiation, as, for instance (1) that which passes over the top of the semi-cylinder, and (2) that which is absorbed by the tiles within the 24 inches radius. It can be easily shown that the heat which passes over the semi-cylinder ultimately reaches the ceiling, so that it is of no great value for warming the room. Fortunately, it is a small quantity. The heat which falls upon the tiled hearth is a very appreciable amount, and is partly available as reflected radiation, which would fall upon the semi-cylinder, and, to that extent, would be placed to the credit of the fire.

Having decided what is to be measured, we may proceed with the methods adopted. It is not convenient to measure the radiation falling upon the semi-cylinder as one quantity; but it is obvious that, if the semi-cylinder is divided into a number of vertical strips, and the heat falling upon each strip measured separately, the separate values can be integrated and the total value found.

RADIATION CALORIMETER.

The instrument referred to is shown in fig. 16. It was made from my models by Messrs. Alexander Wright and Co., of Westminster, who also incorporated some important mechanical details of their own. The instrument consists of a thin tube of 30 gauge copper, 54 inches high and about 2 in. by ½ in. internal section. The tube is suspended in a frame at the top of a stand, in such a way as to prevent heat passing into it by conduction from the stand. Connections are provided, so that water may be admitted at the bottom and led away at the top into a funnel switch. Thermometers graduated to ½° C. are fitted at the top and bottom, so that the difference of temperature can be easily ascertained. The instrument stands so that one of the broad faces of the flat tube is turned towards the fire. This side is lampblackened to facilitate absorption of the radiation, and the opposite side is polished to minimize radiation therefrom.

The left-hand photograph shows the apparatus in position, with the polished side of the tube facing the camera. It stands upon a quadrant base which has holes spaced 10° apart. Pegs in the tripod foot fit into the holes, so that the apparatus can be quickly placed at the various positions round the fire. The quadrant is reversible, so that it can be used on both right and left hand sides of the fire, and is equivalent therefore to a semicircle. The right-hand photograph gives a front view of the apparatus, with the black face of the tube towards the camera. The funnel switch and thermometers with lenses are also shown. It is readily seen that, when the apparatus is placed at the various points round the fire, the black surface always corresponds with a strip of the imaginary semi-cylinder. The flat tube is bevelled at the edges, to accurately define the area of the heat receiving surface. A polished copper screen is used, about 5 inches wide, and equal in length to the flat calorimeter tube. The purpose of this is to screen the radiation of the fire from the tube.

The instrument, when in use, is first of all placed in position opposite the fire, taking care that the blackened surface of the tube is normal with the line joining it and the centre of the fire.

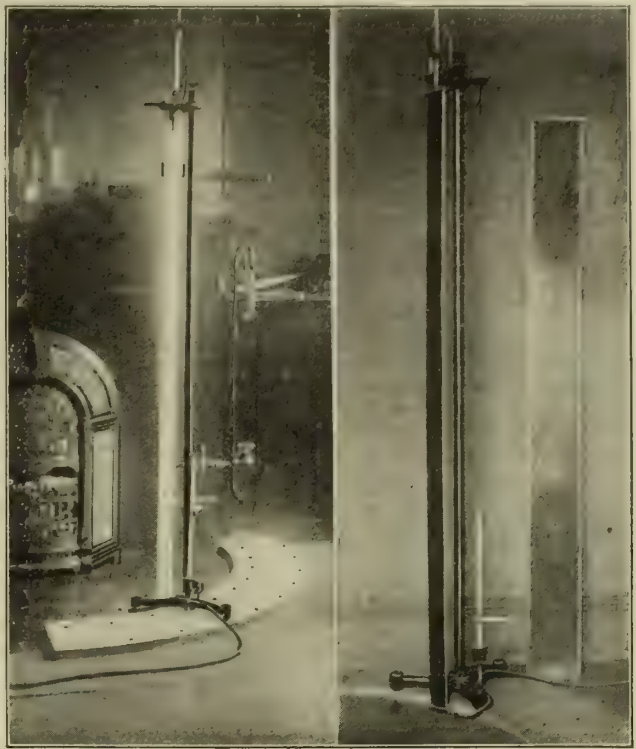


Fig. 16.

This adjustment is provided for in the quadrant stand on which the instrument is mounted. Having adjusted the apparatus, a water current is started and regulated to give a rise of temperature of about 4° or 5° C. When the inlet and outlet temperatures have reached equilibrium, the thermometers are observed, and the speed of the water current noted. The polished copper screen is then placed in front of the tube, about 2 inches from it. This obscures the radiation of the fire from the tube; and after about 2 minutes, the outlet temperature falls to a constant value, when the observations are taken again. The difference between the heat received by the screened and unscreened calorimeter tube, is the radiation which falls upon it at the particular position. These observations are repeated for other positions corresponding with the imaginary semi-cylinder; and from the mean value so obtained, and the relative areas of the imaginary semi-cylinder and the blackened surface of the calorimeter tube, the total radiation value is easily calculated. The separate values obtained for the various positions may be plotted on a polar diagram to show the distribution of the radiation, which is an important characteristic of gas-fires.

The following simple calculations are necessary.

If the calorimeter tube is 54 inches long and 2 inches wide, then—

Surface of calorimeter = $2 \times 54 = 108$ square inches.

Surface of imaginary semi-cylinder = $24 \times 3.1416 \times 54 = 4072$.

Ratio $\frac{\text{Area of semi-cylinder}}{\text{area of calorimeter}} = 37.7$

Therefore the total value in heat units is obtained by multiplying the mean value as given by the calorimeter by 37.7.

USE OF THE OBSCURING SCREEN.

I was led to adopt what I have called the obscuration method by the following consideration. When instruments of the kind described are exposed to a fire, heat is imparted to the current of water by radiation from the fire and conduction from the surrounding air. The latter is an appreciable and variable quantity, depending upon the temperature of the air, and the speed of the water current. Any measurement made without regard to the

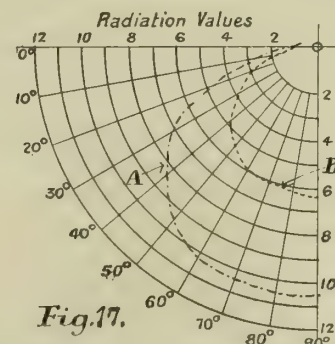


Fig. 17.

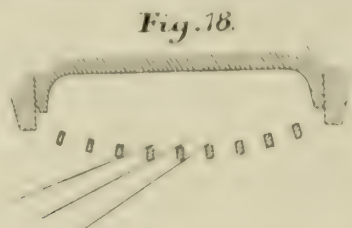
conducted heat is therefore of doubtful value. The obscuration method eliminates the conduction error by differentiation. It will be noticed that, if the inlet-water temperature could be relied upon to keep constant, the outlet temperature would be all that need be measured; but I have found it difficult to ensure this condition, and have two thermometers fitted accordingly.

Fig. 17 represents the polar distribution from a particular fire, as measured by the radiation calorimeter and by the thermopile. A is the thermopile curve, and B the calorimeter curve. The proportion of the radiation in the various directions as measured by the calorimeter does not coincide with the values given by the thermopile. This might have been expected, because the thermopile intercepts a much smaller quantity of the radiation than the calorimeter. The thermopile readings were taken in a plane level with the centre of the fire. The total radiation in this case was 1.49 B.Th.U. per cubic foot of gas consumed.

Of course, in addition to the radiation, a fire gives up a large quantity of heat by convection; and probably the most satisfactory form of heating is by a suitable combination of radiation and convection.

DESIGN OF FIRE FRONTS.

A very conspicuous development in the gas-fire during the past two seasons is the partial or complete removal of the grid-front. This is a material advantage from the point of view of radiant efficiency; and it may not be uninteresting to see how it takes place. Fig. 18 represents a cross-section of a grid-front. The



obstruction of the radiant heat in the normal direction due to the grid-front may be roughly calculated by comparing the frontal area of the bars with the total area of the front. If, however, oblique lines be drawn as in fig. 18, it is clear that the radiation in these directions is entirely obstructed by the bars. The removal of the bars therefore results in a larger increase of radiation in the oblique direction than towards the front.

GRILLERS.

Another practical aspect of thermal radiation is the use of the gas-griller. The toasting or grilling power of the cooker is dependent on radiation from the heated fret. As bearing on this, fig. 19 is interesting. It was obtained by means of a simple form of calorimeter, consisting of a series of copper tubes so

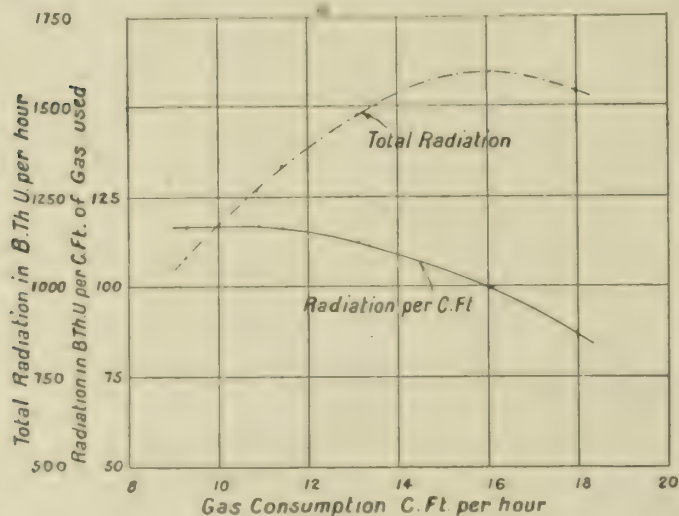


Fig. 19.

arranged as to form a flat surface about 6 in. by 9 in., or 54 square inches. This surface is lamp-black. Connections are provided so that water can be passed through the tubes in series; and the whole is supported in a stand which permits of the calorimeter being placed at a given distance from the griller-fret. Thermometers are fitted to show the inlet and outlet temperatures of the water current.

From a knowledge of the velocity of the water current and the increase of temperature between the inlet and outlet, the heat imparted to the water can be calculated; and, if the consumption of gas is known, the radiant efficiency of the griller can be ascertained.

This apparatus was originally made with some other special calorimetric appliances for the use of my students at the Westminster Technical Institute; but it also serves very well indeed for general work. The diagram shows that, with the particular griller used, the total radiation increases with increasing consumption to a maximum at about 16 cubic feet per hour, above which it falls off. The efficiency curve shows that the radiation per cubic foot of gas is a maximum when the consumption is between 9 and 12 cubic feet per hour. It is very useful and interesting to compare grillers and griller fittings in this way. I need hardly say that the waste heat from the griller is available for heating kettles, &c.

I have endeavoured in the short time at my disposal to indicate to you the importance of the study of radiation in connection with gas lighting and heating. The subject is no less interesting than important; and if I have done anything to make the matter clear to you, the object of my paper will have been achieved.

Discussion.

The PRESIDENT remarked that the author had dealt with his subject in a masterly way. The question of radiation was one of increasing importance, with regard to street-lighting especially. In the scientific lighting of the surfaces of roadways, it should be their object, by means of adequate reflectors, to gather all the rays above the mean hemispherical line and diffuse them in the direction in which they were most needed. In this, the author had afforded them a great deal of help; and the paper would be a most useful one. As to gas-fires, seeing how they wished to push them, it would be of much assistance to be able to tell, with the aid of such an instrument as Mr. Clark had devised, the actual amount of radiant heat that could be secured from different types of fires.

Mr. K. SPROXTON (Hornsey) asked whether the taking of a height of 4½ feet for the calorimeter test was quite an arbitrary thing. It seemed to him that the author was rather sweeping in his announcement that all heat above 4½ feet was entirely lost. One diagram that puzzled him immensely was that of the distribution of light within the sphere. It seemed to him that the diagram was—well, he would not say misleading; but at any rate the author depreciated the light falling in the downward direction, showing that that in the horizontal direction was very much stronger. He (the speaker) had always understood that the light distributed from a central point within a sphere would fall practically equally in all directions, and that every part of the sphere would be equally illuminated. In any case, it seemed to him that to draw a horizontal line was very arbitrary. Why should there be any horizontal line?

Mr. W. T. HOGG (Mitcham) took it that the diagram referring to radiation from the fire just showed the alteration of the intensity of heat over angles in the horizontal plane. Had the author thought it desirable at all to measure the variation in angles over the vertical plane, similar to the light rays?

Mr. T. F. CANNING (Ilford) inquired whether Mr. Clark could give them any idea of the amount of heat that was radiated from a gas-fire, and also whether he could state the exact amount of heat that would be lost from his calorimeter during action. The apparatus was very ingenious; but it seemed to him that there must be an appreciable amount of heat lost over the large surface exposed away from the fire.

Mr. F. AINSWORTH (Ilford) thought the paper must prove of great service to the members. There were always some things they were not altogether sure of; and what Mr. Clark had written would help them to decide upon the course to adopt in certain circumstances. On the subject of reflectors, what kind of burners did he find the most economical and best to use for shop front lighting, upright or inverted? No doubt, for the lighting of shop windows reflectors must be a great help in showing off the goods. As to fires, Mr. Clark had convinced him still further that the fixing of these in an ordinary grate was a mistake, on account of the metal that they had to contend with. He himself had often condemned this form of heating rooms. What he would like to see was a fire constructed specially to put in front of the ordinary grate, and which would stand out a little; and it should be made in such a form that it could be regulated. They wanted a large outlet, so that they could meet all the objections that could be put to them. Perhaps Mr. Clark could tell them the best pressure for a gas-fire. Personally, he had secured very good results with a pressure of 12-10ths. Would Mr. Clark tell them the kind of griller he used for his tests?

Mr. E. W. ELSDRED (Gaslight and Coke Company) remarked that comparing a parabolic shade and an ordinary diagonal half-opal globe, the former gave a very dead appearance to a shop as one approached it; and for this reason he did not like it. Of course, he took the circumstances of the shop into consideration; but he always when possible recommended people to have the ordinary diagonal half-opal globe. He did not think, judging from the look of shop windows, that there was very much difference between the amount of light reflected from the half-opal and that from the parabolic; certainly the appearance on approach was greatly in favour of the half-opal globe.

Mr. F. H. WEDD had two questions he would like to ask. The first was whether raising the incandescent portion of the fire-front would make it necessary for the author to use a higher cylinder, and whether he would not get more heating effect from the fire-front if it were raised a little. The other point was whether, taking an argand burner and an incandescent mantle, he could give any idea as to which furnished the greater radiation per cubic foot of gas.

Mr. J. HEWETT (South Metropolitan Gas Company) remarked that Mr. Clark had dealt with the subject of radiation in such a manner that everyone could understand what he was talking about. As to the instrument which had been shown, he would like to ask whether it was really a laboratory instrument, or whether it could be used on a consumer's premises. Of course, the subject of water would come in, as it was not very easy to fix up a water supply arrangement on the premises of a consumer. Had the author considered whether he could design an apparatus to attain

the same end, in which no water would be used? Then the need of having two thermometers at a considerable distance from each other rendered the readings not quite simultaneous.

The PRESIDENT said they were fortunate in having Mr. T. S. Lacey and Mr. T. V. Fenn, both of the Gaslight and Coke Company, with them that evening; and he hoped these gentlemen would contribute to the discussion.

Mr. T. V. FENN said allusion had been made to fires fitted in grates. He had in mind the "Blenheim" pattern, which was an excellent one, and one of the best on the market. There were thousands of these fixed; and he never recollected having a complaint that there were products of combustion passing into the room. With regard to the consumption and pressure of a fire, this could well be manipulated by a governor; but unfortunately governors were rather unwieldy, and it was difficult to place them so that they would be hidden from sight. In many cases, when they wanted to regulate the consumption, they fixed up a small regulator; and it was often found that this brought the consumption down to the amount the fire should burn, and gave satisfaction to the customer. He quite agreed that the bars of the modern grate did take away a lot of heat units. He had a case in his own office, where there was a fire with a set of rather thick vertical bars. These were removed, and thin bars put in; and the difference in the heating properties of the stove were most marked. With reference to grills, there was, of course, a wide difference in the efficiency of different forms.

Mr. T. S. LACEY remarked that Mr. Clark was a few years ago engaged with him in making certain researches in lighting and the value of the incandescent burner with gases of different calorific powers; and he knew that he was a painstaking investigator, and that any work he undertook would be done thoroughly. The word "research" had been used very frequently lately; and perhaps a somewhat exaggerated value had been given to one form of research, and that was purely scientific research. As far as they were concerned, research on purely abstract questions of science was out of place; but it did not follow that research was not absolutely necessary, and research in the particular direction in which Mr. Clark had undertaken it in his paper was most vital to them. The kind of research that was really useful to them was research that was sufficiently accurate for their purposes. They did not want to determine the length of different coloured waves of light, &c.; but they did want to know, when they were burning gas in a fire, whether they were getting 30, 40, or 50 per cent. of the available heat in the room. It was easy to say this could be ascertained in this way or that. All that was necessary was to put the gas-fire inside a calorimeter, and the thing was done. The only requisite step was to make the calorimeter; and Mr. Clark had done so. He had not before seen one anything like so practical as this instrument. It did what was required of it. The tube would absorb, he understood, the whole of the radiant heat.

Mr. CLARK: We must assume that, at any rate for the present.

Mr. LACEY (continuing) said they might perhaps take it that it would absorb about 95 per cent. If they could put this tube right round the fire, all the heat that came out as radiant heat would pass into the calorimeter, and go to raise the temperature of the water. The principle of the thing was extremely simple. The only point open to discussion was the accuracy of the instrument. The most important thing about the research was that it should be accurate within practical limits; and he felt perfectly certain this instrument was so. As to the particular height of the tube, he thought Mr. Clark had adopted a very sensible course. He had made it high enough for all practical purposes. They had there an instrument which he considered was remarkably useful and practical; and such an appliance was worth a great deal of money to gas companies. It was the kind of thing that constituted their bread and butter. The application of an instrument of this character was of the very greatest importance. Much thought and ability had had to be exercised in devising it. The way in which the problem had been regarded had been a wonderfully clear-sighted one; and it had been tackled in a very sensible manner. There were no complications around the apparatus. In fact, the whole thing was so simple and so unpretentious that Mr. Clark was not likely when showing it to get anything near the amount of credit due to him for the ingenuity displayed in devising it. He heartily congratulated him on having invented it. The manipulation of the instrument could not require any great refinement. All that was needed was conscientious reading of the thermometers, and so on. He did not see any difficulty in using the instrument anywhere—provided people did not object to them doing so. As to the tiled floor, he thought it was quite proper to have used this, as many people had them. The instrument would enable them easily to ascertain the behaviour of different stoves. With regard to the portion of the paper on light, this was a question of immense importance. For public illumination, people did not care how many cubic feet of gas they were going to be supplied with; but they wanted to know how many thousand candle power they were to have, and where it was to be put. What they had to do was to compete with other people in producing a certain illuminating effect in the streets. The distribution of light was a most interesting study. The paper would well repay careful reading; and he had great hopes that in future they would hear more of the performances of the instrument to which Mr. Clark had drawn their attention.

Mr. L. F. TOOTH (Stepney), in proposing a very hearty vote of

thanks to the author, remarked on the full way in which the subject of reflection had been dealt with. The matter of the radiation of gas-fires was also most important; and there was need for a great deal of research work in this direction. The question of fuel had not been touched on. As they knew, the single row fuel with the chimney effect made the gas-fire more efficient; and with the aid of this instrument for the measurement of the radiant heat, he looked forward to getting it absolutely perfect.

Mr. CANNING seconded the vote, which was heartily accorded.

Mr. CLARK said that as time was getting on he would prefer to leave over the reply to the discussion until the May meeting. He was greatly obliged to them for their vote of thanks, and would like to take the opportunity of saying that he was indebted in a very large measure to his chief, Mr. F. W. Goodenough, Chief Inspector of the Gaslight and Coke Company, for the facilities for placing his paper before the members. Mr. Goodenough, he said, always took a keen and kindly interest in work of this kind.

AN ELECTRIC GAS-METER.

Some Further Details of Its Construction.

In the "JOURNAL" for Feb. 15, we reproduced from the pages of an electrical contemporary some particulars of a meter that was described before the American Society of Mechanical Engineers in a paper read by the patentee, Professor Carl C. Thomas, of the Department of Steam and Gas Engineering of the University of Wisconsin.

When sending a copy of his paper (in response to a request addressed to him), Professor Thomas enclosed a print of an addition which he made to the paper, giving the theory of the meter; and he also sent a photograph (fig. 1) showing the general scheme of the meter as it is being built at the present time. He adds: "The Cutler-Hammer Manufacturing Company in Milwaukee are making the meters for commercial work. The meters are being adapted to the measurement of coke-oven gas, blast-furnace gas, producer gas, illuminating gas, and air. In some cases the gas is under high pressure. The meters are at the present time being so arranged that the record of gas-flow is taken in the gas office, where it can be conveniently read without going out into the works. In some cases, the meter is equipped with autographic recording apparatus; and in other cases the principle of the integrating watt-meter is employed."

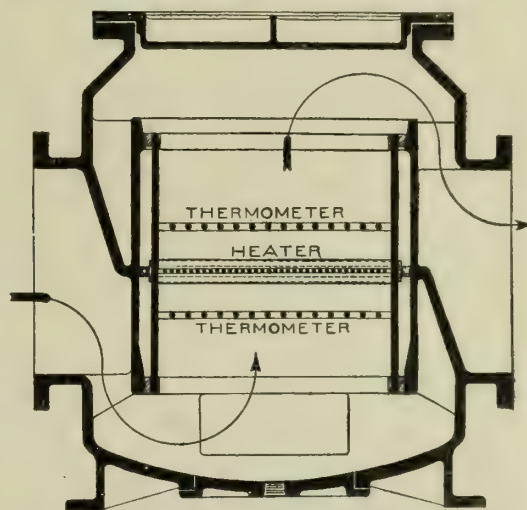


Fig 1.—The General Scheme of the Meter.

The chief paper by Professor Thomas starts by pointing out the six characteristics of the meter he invented—see *ante*, p. 440; and it then proceeds: The meter consists of two parts—first, the measuring element A (figs. 2 and 3), through which all the gas passes when the meter is in operation; and second, a bye-pass, B (fig. 2), so arranged that the meter can be readily cut off from the gas-main by the operation of the valves C, when it is desired either to operate without the meter for the purpose of inspecting or cleaning-out, or to cut the meter out altogether for any reason. In certain classes of gas plant, rolling valves, such as are shown at C, have been found to give trouble, while in other classes of work they are satisfactory. The gate-valves customarily used in gas-work, can be substituted for rolling-valves as occasion requires, and the bye-pass can be made up of ordinary pipe and fittings instead of being part of the meter.

The meter consists of an electric heater D (figs. 2 and 3), formed of suitable resistance material disposed across the gas passage in such a way as to impart heat uniformly and at a regular rate to the gas passing through the meter. The temperature of the gas is thus raised from that at its entrance to some higher exit temperature; and the rise of temperature is measured and autographically recorded by means of the two electrical resistance thermometers E on the two sides of the heater.

These thermometers consist of wire wound upon vertical tubes

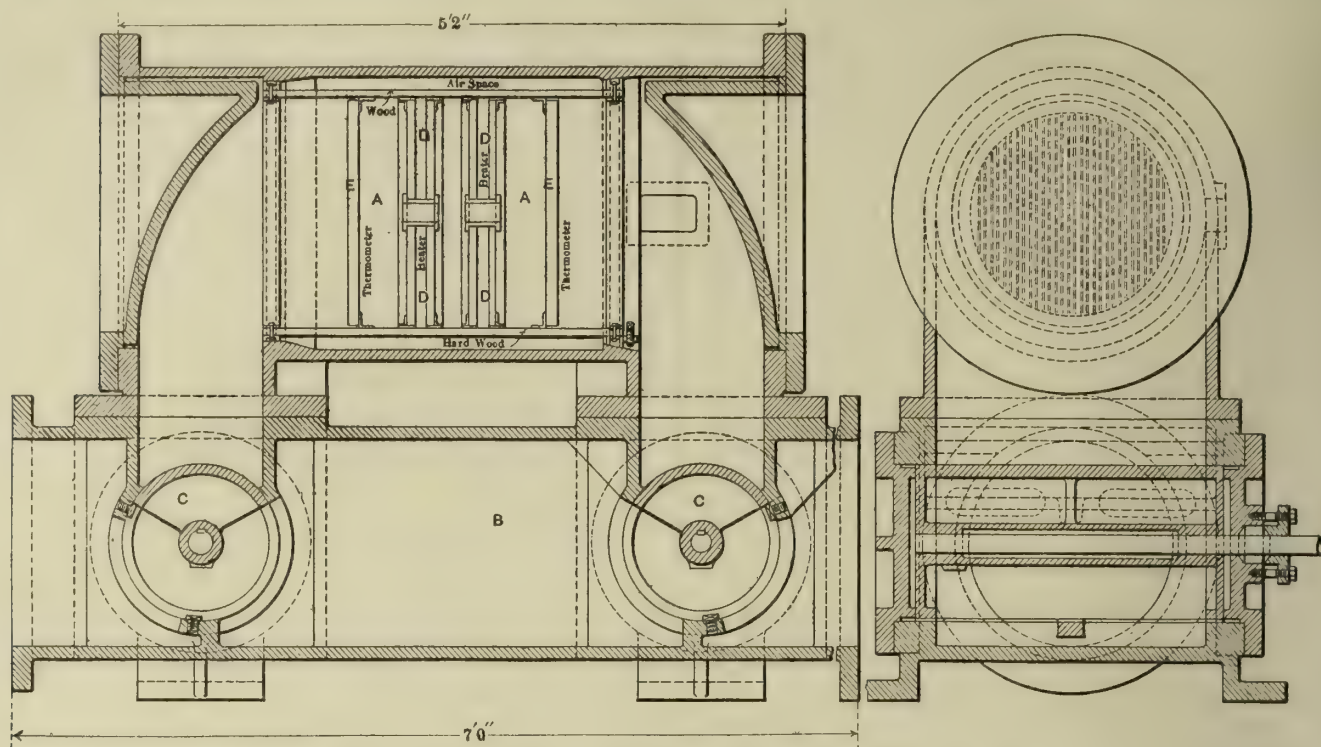


Fig. 2.—Longitudinal and Cross Sections of the Thomas Electric Gas-Meter.

so disposed as to come in contact with all the gas passing through the meter, thereby indicating the average temperature over the cross section of the gas passage. The fifteen tubes shown at the right of fig. 2, and also in fig. 3, extending in a vertical direction over the cross-section of the meter, support the resistance wire of the thermometers so as afford a rugged construction. These thermometers are connected to a recorder which draws a line on a chart and thus indicates the difference of temperature between the two thermometers.

A typical diagram is shown in fig. 4. This diagram represents a gas flow of from 90,200 to 85,000 cubic feet per hour, taken during a portion of the day when the fluctuation in flow is small, but nevertheless continuous. Every small fluctuation in the quantity of flow is recorded on the diagram.

The diagram in fig. 5 was made during a period in which the flow varied extensively; the smallest amount recorded being about 17,000 cubic feet per hour, increasing to 45,000, then to 62,000, to 75,000, the record ending at a flow of about 32,000 cubic feet per hour.

The record in fig. 4 was made with a temperature difference of about 4° Fahr. between the two thermometers, and an energy input of approximately 2 kw. The energy input when the record in fig. 5 was made was approximately 1.15 kw. Fig. 4 is a typical record for a meter of normal capacity of 100,000 cubic feet per hour, with an electric input of 2 kw.

long as the amount of gas passing per unit of time is constant. But if the quantity of gas passing per unit of time diminishes, the heat supplied at the same constant rate as before will raise the temperature of the gas by a greater amount than was the case when a larger quantity of gas was flowing and absorbing the energy liberated by the heater. Conversely, if the rate of flow increases, the energy being supplied to the heater and delivered to the gas will not be able to raise the temperature by as great an amount as when the rate of flow was less. The temperature difference produced by a known input of electrical energy thus forms a measure of the quantity of gas flowing through the meter.

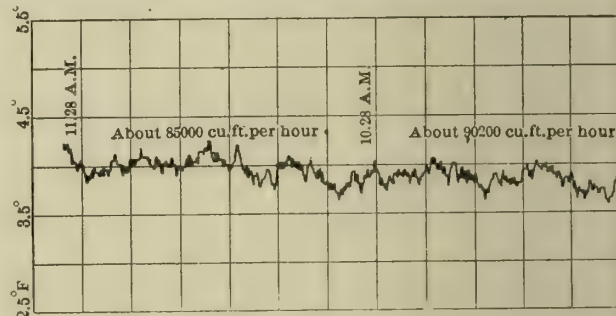


Fig. 4.—Autograph Record Showing Gas Flow of about 85,000 Cubic Feet per Hour.

NOTE.—This diagram was taken under approximately steady conditions of flow during the regular operation of one of the plants of the Milwaukee Gaslight Company. The paper in this case was travelling at a rate of 3 inches per hour. The recorder can be set for any one of the three speeds of paper—3, 6, or 12 inches per hour. The higher speeds are desirable, as they smooth out the curve of temperature differences. The scale of temperature differences can also be greatly enlarged if desired.

The meter may be operated in either one of two ways, of which the first is as follows: The difference of temperature between the inlet and the outlet is kept constant; and the watts required to maintain this constant difference of temperature vary directly as the weight of flow. The watts input thus forms the measure of the weight of flow of air or gas; the watts being measured by a recording wattmeter, or in some cases by an integrating wattmeter. The fixed difference of temperature (about 5° Fahr.) is maintained by the action of a device made upon the same principle as the well-known autographic temperature recorders used in connection with resistance thermometers, but without the autographic part.

The mechanism which actuates the pen carriage in the autographic recorder is so arranged that when the carriage tends to depart from the straight-line path indicating a constant difference of temperature, it automatically cuts in and out the resistance necessary in order to maintain the fixed difference of temperature. This variation of energy input is accomplished by a small motor-controlled rheostat mounted on the switchboard. Thus as the rate of flow of gas is increased the temperature difference tends to decrease; and at once additional energy is introduced, sufficient to heat the increased weight of gas so as to maintain the constant temperature difference. This method of operation is advantageous because it does not require the maintenance of a

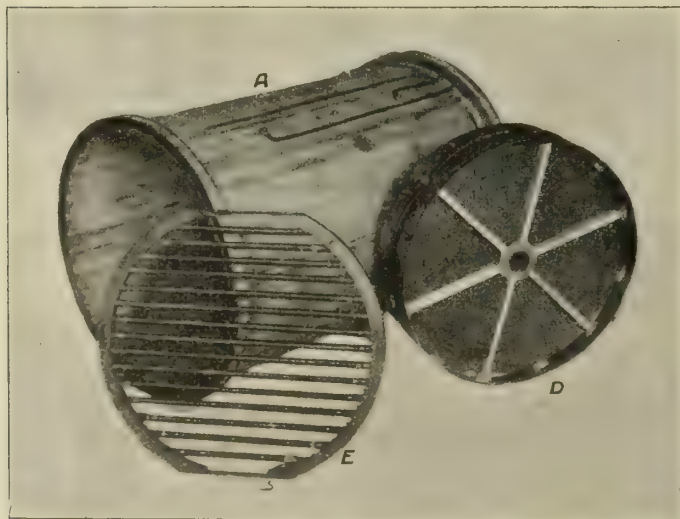


Fig. 3.—Showing Construction of Heater and Thermometers.

The principle underlying the measurement of gas by this means is as follows: If gas is flowing through the heater at a given uniform and constant rate, and if heat is being supplied electrically, and imparted to the gas at a constant rate, a certain definite rise of temperature will be produced in the gas during its passage between the two thermometers and through the heater; and this constant difference of temperature will be maintained so

constant voltage on the line supplying the energy for heating the gas. The accuracy is thus independent of the small fluctuations in voltage generally found on electric supply circuits.

The second method of operation involves the use of the autographic temperature recorder, including the graphical part, the diagram from which, representing the variation of difference of temperature with constant energy input, gives the measure of the quantity of gas passing the meter. That is, the electrical resistance of the meter remains constant, and the meter is supplied with current at constant voltage, which results in constant energy dissipation in the meter. The difference of temperature between the inlet and the outlet then rises and falls according to the decrease or increase, respectively, of the rate of flow of gas.

The first method of operation mentioned is superior to the second method, inasmuch as the first is independent of any change which might take place in the electrical resistance of the material composing the heater. Operation by the second method requires that constant voltage be maintained across the line, and that the electrical resistance of the heater shall remain constant, or else that both watts input and temperature difference shall be recorded. In the experimental work of developing the meters, it has been found convenient to use this second and more cumbersome method; but in meters at present under construction, the first-mentioned method has been adopted—thus avoiding the necessity for either constant voltage or constant resistance, and resulting in simpler apparatus throughout. A record of the watts input is, by the method now used, all that is required for determining the flow of gas through the meter. The meters can be arranged to operate with either direct or alternating current; and the controlling device can be arranged to work with any desired voltage.

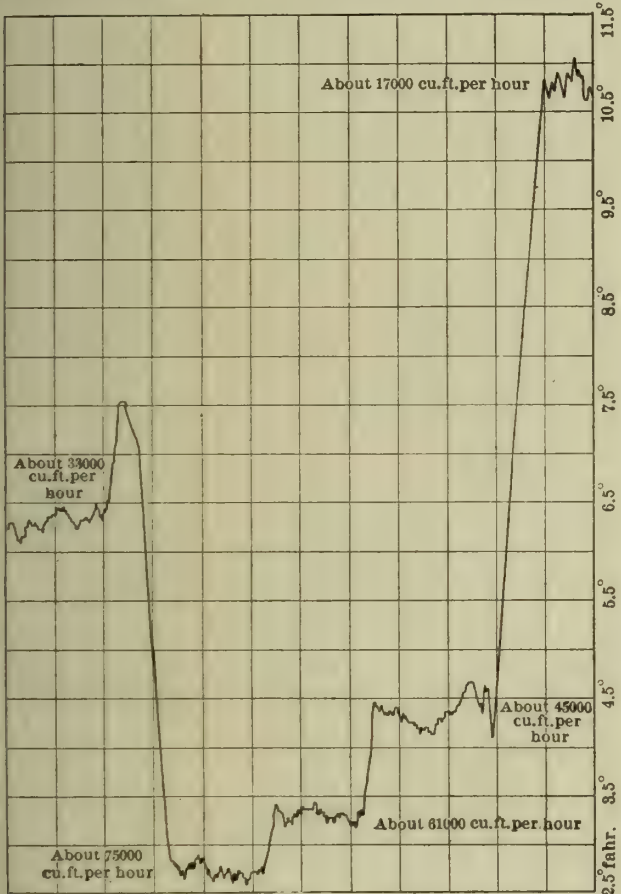


Fig. 5.

The electric meter at Milwaukee is used for measuring all the gas which was formerly passed through a large wet meter, and is of sufficient capacity to enable it to measure about three times the amount of gas for which the wet meter is suited. The electric meter was placed in this position between a 100,000 cubic feet gasholder and the large station wet meter, for the purpose of calibrating the electric meter and comparing the results, based upon the rate of drop of the gasholder, with the readings of the wet meter. The curve obtained from the autographic recorder was thus interpreted by means of the calibration carried on in connection with the gasholder, the wet meter, and a meter prover of the largest size made. It was found that the wet meter used in this case was exceedingly accurate. It had been carefully put in order and calibrated before the tests, and when operated at loads within its capacity the readings were entirely reliable. The best evidence of this is given by the results used in plotting fig. 6.

The specific heat of a given kind of gas appears to be very nearly constant, since those constituents which vary from time to time are not those which appreciably affect the value of the specific heat. But it is desirable to calibrate the meters with a gas having the same specific heat as that which it is intended to measure in a particular case. The specific heat of illuminating gas is very closely 0.020 per cubic foot at atmospheric pressure, as shown by fig. 6 and also by the following calculation based upon a fairly

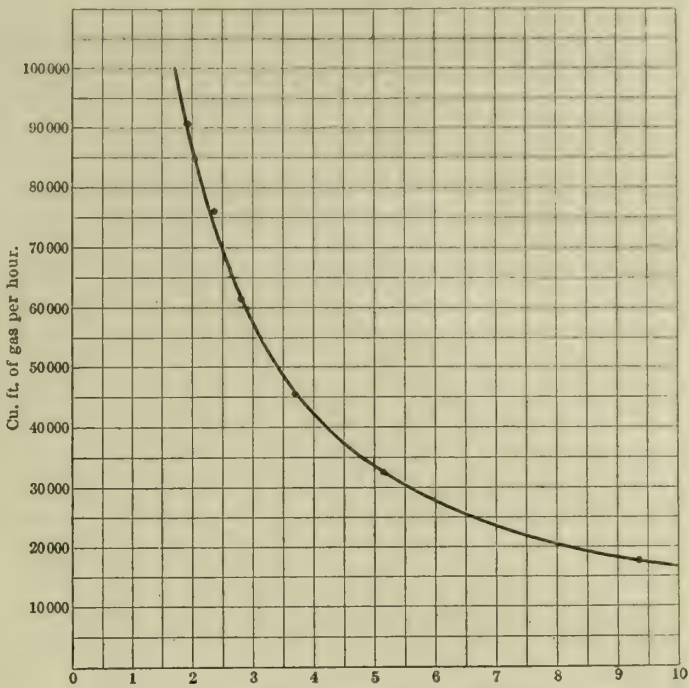


Fig. 6.

typical analysis. Such variation as commonly occurs in the relative amounts of the various constituents does not materially affect the specific heat.

| | Volume, Cubic Feet. | Weight per Cub. Ft., Lb. | Total Weight, Lb. | Specific Heat per Lb. | Specific Heat per Cub. Ft. |
|-------------------------------|------------------------|-----------------------------|----------------------|--------------------------|-------------------------------|
| CO ₂ | 0.04 | 0.11637 | 0.004658 | 0.216 | 0.00100 |
| C ₂ H ₄ | 0.11 | 0.0741 | 0.00815 | 0.404 | 0.00329 |
| O ₂ | 0.001 | 0.08463 | 0.00085 | 0.217 | 0.00023 |
| CO | 0.331 | 0.07407 | 0.02450 | 0.245 | 0.00600 |
| CH ₄ | 0.1761 | 0.04234 | 0.00746 | 0.593 | 0.00442 |
| H ₂ | 0.303 | 0.00530 | 0.00160 | 3.409 | 0.00546 |
| N ₂ | 0.0389 | 0.07429 | 0.00289 | 0.244 | 0.00071 |

0.02111

The specific heat of blast-furnace gas is practically the same as that of atmospheric air; and the same is true in a general way regarding producer gas. Thus, taking the following as an average analysis of blast-furnace gas, the specific heat is found to be 0.0192; while atmospheric air has a specific heat almost identical with this, or approximately 0.0191 per cubic foot. This is to be expected, since producer gas and blast-furnace gas consist principally of nitrogen and carbon monoxide.

| | Volume, Cubic Feet. | Weight per Cub. Ft., Lb. | Total Weight, Lb. | Specific Heat per Lb. | Specific Heat per Cub. Ft. |
|-------------------------------|------------------------|-----------------------------|----------------------|--------------------------|-------------------------------|
| N ₂ | 0.60 | 0.0743 | 0.0446 | 0.244 | 0.0109 |
| CO | 0.24 | 0.0741 | 0.0178 | 0.245 | 0.0044 |
| CO ₂ | 0.12 | 0.1164 | 0.0140 | 0.216 | 0.0030 |
| H ₂ | 0.02 | 0.0053 | 0.0001 | 3.409 | 0.0003 |
| C ₂ H ₄ | 0.02 | 0.0741 | 0.0015 | 0.404 | 0.0006 |

0.0192

The meters have been calibrated with illuminating gas and with air. A certain amount of water vapour is carried with the gas or air passing the meter. This vapour forms part of the gas or air, and is heated just as are the other constituents. The rise of temperature caused by the heat added in the meter is only a few degrees, and consequently the water vapour does not experience a change of state. The temperature of the metal forming the electric heater rises only 15° or 20° Fahr. above the temperature of the gas. The question of latent heat of vaporization of the water vapour, therefore, does not enter into the considerations underlying measurement of the gas.

While calibration of the meters under actual conditions of service is depended upon to obtain quantitative results, yet these meters are of such a nature that the quantity of gas or air passing through them can be very closely calculated from a knowledge of the energy input and the specific heat of gas or air. This fact—that the quantity of flow can be quite closely calculated, independently of a calibration curve—makes it possible to check the accuracy of the readings obtained.

The development of this meter is a result of experiments which the writer has been making for some years to determine the specific heat of gases by heating them electrically. The performance of a properly constructed heater for this purpose proved to be so entirely regular that it was apparent that the quantity of gas flowing through it could be very accurately measured by the method now used in these meters. The problem is thus the reverse of the problem of determining specific heat by measurement of the electrical energy necessary to heat the gas. It will be seen by reference to fig. 2 that the whole process of heating the gas and of measuring the difference of temperature between inlet and outlet is accomplished in a relatively small space which is well insulated so far as heat losses are concerned, since the

heater and thermometers are contained in a casing made of hard-wood strips and separated from the metallic walls of the meter by an air space.

A typical calibration curve is shown in fig. 6. The curve shows the degrees rise in temperature per kilowatt introduced when any given rate of flow through the meter is taking place. It will be seen that this curve is asymptotic to the co-ordinate axes, because, when an indefinitely great amount of gas is being heated, any finite input of heat will produce only an indefinitely small rise of temperature; and, on the other hand, when the amount of gas becomes indefinitely small, a finite input of heat will cause an indefinitely great rise of temperature. The calibration curves obtained are, therefore, rectangular hyperbolas. The product of weight of gas multiplied by degrees temperature rise per watt introduced is a constant; and this constant, for a given kind of gas, takes the place of a calibration curve and renders it unnecessary to refer to a curve. The constant as shown by fig. 6 is 170,000, showing a specific heat per cubic foot of $\frac{3412}{170} = 0.0201$.

The accuracy of these meters is not affected by changes in pressure of the gas or air, since the unit of measurement is that of weight rather than of volume—that is, the meter takes cognizance of the specific gravity, or the amount of "stuff" in a given volume of the gas. Also variation of temperature of the incoming gas does not affect the accuracy, because it is a difference of temperature, rather than a fixed temperature, upon which the measurement depends. The meter can be used for gas or air at either high or low pressure, and at either high or low temperature, provided the materials used in its construction are suited to the conditions.

This method of measuring gas seems especially useful in connection with engines operated by gas from producers, blast furnaces, &c., and in measuring the discharge of gas or air from compressors, because the small and rapid periodic fluctuations of pressure due to the suction of gas-engines or to the discharge from compressors, do not interfere with the steady action of the thermometers. The time-lag of the latter is sufficient to smooth out the curve of temperature variation or of watts input, as the case may be, and true average results are thus indicated.

The temperature difference employed when operating with a constant difference is approximately 5° Fahr. When a curve of temperature difference is employed, the temperature rise is from 4° to 5° Fahr. when the normal maximum amount of gas is flowing. This difference may be increased to 10° or 12° when the rate of flow is greatly diminished; and at 100 per cent. overload the temperature difference is from 2° to 2½°. On the autographic record an inch represents a temperature difference of one degree. The thermometers and recording device are such as to render the records accurate within 1 per cent. The minute fluctuations shown by the curves on fig. 4 and fig. 5 are produced by the constantly varying rate of flow in the gas-mains. These can be "damped out" to any extent desired. The apparatus with which this record was taken was purposely made sensitive to minute fluctuations.

The electrical energy required to operate the meters is approximately 1 kw. per 50,000 cubic feet hourly capacity. The curves shown in fig. 5 represent variations of from 17,000 to 75,000 cubic feet per hour, and were made with an energy input of approximately 115 kw. To provide for more gas and still have the record lie conveniently on the paper, it is only necessary to increase the energy input by manipulation of the rheostat hand-wheel on the switchboard.

The meters are so constructed that the heads can be easily removed and an air-blast used for cleaning out the interior, or the entire casing, containing heater and thermometers, can be removed and dipped in gasoline for the purpose of removing tar or other deposit. All parts of the meter are of rugged construction, and are of well-developed materials familiar to engineers. The heater units consist of corrugated strips of resistance ribbon about 1½ inches wide, wound spirally into discs of such diameter as to fit the inside of the wooden casing. The number of these discs depends upon the capacity of the meter. The heater shown in fig. 3 consists of two discs.

After describing a modification of the meter specially adapted for the measurement of steam, the author proceeds: The automatic recording device for the gas-meter is so arranged that in case the flow of gas should be interrupted for any reason the current is automatically cut off at the switchboard. Also if the flow of gas becomes so small in amount that the pen reaches within ½ inch of the edge of the paper, the current is cut out. When the gas has cooled the heater slightly, the current is automatically cut-in again; and if the gas flow is increased, the pen goes back toward the middle of the diagram and operation proceeds normally. If the gas flow continues but does not increase beyond that at which the current was cut-out, the pen will "hunt" back and forth near the edge of the paper. It can be brought back toward the middle of the paper by the introduction of more energy to the meter. The gas-meter is thus fully protected from possible injury due to the complete shutting off of the gas supply.

At the other edge of the paper, representing the maximum flow of gas, the operation is similar to that already described. In order to bring the recording pen upon the range again, the electrical input is increased by manipulation of the hand-wheel on the switchboard. This applies to operation by the second method of operation (described earlier), in which the temperature difference between the two thermometers forms the record of gas-flow.

When the first method is employed—that of maintaining constant temperature difference—the meter is also automatically protected by the motor-controlled rheostat, and the range of the instrument is unlimited and it does not require manipulation by hand. It will be seen by reference to fig. 5 that the range of the instrument when operated by the second method of varying temperature difference is very wide, and takes care of extensive fluctuations of gas-flow.

APPENDIX.

Data relating to the Calibration Curve, Fig. 6.

| Time. | Wet Meter Reading. | Cubic Feet Gas per Hour. | Average Temperature Difference Deg. Fahr. | Average Kilowatt Input. | Deg. Temp. Rise per Kilowatt. |
|-------|--------------------|--------------------------|---|-------------------------|-------------------------------|
| A.M. | | | | | |
| 10.05 | 90,148.0 | | | | |
| 10.10 | | | | | |
| 10.15 | 90,177.5 | | | | |
| 10.20 | 90,192.0 | 17,350 | 10.7 | 1.153 | 9.30 |
| 10.25 | 90,206.0 | | | | |
| 10.30 | 90,220.5 | | | | |
| 10.50 | 90,396.0 | | | | |
| 10.55 | | | | | |
| 11.00 | 90,470.0 | | | | |
| 11.05 | 90,509.0 | 45,200 | 4.25 | 1.150 | 3.69 |
| 11.10 | 90,546.0 | | | | |
| 11.20 | 90,644.0 | | | | |
| 11.25 | 90,695.0 | 61,200 | 3.25 | 1.160 | 2.80 |
| 11.30 | 90,746.0 | | | | |
| 11.40 | 90,884.0 | | | | |
| 11.45 | 90,947.0 | 75,600 | 2.70 | 1.160 | 2.32 |
| 11.50 | 91,010.0 | | | | |
| P.M. | | | | | |
| 12.05 | 91,098.0 | | | | |
| 12.10 | 91,125.5 | | | | |
| 12.15 | 91,152.7 | 32,640 | 6.25 | 1.22 | 5.12 |
| 12.20 | 91,180.0 | | | | |
| 12.25 | 91,206.8 | | | | |
| A.M. | | | | | |
| 9.30 | 91,418.2 | | | | |
| 9.35 | 91,493.4 | 90,240 | 3.90 | 2.05 | 1.90 |
| 9.40 | 91,568.8 | | | | |
| 9.45 | 91,643.8 | | | | |
| 10.00 | 91,857.1 | | | | |
| 10.15 | 92,074.0 | | | | |
| 10.30 | 92,291.7 | 84,960 | 4.10 | 2.05 | 2.00 |
| 10.45 | 92,506.2 | | | | |
| 11.00 | 92,717.5 | | | | |
| 11.15 | 92,925.4 | | | | |
| 11.30 | 93,131.0 | | | | |

THE SUPPLEMENTARY PAPER.

THEORY OF THE METER AND METHOD OF OBTAINING STANDARD RESULTS.

The figures given in the paper can be reduced to standard conditions of temperature and pressure, and the meter readings can be autographically recorded directly in "standard cubic feet" of gas or air. Let

G = cubic feet of gas per hour

E = energy in kilowatts

Then B.T.U. per hour = $3412 E$

T = temperature difference, degrees Fahr.

S = specific heat per cubic foot

Then G S T = heat energy equivalent to E, or G S T = $3412 E$.

$\frac{G T}{E} = \frac{3412}{S} =$ a constant K which depends upon the specific heat of the gas.

Since the temperature difference T is kept constant, it follows that $\frac{K}{T}$ is constant. Let $\frac{K}{T} = C$. Then $G = \frac{K E}{T} = C E$.

It is now proposed to show, by reference to the gas and the air curves in fig. 7, that if the specific heat of gas made under given conditions be calculated from the customary chemical analysis and the specific heat of constituents, then this specific heat may be used for determining the constant C. From the gas curve (fig. 7), which was made with illuminating gas at an average temperature of 50° Fahr., and under an average absolute pressure of 6 inches of water and 29.8 inches of mercury,

$$K = 170,000 - \frac{3412}{S}$$

Therefore for the condition of the gas when the tests were made the specific heat per cubic foot = $S \frac{3412}{170,000} = 0.0201$. If this be reduced to standard conditions of 32° Fahr. and 29.9 inches mercury, then $S = 0.021$, which is to be compared with the calculated specific heat, giving $S = 0.0211$. If the standard conditions are taken as 62° Fahr. and 29.9 inches mercury, the specific heat becomes 0.0198, and the constant becomes

$$K = \frac{3412}{0.0198} = 172,500, \text{ nearly.}$$

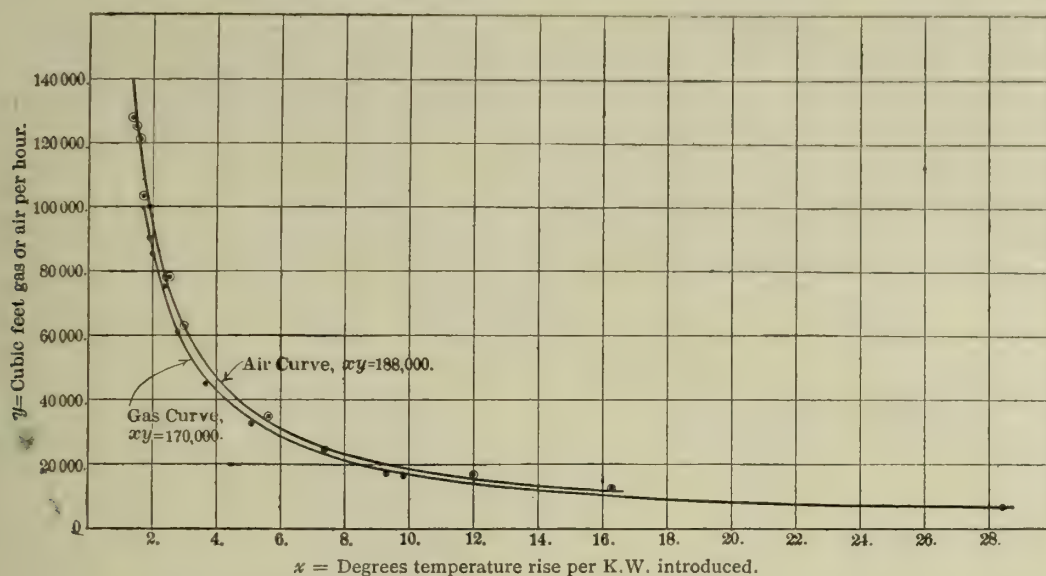


Fig. 7.—Showing Degrees Temperature Rise per kw. for Different Rates of Flow of Gas and Air.

If the temperature difference is kept constant at 5° Fahr., then

$$\frac{K}{T} = \frac{172,500}{5} = 3450 = C, \text{ or } G = 3450 E.$$

The cross-section paper on the recording wattmeter is ruled so that 3450 E is read directly, instead of the watts E. The record is thus read directly in cubic feet of gas. The regular records of chemical analysis of the gas should be referred to from time to time in order to ascertain what percentage variation takes place in specific heat. It appears, as stated previously, that the elements which vary during the operation of a gas plant are not those whose variation would produce serious variation in specific heat. The variation that does take place is apparently well within the limits of accuracy practicable, or generally considered necessary in the operation of gas plants. By taking frequent chemical analyses, the error can be reduced so as to be quite negligible.

The conditions during the air tests were as follows: Barometer, 29.75; pressure, 6.5 inches water; average temperature of air as measured in the wet meter, 60° Fahr. From the air curve obtained under these conditions (fig. 7)

$$K = 188,000, \text{ and } S = \frac{3412}{188,000} = 0.0181.$$

Reducing this to standard conditions of 32° and 29.9 inches mercury, $S = 0.0191$. This is to be compared with the accepted specific heat of air under these conditions, or 0.0192 B.Th.U. per cubic foot. This provides perhaps the best evidence that could be obtained as to the accuracy of these tests, since the specific heat of air is well known at the conditions under which the tests were made. A more commonly familiar figure for specific heat of air is obtained by multiplying 0.0192 by the number of cubic feet of air per pound under the above conditions, or 12.38. The result is 0.2377 B.Th.U. per lb. per degree; and this is to be compared with 0.0191 \times 12.38 as given by the meter, or 0.2365.

The constant K for air at 32° and 29.9 inches is therefore

$$\frac{3412}{0.0191} = 178,630$$

And reducing this to 62° instead of 32°.

$$= K \left(1 - \frac{30}{493}\right) \times 178,630 = 189,500 \text{ nearly}$$

$$\text{If } T = 5^\circ, \frac{K}{T} = 3790.$$

The error involved in calling this constant 3800 is less than $\frac{1}{2}$ of 1 per cent. and well within the limits of accuracy possible under the circumstances. The standard cubic feet of air passing the meter are therefore $G = 3800 E$; and the autographic records are arranged to read accordingly, in standard cubic feet of air per hour.

The development of a new device requires consideration of a large number of questions arising out of the conditions of service proposed. The question of specific heat has been considered in the preceding paragraphs. The degree of success which has been attained with this meter in accurately measuring specific heat is due principally to an extensive experience in this particular class of work, which has served to point out the way to make an electrical heater in which heat losses are negligibly small. The arrangement of the meter is such that the heat given off can go into the gas only; and it necessarily all goes into the gas, with the exception of a negligibly small loss which it is not worth while to minimize further. That the gas receives all the heat, excepting this negligibly small loss, is true whether or not the heating material has collected deposit of some kind. So long as the gas can get through the heater, its temperature is raised proportionately to the heat supplied.

The question of the presence of a small amount of water

vapour, as part of the gas, has so far not introduced any complications. It is conceivable that if the gas carried a large percentage of water, the operation of the meter would be interfered with; but so would the operation of a gas-engine or a burner. The meter can apparently measure accurately any gas that can be used by a gas-engine. The absence of moving parts in the meter gives it an advantage over the engine, and dust can be to a considerable extent deposited before entrance of the gas to the meter. The heating element and thermometers can be cleaned by dipping in gasoline, without damaging them.

Referring to the conditions for gas or air existing during the tests—of approximately 60° Fahr., 29.8 inches mercury, and 6 inches water pressure—the correction for water vapour introduces a change in the results of less than one-half of one per cent., and was therefore omitted. At other pressures and temperatures the correction for water vapour can be easily made by reference to the charts commonly used in gas-works. An interesting confirmation of one statement appeared during the tests, in that the most minute addition of electrical energy caused an immediate rise of temperature of the gas or air. This was repeatedly tried with great care, and always with the same result.

Meters at present under construction are being made with the axis of the cylinder vertical, with a view to greater convenience of access and in making connections. The first large meter of this type to be installed was put in the works of the Milwaukee Gaslight Company.

North of England Gas Managers' Association.—The sixty-sixth half-yearly meeting of the Association will be held in the Lecture Theatre of the Subscription Library, Sunderland, on Saturday, the 7th prox., under the presidency of Mr. T. H. Duxbury. We learn from the agenda issued by the Hon. Secretary (Mr. Herbert Lees, of Hexham) that the business will include the consideration of a report on the formation of a Special Purposes Section, to deal with such matters relating to the interests of the gas industry as shall be deemed desirable by the members, as suggested by the President in his address on the last occasion. The other matters will be the presentation of the Scrutineers' report on the election of officers, and the fixing of the place for holding the next meeting. At the close of the business, the members will visit the Ayres Quay Gas-Works, to inspect the installation of Dessau vertical retorts (the first in England) described and illustrated in the "JOURNAL" for July 6 last year; and in the afternoon they will dine together at the Palatine Hotel.

Societe Technique du Gaz.—Notices have been sent by M. Godinet, the President, to members of this Society, announcing the provisional programme of this year's meeting. It will be held in Paris from Monday, June 20, to Thursday, June 23; and the members will assemble, as usual, in the hall of the Société des Ingénieurs Civils de France. The first day's proceedings will, as is customary, be taken up with the ordinary business of the Society, the election of members, the reading of reports, and the like, including the distribution of medals and awards. The mornings of the two following days will be devoted to the technical papers to be read; while on the last day, a discussion will take place on three selected subjects—Different kinds of furnaces, heating with tar, and quenching coke. Two visits are on the programme. One is to the Gennevilliers Gas-Works, and the other to the Landy works of the Paris Gas Company. A special feature of this year's meeting will be the excursion to Brussels, on the occasion of the Exhibition there, to see its Gas Section. This visit will extend from the Thursday, June 23, to the following Saturday; and opportunity will be given to view the bench of vertical retorts at the Forest Gas-Works. Altogether, an attractive programme and pleasant gathering are assured to our French colleagues.

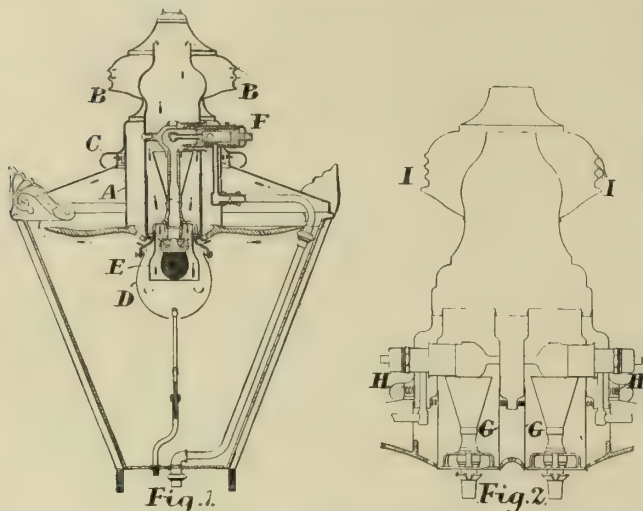
REGISTER OF PATENTS.

Gas-Lamps.

ANDERSON, D., and WORSFOLD, J., of Farringdon Road, E.C.

No. 7486; March 29, 1909.

This invention relates to gas-lamps, particularly for mill and street lighting, and has for its object to construct an incandescent gas-lamp operating on the regenerative principle—the whole of the air passing to the burner being previously heated by passing around a chamber in the form of a pipe in which the products of combustion are passing to the outside of the lamp.



Anderson and Worsfold's Gas-Lamps.

In fig. 1, which is specially suitable for street lighting, the burner is completely enclosed in a lantern with a reflector at the top. In the top of the lantern is a cylindrical piece A, and inside this is a chimney, by which the products of combustion pass up into the space at the top of the lamp, from which they pass downwards and out to the air through the apertures B. The air is admitted circumferentially underneath the flange C, and passes through apertures into the space between the top of the lantern and the reflector. From this space the air which has become heated passes round past the outer edges of the reflector, and so into the lantern. The air then divides—part of it passing inside the inner globe D, and outside the funnel-shaped globe E, and so to the outside of the mantle. The other part of the air passes upwards through apertures in the reflector, and so to the mixing-tube. The gas enters at the bottom of the lantern and passes to the annular space F, in the upper end of the mixing-tube, and thence to the burner nipple. The construction of the burner and nipple, however, forms the subject of a later patent (No. 4293 of 1910). Surrounding the mixing-tube is a deflecting cone, to throw the hot gases away from the joint in the mixing-tube, and thereby keep it comparatively cool.

The air passing from the inlet C becomes heated before it passes to the lantern, and the air passing out of the lantern and up through the holes in the reflector passes into a chamber immediately surrounding the pipe by which the burnt products are carried off. The air going into this chamber can only pass to the mixing-tube; and the air supply to the mixing-tube therefore becomes strongly heated. Further, as the gas-pipe is situated entirely within the lamp, and the final portion of the pipe is situated in the chamber from which air is taken directly to the mixing-tube, the gas and air will be at practically the same temperature when they arrive at the injector nipple; and the air passing from the lantern into the inner globe, and to the burner, also becomes considerably heated by passing down between the inner globe D and the funnel E, so that only heated air arrives at the burner.

In fig. 2, a pair of burners is used in a single lantern. In this form of the invention, the chimneys G, by which the burnt products pass away, are fitted into apertures in a plate dividing the top part of the lamp from the bottom. The only passages by which air or gases can escape is up the chimney tubes. In this form there is considerable height between the air admission holes H and the outlet to the atmosphere I.

Manufacture of Gas by Continuous Dry Distillation.

ZINDLER, A., of New York.

No. 13,796; June 11, 1909.

The patentee, in his specification, remarks: In the dry distillation of shales and all bituminous matter, by the continuous process in a closed vertical retort through which the matter passes without injection of steam and admission of air, it is usual to take the gases, by suction, from different parts of the retort, but to conduct them collectively to the cooling and purifying apparatus through a main, in which the hot gases are mixed with comparatively cold gases; and "it is well known that the latter are decomposed and deteriorated by the former."

The object of the present invention is to prevent this deterioration—preventing the mingling of the hot and cold gases by using two or more mains connected by separate conduits to hot and cold regions of the retort and taking the gases from the hot and cold regions separately through the mains to cooling and purifying appliances by which they are separately treated.

The specification (which is not illustrated) concludes: "The process of distillation is a continuous and uniform process, in so far as it takes place in a single retort-chamber, through which the material passes

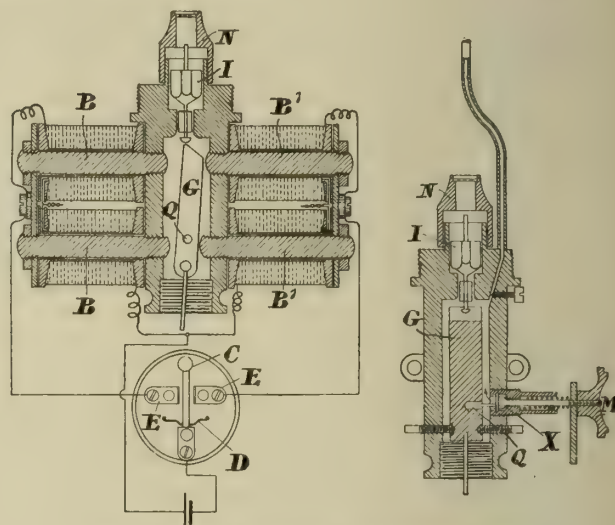
uniformly and uninterruptedly. Except as regards the normal differences of temperature, there is no difference in the treatment of the material at different parts of the retorts. I am aware that it has heretofore been proposed to take gases from different zones of a blast-furnace or open-grate retort and separately cool and purify the same—the object being to obtain by this means gases of different qualities."

Valves for Gas-Burners.

KOCKEN, E., and MEETEREN, B. T. A. W. van, of Arnhem, Holland.

No. 16,161; July 10, 1909.

This invention relates to a gas-burner valve, which, when the burner is provided with a continually burning flame, can be adapted to be operated by an electric switch.



Kocken and Van Meeteren's Gas-Burner Valves.

The burner in the first arrangement shown is provided with a drop valve I adapted to be operated by a lever G pivoted underneath the valve, and having a bevelled top edge controlling the valve, which it raises or allows to drop through being rocked on its pivot. The valve is covered by a hood N. If the lighting and extinguishing is to be effected by an electric switch, the casing of the burner is fitted with two series of electro-magnets B B', for which the lever G will serve as armature. The switch lever C is held in central position by a spring D. By turning it over to the contacts E¹, an electric current is induced in the magnets B¹, which then attract the armature G, the bevelled top edge of which raises the valve I and lights the lamp. For extinguishing it, the lever C is passed over to the contact E, which induces a current in the magnets B. The armature G, being attracted by the magnets, releases the valve I, which drops, thereby cutting off the gas.

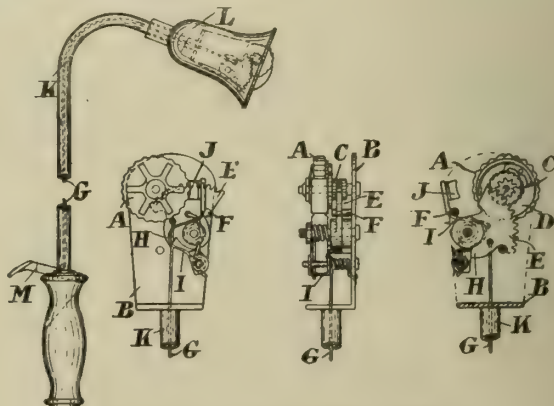
For operating the valve by hand (as in the second arrangement), a grip M is mounted with its spindle in a socket. The tightening of the spindle is effected by a conical enlargement X held against a seating in the socket by a helical spring. A pin eccentrically disposed on the enlargement of the spindle engages a slot Q arranged below the centre of the spindle in the lever, which thus can be rocked by means of the grip M.

Ignition Devices for Gas-Burners.

NAAMLÖÖZE VENNOOTSCHAP BERGEN OP ZOOMSCHE METAALWAREN-FABRIEK, and MILO, C. J., of Bergen op Zoom, Holland.

No. 16,258; July 12, 1909.

This invention relates to an ignition device of the type in which a rapidly rotating emery disc is adapted to evolve a shower of sparks by contact with a small block of metal.



A Dutch Gas-Lamp Ignition Appliance.

An emery disc A is pivotally mounted on a pin carried by a right-angled plate B. The emery disc is grooved on its circumference; and a small toothed wheel C is pivotally mounted on the same pin. This wheel is preferably integral with a ratchet wheel, the pawl of which is mounted on a flat disc D, firmly connected to the emery disc. A sector or quadrant E is pivotally mounted on a second pin provided on the

plate B. The teeth of this sector or quadrant engage with the toothed wheel C. To limit its stroke in one direction, the sector is pressed against the pin F by a helical spring; the pulling member or cable G being attached to the quadrant or sector E, by means of which the quadrant is turned, and the emery disc is rapidly rotated after the lever has been released. The stroke of the sector is limited in the other direction by a pin.

The mode of operation is as follows: When the quadrant or sector is actuated, the emery disc on the circumference of which the metal block presses will not participate in the turning movement, as the teeth of the ratchet wheel pass freely beneath the pawl. Shortly before the end of the stroke of the quadrant is reached, the projection H collides with the spring I, and presses the block J away from the emery disc. If the pulling cable is released, then the helical spring above pulls the quadrant or sector the other way, thus rapidly rotating the emery disc; while the small block of metal collides with, and hammers upon, the grooved circumference of the disc—evolving a shower of sparks, which leave the emery wheel in a tangential direction.

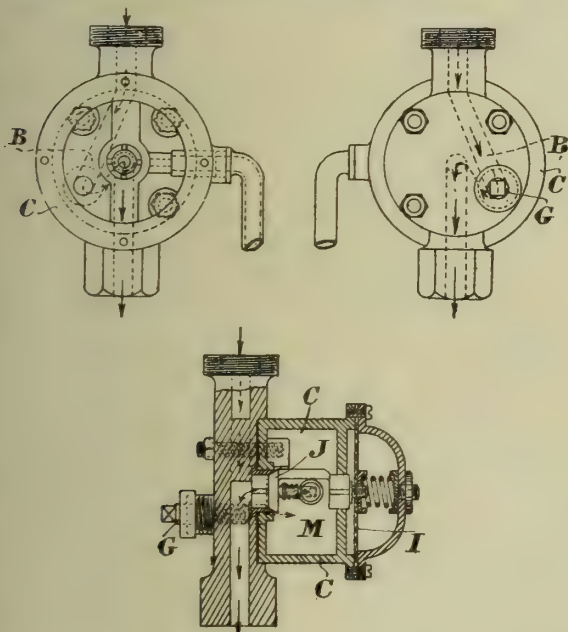
When using the device for lighting lamps, the carrying plate is arranged on a bent pipe K inside a hood or bell L. The pulling member G, which passes through this pipe, is secured to a lever M, which is resiliently mounted on the handle of the appliance.

Automatically Lighting and Extinguishing Gas-Lamps.

EHRICH AND GRAETZ, of Berlin.

No. 19,935; Aug. 31, 1909. Date claimed under International Convention, Sept. 22, 1908.

This invention relates to devices for gas-lamps which switch on the main gas supply and cut out the pilot flame when the pressure of gas in the conduits is increased. The increased pressure then maintains the main gas supply open, and on reduction of the pressure the main gas supply is closed and the pilot flame switched on.



A Graetzin Automatic Lighter.

In the form illustrated, gas entering passes through the inclined passage B, which is bent at right angles to conduct the gas into a casing C. The casing is provided with a side facing to which the casing is attached; the attachment being effected by studs held by nuts. Opposite the opening of the channel B into the casing C, and engaging with a thread in the casing, there is a stop-valve G. The gas is adapted to pass to the lamp from the chamber C and the valve J, connected by a yoke to be operated by a diaphragm I. The valve M, controlled in one direction by a spring and in the other by the motion of the valve J, is arranged to effect the switching of the pilot flame. When a damaged switch is to be removed from a lamp, it is only necessary to close down the stop pin G, and thereby prevent all flow of gas to the casing C, which may then be easily detached by slackening the nuts.

Inverted Incandescent Gas Lighting.

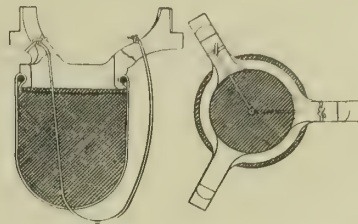
DEUTSCHE GASGLÜHLICHT AKTIENGESellschaft (AUERGESellschaft), of Berlin.

No. 24,122; Oct. 20, 1909. Date claimed under International Convention, May 15, 1909.

Mantles for inverted incandescent gas lighting are already known (the patentees remark) in which the mantle fastened to a supporting ring is surrounded by a basket; so that if the mantle is damaged from any cause, and detached from the mantle ring, it is still retained so near to the flame as to cause it to maintain at least partial incandescence. (See the patent No. 23,466 of 1904). It has also been sought to attain the same end by either carrying threads through the interior to the apex of the mantle from the mantle-ring (see patent No. 5333 of 1904), or by the application of a piece of fine wire so as to extend over the closed end, and through the sides of the mantle if preferred, and secured at its extremities to the mantle-ring. The former method has the disadvantage that the illuminating power of the mantle is interfered with by the

surrounding basket. The second method is of disadvantage in that the plurality of threads passing through the interior of the mantle interferes with the formation of the flame. The third method is disadvantageous because the wire being in close connection with the mantle will not allow of any shrinkage thereof when the mantle is burnt off; so that the mantle is either distorted in shape or broken. The two latter methods are also of disadvantage on account of the difficulty of fitting the threads or wire to mantles without injury to the latter.

To overcome these disadvantages, the patentees propose to make a mantle in which a single strand or thread of incombustible material is secured to the mantle-ring, passes through the mantle, and is then led back to the ring on the exterior.



A German Inverted Mantle Protector.

By the arrangement shown, the mantle is prevented from falling down completely if torn away from the carrying ring, but is held sufficiently within the area of the flame by the thread to produce at least partial incandescence. In its details, the invention is capable of various modifications without affecting the spirit of the same. The thread may be fastened otherwise than shown in the drawings; and instead of a thread, a wire may be used. Instead of being fastened to the lugs of the ring, the thread can be attached to the body of the ring in any convenient manner. If the thread consists of asbestos, it is preferable to make it longer at first, in order to avoid the possible destruction of the mantle by shrinkage of the thread when burnt off.

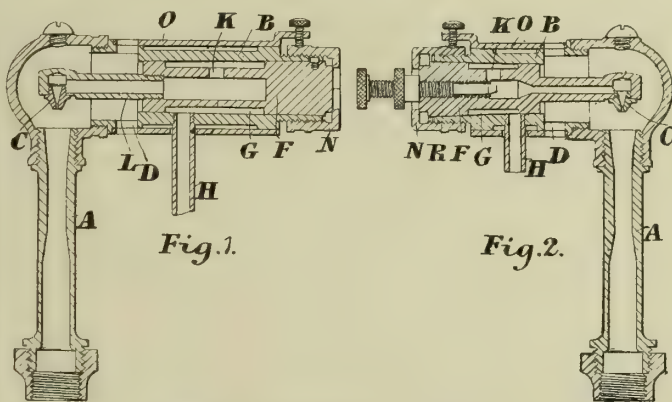
Supply of Combustible in Gas-Lamps.

ANDERSON, D., and WORSFOLD, J., of Farringdon Road, E.C.

No. 4293; April 6, 1910.

This invention has for its object to construct the gas injection means for inverted burners so that ready removal thereof without interfering with the main enclosure or burners of the lamp is facilitated.

The invention consists in a gas-burner having supply means comprising a sleeve to which the gas connection is made provided with a hollow plug slidable therein and a gas-nipple either formed in, or carried by, the hollow plug delivering gas in a transverse direction to the sleeve. It further consists in providing gas and air regulating means in connection with the gas supply means of the type indicated.



Anderson and Worsfold's Gas-Nipples.

Fig. 1 is a section of a gas-burner provided with supply means according to this invention; and fig. 2 shows a similar burner provided with means for regulating the gas.

The upper end of the mixing-tube A is enlarged and turned over at right angles, forming a bend, the end of which is arranged in the form of a sleeve B for the reception of a gas-nipple C, and is provided with air inlet ports D. The sleeve is formed to receive a hollow plug F, preferably ground in gas-tight and recessed out in the middle so as to form the annular space G, to which gas is admitted from the pipe H and from which gas passes through apertures K to the gas-nipple.

When used in the form shown, the gas-nipple is carried at the end of a small piece of tube L screwed into the hollow plug F. In other forms, however, the passage by which the gas enters the injector plug may be in the same line as the mixing-tube A; the nipple being then in the gas-plug itself, and the gas entering from the top or other convenient position.

A pin and incline on the plug F and sleeve B ensure that the nipple is pointing in the right direction and exactly central to the tube A when the plug is forced home; and a suitable cap N encloses and holds in the plug.

The air regulation is effected (as in known types of burner) by rotating a sliding collar O surrounding the plug. The end of the collar projects to the outside of the lamp casing, and is readily accessible.

In some cases—particularly where varying pressures of gas have to be dealt with—it is desirable, the patentees say, to regulate the gas supply. This may be effected by fitting a screw pin R, as in fig. 2, centrally along the plug F, by which the effective area of the passage leading to the gas-nipple may be controlled or entirely shut off.

If desired, other gas regulating devices, such as conical valves fitting into suitable seats, and operated by eccentric pins, may be used; but

in all cases the gas-plugs carry the nipples in such a way that they can be readily removed without opening the lantern, or removing any other part of the lamp except the cap N.

When the burners are used for high-pressure lighting, the tube which carries the gas-injector nipple should be taken back to the end of the hollow plug and have fine holes drilled in it, so as to prevent the pressure from too suddenly entering the gas-injector when first turned on.

APPLICATIONS FOR LETTERS PATENT.

- 8689.—JOHNSTON, A. G. K., "Regulating the supply of gases." April 11.
 8787.—LEATHER, C. A. J., and PEACH, E. M., "Gas-engines." April 12.
 8820.—FEENEY, V. I., "Gas-governors." April 12.
 8842.—JAMES, T., "Device for grilling and toasting." April 12.
 8904.—FARRINGTON, T. B., "Pipe-joints." April 13.
 8917.—RICHMOND GAS STOVE AND METER COMPANY, MEAD, A., and TAUDEVIN, E. P., "Gas-heated brazing or like tables." April 13.
 8978.—LEGGE, A. DI, "Indicating escapes of gas." April 13.
 9086.—FELD, W., "Extraction of tar and tar constituents from gases." April 14.
 9091.—LENNOX, A. B., "Gas-stoves." April 14.
 9113.—SUTTON, C. J., "Supports for burners." April 15.
 9119.—PEASE, E. L., "Obtaining power gases and sulphate of ammonia from refuse materials." April 15.
 9144.—RAYBOULD, A., "Gas-cocks." April 15.
 9159.—POTTER, W. G., "Gas-engines." April 15.
 9162.—BRAIN, H. G., "Petrol gas." April 15.
 9177.—BUEB, J., and DEUTSCHE-CONTINENTAL GAS-GES., "Manufacture of ammonium carbonate." April 15.
 9202.—MORAND, G. A. A., "Lighting and extinguishing gas-burners." April 15.
 9213.—BARLEN, R., "Upright retorts for the distillation of tar, oils, and the like." April 15.
 9249.—BYRNE, J. F., and LAWRENCE, J., "Acetylene generators." April 16.
 9293.—KOPPERS, H., "Doors of ovens for generating gas and coke." April 16.
 9297.—BURSTALL, F. W., and the BRITISH PURE FUEL, LTD., "Combination plant and process for purifying fuel and carbonaceous substances." April 16.

Improved Lighting of Blackfriars Road.

At the meeting of the Southwark Borough Council last Wednesday, the Works Committee reported that for some time past they had had under consideration the question of the lighting of Blackfriars Road, which in their opinion stands in great need of improvement. At present the road is lit by lamps fitted with a single inverted burner, the cost of which is £2 16s. per lamp. There are 54 lamps in the road, which makes the cost per annum £160 13s. The Borough Engineer (Mr. A. Harrison) suggested that the lighting of the whole of the road should be doubled by the fixing of twin inverted burners in each lamp. This would bring up the cost of each lamp to £5 5s. per annum, or a total annual expenditure of £283 10s. The cost of conversion would be 9s. per lamp, equal to £24 6s. Therefore the extra cost to the Council, exclusive of the cost of conversion, would amount to £122 17s. per annum. There is no doubt in the minds of the Committee that the lighting of the majority of the main roads in the borough is seriously in need of attention. The Committee have also had before them a list submitted by the Borough Engineer of the amounts paid by other Metropolitan Borough Councils for the lighting of their main roads, and they find that Southwark comes very low. The Committee are of opinion that Blackfriars Road should be taken in hand at once. They have also instructed the Borough Engineer to report to a future meeting with regard to the lighting of the other main roads in the borough. The Committee recommended: (a) That the 54 lamps in Blackfriars Road be fitted with twin inverted gas-burners, as suggested by the Borough Engineer; and (b) that the estimate submitted by the Finance Committee, amounting to £147 3s., being £24 6s. the cost of conversion and £122 17s., the extra cost of lighting per annum, be approved. This was agreed to.

Sales of Shares.—At the Mart, Tokenhouse Yard, last Tuesday, Messrs. A. & W. Richards sold, by order of the Directors, 1000 new ordinary £10 shares in the Southend Water Company, ranking for a maximum dividend of 5 per cent.; the last dividend on similar shares having been at the rate of $4\frac{1}{2}$ per cent. They were all placed at par. At a recent sale at Torquay, some £10 shares (10 per cent.) in the Torquay Gas Company realized from £22 10s. to £22 15s. each, and some 7 per cent. shares of similar nominal value fetched £15 17s. 6d. to £16 apiece. Sixty £10 ordinary shares in the Exeter Gas Company were sold by auction last week at the price of from £16 7s. 6d. to £16 10s. each.

Suffocation by Gas.—Mr. Chester Ives, a London journalist, has just died under tragic circumstances at his residence, Thames Avenue, Molesey. Early on Friday morning a neighbour detected a strong smell of gas coming from the house. She fetched the police, who, failing to get an answer, forcibly entered the premises. Proceeding upstairs, they found the bed-room door locked, and the door had to be burst open. Mr. Ives was discovered lying on his bed and breathing heavily. In the room there was a very strong smell of gas; the gas-bracket being turned full on. After opening the doors and windows, the police endeavoured to restore respiration, and a doctor was summoned. Mr. Ives, however, died before medical assistance arrived. It was stated by the doctor that death was due to gas poisoning. The deceased gentleman had locked the door and taken the key to bed with him. A letter left by him is expected to throw light on the tragedy, as in it he explained that he had been troubled by failure in business. He had lately suffered from depression. He was a native of Buffalo, and was about 58 years of age.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Japan-British Exhibition.

SIR,—Your readers will, we think, be interested to hear some particulars of what is being done by the Committee that was appointed some weeks ago (at a meeting of representatives of Metropolitan and South of England Companies) to organize an exhibit at the Japan-British Exhibition.

Space amounting to nearly 1500 square feet has been secured in a good position in the "Decorative Arts Section," which will immediately adjoin the "Court of Honour."

A stand is in process of erection on this space, which will comprise on one side of the gangway a large oak-panelled salon, a kitchen, bedroom, and bathroom; and on the other side a show-room containing a selection of gas fittings, fires, and stoves.

The stands have been designed by an architect, and will, it is hoped, constitute a thoroughly attractive exhibit.

The cost will necessarily be considerable; and the Committee would be glad to have at their disposal at least £3000. Towards this sum, £2285 has been guaranteed by twenty-three gas undertakings in London and the South of England.

It is felt that there are very many other undertakings who would be willing to assist in making a thorough success of an exhibit which cannot fail greatly to stimulate interest in the domestic applications of gas among the many thousands who will visit the exhibition from all parts of the country.

The exhibition, as a whole, promises to be a great success—thanks largely to the strenuous efforts of the Japanese Government and people. The Committee, therefore, feel justified in appealing to their colleagues up and down the country to help make the gas exhibit worthy of the industry, by bringing the matter at the earliest possible moment to the notice of their Boards or Committees, and securing substantial additions to the list of guaranteed subscriptions.

For the GAS COMPANIES' JOINT EXHIBIT COMMITTEE,

D. MILNE WATSON, *Chairman*,

F. W. GOODENOUGH, *Hon. Secretary and Treasurer*.

Offices of the Gaslight and Coke Company,

Horseferry Road, Westminster, S.W., April 22, 1910.

The Eaton Group of Companies.

SIR,—My attention has been drawn to your reference to the registration of the Gas and Water Works Finance and Contract Company, Limited.

It is true that some time ago I became a signatory to two of the companies known as of the Eaton group, and that was brought about through my firm being engaged in the registration.

I particularly wish to point out on this occasion, however, that the Company under notice is not in any way connected with the group referred to; and as a matter of fact I was careful on this occasion to inquire into that before becoming a signatory.

I should esteem it a favour if you will let your readers know that the Company in question has nothing whatever to do with the Eaton group, as from your remarks it might be taken otherwise.

89, De Laune Street, S.E., April 19, 1910.

HARRY A. EDGAR.

Maintenance of Stopcock Box Covers on Private Services.—A correspondent would be glad of a reply to the following question: Are water companies liable to maintain the box covers of stopcocks on private services when they are fixed on the pavement or in the roadway?

New Joint-Stock Companies.—The gas engineering firm of W. C. Holmes and Co., of Huddersfield, has just been registered as a limited liability Company with a capital of £40,000, in £1 shares (30,000 preference). The Theale Gaslight and Coke Company, Limited, has been registered with a capital of £3000, in £1 shares, to acquire the undertaking, business, and goodwill of the Theale Gas and Coke Company, Limited (in liquidation), and to enter into an agreement with W. Phillips; also to manufacture, sell, and supply light in Theale and the surrounding districts in Berkshire, and to carry on the business of a gas company in all its branches.

Manchester Corporation Water Undertaking.—The accounts for the past year show a net surplus on revenue account of £1440, though in April last year there was an adverse balance of £21,244 to start with. The consumption of water during the year exceeded, on an average, 41 million gallons per day. At the Thirlmere works the supply averaged more than 18 million gallons per day. The Committee estimate that the income from the department for the present year will be £412,500, which will give them a surplus of £1972. The estimated expenditure on capital account is £485,000, compared with £241,921 for the past year. It is contemplated to spend during the twelve months £290,000 on the third line of pipes from Thirlmere, and £115,000 on the Heaton Park reservoir.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Little Hulton Urban District Council Bill, Mallow Urban District Gas Bill, Pontypridd Water Bill.
Bill read a second time and committed: East Grinstead Gas and Water Bill.

Bills read the third time and passed: Cambridge University and Town Water Bill, Garnant Gas Bill, Gas Companies Standard Burner (No. 1) Bill, Gas Companies Standard Burner (No. 2) Bill, Gas Companies Standard Burner (No. 3) Bill, Matlock Bath and Scarthin Nick Urban District Council Bill, South Lincolnshire Water Bill, Thorne and District Water Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:

Bills brought from the Lords, read the first time, and referred to the Examiners: Cambridge University and Town Water Bill, Garnant Gas Bill, Gas Companies Standard Burner (No. 1) Bill, Gas Companies Standard Burner (No. 2) Bill, Gas Companies Standard Burner (No. 3) Bill, Matlock Bath and Scarthin Nick Urban District Council Bill, South Lincolnshire Water Bill, Thorne and District Water Bill.

Bills read a second time and committed: Gowerton Gas Bill [Lords], Staffordshire Potteries Water Bill.

Bills reported: Egremont Urban District Council (Gas) Bill, Exmouth Gas Bill, Exmouth Urban District Water Bill, Farnham Gas and Electricity Bill [Lords], Mountain Ash Water Bill, Slough Water Bill, South Hants Water Bill, Wishaw Burgh Extension Bill [preamble not proved].

Bills read the third time and passed: Little Hulton Urban District Council Bill, Mallow Urban District Gas Bill, Wicklow Gas Bill [Lords].

The Water Provisional Order Bill, to confirm the Sutton District Water Order, has been presented, read the first time, and referred to the Examiners.

The Nottinghamshire County Council have withdrawn their petition against the Shirebrook and District Gas Bill.

BRADFORD CORPORATION BILL.

THE GAS AGREEMENT.

Local Legislation Committee.—Thursday, April 21.

Before Mr. C. N. NICHOLSON, Chairman, Mr. HARRISON-BROADLEY, Mr. HELME, Mr. W. E. HORNE, Viscount LEWISHAM, and Mr. MIDDLEBROOK.)

Part 8 of the Bill promoted by the Bradford Corporation related to gas, and dealt with the confirmation of an agreement dated Dec. 19, 1907, between Henry Ripley, Hugh Ripley, and Edward Guy Ripley as Trustees under the will of the late Sir H. W. Ripley and the Corporation. On this clause, the Local Government Board made the following observations: "The Committee will no doubt require to be satisfied that the price agreed to be paid for the undertaking represents its reasonable value to the Corporation in its present condition. It is presumed that the Corporation propose to use the gas-works to which the clause relates for the supply of gas; and it is suggested that the Bill should provide that the gas-works should be held as part of the gas undertaking of the Corporation, and subject to the provisions of the local Acts governing that undertaking."

Mr. BOYCE (representing the Local Government Board) said the second part of their criticism was met; the only point was as regarded the value of the property.

Mr. JEEVES (for the promoters) said the only thing the Local Government Board desired the Committee to do was to satisfy them as to the value of the undertaking. This they would have been prepared to do, whether they had so desired or not.

Mr. BOYCE said that although the agreement might have been a perfectly proper amount in 1907, it did not necessarily follow that it was so at this time.

Mr. JEEVES admitted this was so; but what it meant was that instead of the £15,000 it perhaps ought to be £20,000. The position was this, that the Corporation since 1871 had been the owners of the gas undertaking for the whole city with slight exceptions. There were now three small areas of supply that overlapped the existing city boundaries—the Drighlington and Gildersome Gaslight Company, the Pudsey Gas Company, and the private gas-works owned by the Trustees under the will of Sir H. W. Ripley. The policy of the Corporation, of course, always had been to be suppliers of gas for the whole area. This had afforded the opportunity of closing up one area supplied by other people. It was quite true that the greater part, if not the whole, of the gas manufactured at these works was supplied to people on the estate. But it was gas supplied within the City affording a very considerable supply and a source of income if the Corporation absorbed it into their own undertaking. An opportunity arose a year or two ago for the purchase of this undertaking. They availed themselves of it; and they had a Bill last year which was thrown out by the ratepayers. So it happened that it had had to wait two years for confirmation. This property consisted of the works and eight cottages; and the land itself was an area of 4838 square yards. The area supplied from the works was 30 acres. Another point was that it was very undesirable to have these little gas-works.

Mr. Charles Wood, the Gas Engineer to the Bradford Corporation, said the area that the works had been supplying was about 30 acres, and there were 49 Corporation public lamps supplied from it. The 30 acres were entirely within the area of supply of the Corporation. By reason of Sir William Ripley owning the whole, he was enabled to continue the supply himself.

Mr. JEEVES: In your view, is the price of £15,000 a proper one for the Corporation to pay for the works?

Witness: It is very reasonable. I may say that it is the lowest price for the amount of gas sold of which I am aware.

Will the revenue you get from the area of this undertaking enable you to pay the expenses in connection with the purchase?—Yes.

In addition to this, will you be able to supply the residents in that particular 30 acres with gas at a more reasonable price than they are at present obtaining it at?—They are getting it now at the same rate as charged by the Corporation. We shall be able to make gas more cheaply on our large works than is possible in such a small works as Messrs. Ripley's.

Witness, continuing, said this meant that the price of gas would be the same; but the margin of profit obviously would be greater. They were to pay £15,000 for the goodwill and for the land, which would be valuable when the works were dismantled. The actual area was about an acre; and being within less than half-a-mile of the centre of the City, it should be valuable land. Some of the plant had been there for nearly 50 years. This portion, of course, was worn out; and they would wish just to continue the works for a short time to wear out the plant. They had large gas-mains practically surrounding the works; so that there would be very little extra cost to them to supply Messrs. Ripley's district from their own larger works.

Replying to Mr. HELME, witness said the quantity of gas supplied from these works was about 32 million cubic feet per annum.

Answering the CHAIRMAN, witness said the approximate value of this particular acre of land would depend upon who wanted it; but he should think it would fetch £3000 or £4000.

The CHAIRMAN: You would be paying £11,000 for the goodwill practically and for a rather worn-out plant?

Witness: Yes; but the mains and meters will be worth £3000 or £4000.

Mr. JEEVES: It is suggested to me that, roughly, this land would be worth about £1 a yard, judging by other property—that would be practically £5000?

Replying to the CHAIRMAN, who said he was only trying to arrive at a conclusion as to whether £15,000 was a reasonable sum for the Corporation to pay, witness said that, calculated on the price paid per million cubic feet of gas sold, this particular purchase would be the lowest which had taken place for, at any rate, the past 20 years. It was very much lower than they had paid for statutory gas undertakings surrounding Bradford. It was less than half the price that was provisionally agreed some years ago between the Corporation and Messrs. Ripley.

The CHAIRMAN intimated that the promoters might take the first sub-section of the clause; and it was passed. Respecting sub-section 2, he said he noticed that there was a proviso "that the Corporation shall not, unless authorized by Parliament so to do, manufacture gas upon any lands vested in them under or in pursuance of the said agreement." Mr. Wood had told them that they proposed to manufacture for a certain period.

Mr. JEEVES pointed out that they could not, under the Standing Orders, take any statutory authority for this purpose. They were bound to put this proviso in.

Mr. Wood having been recalled, sub-section 2 was passed; and part 8 was added to the Bill.

UNOPPOSED PRIVATE BILLS.

(Before Mr. ALFRED EMMOTT, Chairman, Mr. WHITLEY, Deputy-Chairman, Mr. J. W. HILLS, Mr. MOON, and Mr. VIVIAN.)

The Unopposed Bills Committee, constituted as above, had before them on Thursday last the following Bills.

Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill.

Mr. BERRY, on behalf of the Parliamentary Agent, stated that the Bill was promoted by the three statutory Companies of Bishop's Stortford, Harlow, and Epping, and by the Ongar Gas Company—the latter being a limited Company, with no statutory powers. The proposal was to enable the three statutory Companies to amalgamate, take over the Ongar Company, and absorb two other limited Companies which were within the area. The two Companies were very small—having capitals of £2400 and £1400; and they were technically competing Companies. Under the amalgamation, the area of supply would extend through the boundaries of ten local authorities, all of whom had conferred with the promoters and were satisfied with the proposals in the Bill. Certain objections certainly had been raised by them; but these had been met by amendments. The object was to effect economies by enabling the amalgamated Companies to buy material on a larger scale and concentrate their works; and by the linking-up of the various districts they would get rid of the difficulty with regard to the non-statutory Companies. With regard to capital, the basis of the Bill was all 5 per cent. In the case of Bishop's Stortford, where there was both 7 per cent. and 5 per cent. stock, the holders of the 7 per cent. stock got £140 of new stock for every £100 of old stock, and the holders of the 5 per cent. stock would have in exchange the equivalent in 5 per cent. new stock. The standard price was 4s. per 1000 cubic feet; the actual price charged being 3s. 9d. The dividend earned was 7½ per cent.; and they paid 7 per cent. In Epping, the price was 4s. 3d.; but they were selling at 3s. 9d.; in Harlow, it was 3s. 11d., and they were selling at 3s. 8d. So that under the proposal in the Bill to make a charge of 4s., in Epping there would be a loss of 3d., and in Harlow a gain of 1d. In Stortford, it remained the same. The Harlow Company were paying a dividend of 5 per cent., and the Epping Company of 5½ per cent. There was an inner and an outer area; and the Bill provided that the price in the outer area should not be 1s. in excess of that in the

inner area. In the inner area, there was a close population; in the outer area, it was open country. But the price in the outer area might be reduced so that they should get gas as nearly as possible at the same rate as that in the inner area. The population in Bishop's Stortford was 12,000; in Harlow, 6000; in Epping, 6000; and in Ongar, 2200. At present, the Ongar Company were charging 3s. 6d., and paying a dividend of 10 per cent. There were two stocks in the Bill; and they had reduced the 5s. sliding-scale to 3s. 6d., so that the "A" stock got a 3s. 6d. sliding-scale, and the "B" stock a 2s. 6d. sliding-scale. Of the additional share and loan capital, some was required for gas and some for electricity; the total capital to be authorized under the Bill being £240,000. They were also asking for power to supply electricity in the urban district of Bishop's Stortford and a few outlying villages. In 1905, the Council obtained a Provisional Order to enable them to supply electricity. But on going more thoroughly into the matter, they were doubtful as to whether it would be a financial success; and eventually they sold their Order to a private Company for £250. The Company were, however, unable to make any progress in the matter. The Gas Company, having already the land and soon, would be able to reduce the working expenses when run in connection with the gas undertaking, and using suction gas they would be able to work at a price at which no private company could sell. At first, the Council were opposed to the idea; but in consequence of a clause which was inserted in the Bill, they were now satisfied. With regard to the reserve fund, the only effect was to enable them to equalize dividends; and this tended to keep up the value of the stock when they came to issue additional capital, and of which the consumer got the advantage.

Mr. E. L. Burton, the Chairman of the Bishop's Stortford Gas Company, said they (the three Companies) were entitled to further capital under their existing Acts to the extent of £83,250, including loan capital. In addition to this, upon the further development of the district they were asking for powers to raise £46,000 share capital and £28,000 loan capital. They further asked for £30,000 share capital and £10,000 loan capital for the purposes of the electricity undertaking. The additional capital should last—assuming that the rate of increase was the same as in the past three years—something like 12 or 15 years. The consumption of gas in 1909 was 96 million cubic feet; and in 1903 it was 61,867,000 feet. Accordingly, the sale of gas 15 years hence would be 317 millions. Taking the increase of sale at £800 per million, and putting that to the existing capital, and including £40,000 for the electrical undertaking, they would require £340,000 altogether. They were asking for £320,000.

Mr. HILLS: Do you think you could make the electricity undertaking pay in spite of the fact that the Local Authority and private Company have fought shy of it?

Witness: Yes. We have the lands, buildings, and so forth, which can be adopted.

Replying to further questions, witness said they were not looking forward to an immense increase in sales of gas in the near future. There were companies in the suburbs of London which had much higher prices; in fact, he knew of no other company in the county of Herts, with one exception, who had a lower standard price than 4s.

Mr. Snell gave evidence to the effect that gas was to be used for driving electrical plant. He thought the electrical undertaking should be self-supporting in its third year.

Mr. E. H. Stevenson, in reply to the CHAIRMAN, said it would be unwise to alter the standard price. He thought 4s. was fair all round. If the Committee were to alter the standard price, it would depreciate the gas stocks and would damage the consumer much more than the shareholder, because at present the consumer got the capital for new works at the very cheapest rate in the market. It had never been done, with one exception; and that was where a company had a high standard price of 5s., and they never thought of paying more than the standard dividend and put everything to the reduction of the price of gas. The company admitted that they had never used the sliding-scale, and never intended to do so; and the Committee reduced the standard price to 4s. 6d.

The CHAIRMAN: Supposing that these Companies with which we are now dealing were old companies with a 5s. standard rate, would not your arguments apply equally to that?

Witness: If they had never used it, I should say it would not do any harm to reduce it.

Continuing, witness said where a Company came to Parliament and asked for something which would increase the benefit which Parliament had given them, then Parliament had said: "If we give this, it must go to the consumer." With regard to electricity, the position taken up by the promoters was that some day or other—it might be in 10 years or 20 years—electricity would be in great demand; and if they had the power, they would be able to supply it at a fairly reasonable price. His own opinion was that it was better for the gas consumer that the Company should have the electrical powers than that they should be in the hands of an outside company.

Mr. Cooper, a member of the Bishop's Stortford Council, said the previous Council opposed the idea of the electricity undertaking being carried on by the Council; and of the new Council—which was quite recently appointed, and had not yet met—he knew that 9 out of 15 members were in favour of the Gas Company having charge of the matter.

Mr. BERRY pointed out that the promoters could not use their electrical powers if the Council chose to go on with their Order; and the Company would not go on till the Order was revoked by the Board of Trade.

Eventually the Committee decided to pass the preamble of the Bill with regard to gas; but they were not satisfied on the question of electricity. The decision on this part of the Bill was therefore postponed until the new Council of Bishop's Stortford have met, with the object of seeing if the Council desire to put in a plea by a late petition.

Farnham Gas Bill.

The Agent with regard to this Bill explained that its object was to incorporate a limited Company and give power to supply electricity. Under a Provisional Order of 1899, gas of 15-candle power was sup-

plied at a maximum price of 3s. 9d. Now they were asking to extend the limits of supply, to use roads for electricity purposes, substitute a standard price of 3s. 6d. for the maximum price of 3s. 9d., and reduce the illuminating power to 14 candles. The present capital authorized was £49,200, of which £29,200 had been raised—there being a balance of £20,000 unissued. The borrowing powers were £12,300, of which £6800 had been raised. The total authorized share and loan capital amounted to £61,500, of which £36,000 had been issued. They were asking in the Bill for a capital of £60,000 and £20,000 borrowing powers. The estimated cost of the electricity undertaking was £18,500. A clause had been inserted in the Bill, at the instance of the Local Authority, which provided that if they failed to exercise their electrical powers, the Board of Trade might revoke the Order; and in that event, their capital powers were to be reduced by £18,500. In 1902, the price charged for gas was 3s. 9d.; and the Company were paying 5 per cent. From 1903 to 1905, the price charged was 3s. 6d., and the percentage the same; and for the past three years the charge had been 3s. 4d., and they paid a dividend of 7 per cent. as authorized in their Provisional Order.

Replying to Mr. MOON, the Agent said there were gas companies who had already been authorized to supply electricity. The Ascot Company were at the present time supplying.

Mr. A. H. Dykes, the Consulting Engineer to the Ascot Gas and Electricity Company, said that practically a supply of electricity was not given until the middle of 1907. In the first completed year's working, the revenue was £1330, and from the gas undertaking in that year £9240. The following year, it was found that the supply of electricity did not stop the sale of gas. The total cost of the production of gas in 1909 was £7130, as against £7293 in the previous year. Although the consumption of gas had increased, the cost of production had decreased. In 1907, the management charges in regard to gas amounted to £903, and last year to £735. They found that the gas expenses were helped when shared with the electricity undertaking. In their Act, the charge was 8d. per unit; but they were supplying at 5d. and 6d.

Mr. MOON: What dividend does it pay?

Witness: On the electricity undertaking alone, there is a return of 3.16 per cent.

The CHAIRMAN: Then you actually made a profit on the gas production in running the electricity?—That is so.

How soon do you calculate that the scheme proposed by the Bill will be self-supporting?—That, of course, is a matter which is in the hands of the Directors of the Company.

In what way, for better or worse, does the Farnham district differ, from the point of view of the electricity undertaking, from that of Ascot?—I think the circumstances are very similar, with the exception that Farnham is more closely built, and the demand is likely to be more nearly round the works.

Mr. Edgar Kempson, a member of the Farnham Town Council, said the Council had passed a resolution assenting to the electricity proposals in the Bill.

Mr. BERRY having pointed out that everything in the reports of the Local Government Board and Board of Trade had been complied with, the Bill was ordered to be reported to the House.

Egremont Urban District Council Bill.

Mr. CROWTHER, the Agent for the Bill, remarked that the proposal was to acquire, by agreement, the undertaking of the Egremont Gas-light and Coke Company. This was a non-statutory Company; and the price to be paid for the undertaking was £6500. The reason why the Council desired to obtain possession was that the Company could not properly or adequately supply the present number of consumers. The Cleator Moor Urban District Council supplied a small portion of Egremont with gas; and there was also an agreement with regard to them that the Council should take over the pipes in their district at a price of £579 10s. 7d. It was also proposed by the Council to acquire additional lands and construct new works, because the present works were not capable of supplying the necessary gas, and there was an increasing population. The district to be supplied was that of the Egremont Urban District Council and a small area adjoining. The price to be charged was 5s. 6d. per 1000 cubic feet; and the quality of the gas was 14-candle power.

Mr. W. Newbigging said the Company had, especially in the matter of pressure, failed to supply the demand for gas. Although the works had been well maintained, they were now old; and it was proposed to build a new retort-house. The production of gas per ton of coal was at present unsatisfactory.

Mr. MOON: Why is it possible for the Council to extend the mains while the Company cannot?

Witness: I think it rather shows want of foresight on their part.

Mr. CROWTHER: I understand they are not willing to do it.

Continuing, witness agreed that 5s. 6d. was an unusually high price; but the price of coal was high. The Council's object was to get the price down.

Mr. VIVIAN: What will be the effect of the purchase price on the shareholder?

Witness: He will get his money back again and no more. I do not wish to say anything harsh about the Company; but they certainly have not made as much out of the undertaking as they might have done.

Mr. MOON: If we gave a maximum of 5s., you would not come on the rates, would you?

Witness: I think it would be running it rather fine.

Mr. CROWTHER pointed out that the periods for repayment were low. With regard to land, the period was 40 years, instead of the usual 60 years, and for the repayment of purchase money and the extension of works 30 years—the usual period being 40 years.

The Bill was ordered to be reported.

Exmouth Gas Bill.

This is a Bill to obtain additional capital powers and to extend the limits of supply.

Mr. J. T. Foster, the Engineer of the Company, gave evidence, and said they were not asking to alter the standard price of 5s. which was

en under their Act of 1882. The average price charged in the last years was 3s. 8d., and the price actually charged now was 3s. 5d. Mr. HOOKER, the Agent for the Bill, said there was objection to any variation of the standard price, because it was upon the standard price that the capital had been subscribed. They had never paid more than the standard dividend, although they might have done so. Mr. HILLS said that stock had surely changed hands since 1882 in the expectation that higher dividends would be paid. Mr. MOON drew attention to clause 41 of the Bill, which provides as follows.

Notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or any other Act, a person shall not be entitled to demand from the Company a supply or the continuance of a supply of gas for premises having a separate supply—that is to say, a supply from an installation other than that of the Company—unless he shall have previously agreed to pay the Company a minimum annual sum as will give to them a reasonable return on the capital expenditure and standing charges incurred by them to meet the possible maximum demand for the premises, and the minimum annual sum to be so paid shall be determined, in default of agreement, by arbitration in the manner provided by the Arbitration Act, 1889.

Mr. HOOKER: There was an exact precedent for this in the case of *Mountain Ash*. It was a clause which gas companies had been asking for, and last session it was given in two cases in favour of two local authorities. In reply to the CHAIRMAN, he said there was no case in the area of people having their own supply of gas; but there might be in the next 10 or 12 years. The Bill was ordered to be reported.

THE PROTECTION OF WATER SUPPLIES.

The Joint Committee of the House of Lords and the House of Commons appointed to consider the Water Supplies Protection Bill commenced their sittings last Wednesday. Lord MACDONNELL presided.

Mr. J. LITHBY, the Legal Adviser to the Local Government Board, in the course of a long statement, explained the law with regard to water supplies. The law as to the use of underground water, he said, had been altered for a great number of years. Practically it was the same as the law of Ancient Rome, as laid down by Justinian, according to which if a man dug a well in his own field and thereby drained his neighbours, he might do so unless he acted maliciously. The only part of the Roman law on this point which was not British law to-day was that which related to the doing of the action maliciously; for it had been held that no use of property which would be legal if done for a proper motive could be illegal if done for a motive which was improper or malicious. By the English law, power to take underground water was absolute. The same law applied to defined streams whether above or below the surface. On the authority of a number of cited cases, it appeared that water could not lawfully be extracted from any stream for sale or for the supply of the inhabitants of a neighbouring area by any riparian owner without the aid of a Statute. So far as he knew, no report had ever been prepared which dealt with the water supply of England as a whole—that was to say, with the water supply of the country from underground sources as a whole. But in many parts of England wells had been sunk, and geologists had been keen to inquire as to the strata disclosed by the sinking of the wells. Therefore, information was available in a general way as to the conditions in various places. Also in the course of the geological survey a great deal of information had been collected in regard to the water-bearing strata. The jurisdiction of the Local Government Board in connection with Water Provisional Orders went a long way—indeed, it went far enough to protect those who were likely to be injured by the abstraction of water. Local inquiries were held before Provisional Orders were granted. The Local Government Board and its system of Provisional Orders afforded adequate protection to tracts which were not covered by being mentioned in an Act of Parliament. The provisions of the Bill before the Committee would require very careful consideration. Restrictive provisions in Local Acts had been inserted by agreement or after full inquiry before a Parliamentary Committee. This was also the case with regard to restrictions contained in Provisional Orders; but the present Bill proposed to alter the general law as well as the law contained in Local Acts. In many cases it might prevent the abstraction of water from areas where it was useful; but it would certainly prevent local authorities and companies from carrying out statutory duties which devolved on them. If clause 3 of the Bill became law, no corporation, urban district council, or rural district council would be able to sink a well or construct other works for taking or intercepting water without applying to Parliament. This would give rise to considerable difficulty. In cases in which the power could be obtained by a Provisional Order issued by the Local Government Board or Board of Trade, the expense would not perhaps be very great; but in cases in which a Local Act had to be obtained, the cost would be considerable. In no instance in which a supply of water is given under the provisions of the Public Health Act could the supply be extended in the manner referred to without incurring this considerable expense. At present a rural district council could not apply to Parliament. Clause 3 was much too restrictive and altogether unnecessary in cases in which local inquiries had been held. It should therefore be inserted in Provisional Orders; nor was it necessary in cases in which Parliament had had an opportunity of seeing all the details of a Bill. It was the practice of the Local Government Board to apply in Provisional Orders the powers and the restrictive provisions of the Public Health Act, and thus to extend sufficient protection to all parties. If the Local Government Board were able to grant a local authority power to acquire water rights compulsorily, the powers of the Board would be ample. The question before the Committee is exceedingly difficult. Undoubtedly there had been a great amount of litigation over water and water undertakings; and it was desirable that further legislation should be undertaken with a view to improving the situation. While, however, the present Bill was a movement in the right direction, it did not cover the ground as it ought to do; and the Bill could cover the ground properly until they had such information as one of the Royal Commissions had suggested respecting the

water-bearing strata of the country. Litigation would increase, rather than diminish, as a result of the Bill. It was not necessary that Parliament should deal, by means of Private Bills, with questions such as those to which the Bill related. A Government Department could deal with them satisfactorily under powers conferred on it by Act of Parliament. Local authorities were, he thought, sufficiently protected now by the Local Government Board. The difficulty with regard to rural district councils could possibly be met by excluding them from the purview of the Bill. He was not aware that local authorities were so dissatisfied with the present position that they desired the Bill. The powers of the Local Government Board were satisfactory, except as regarded the larger water undertakings; and in respect of these, applications were made to Parliament. Clause 4 of the Bill, which provided for giving compensation for injury caused by the abstraction of water, would probably cause a great deal of litigation. The onus of proof was placed on the local authority. Therefore, if a man's pond, situated within 2½ miles of a pumping-station, for some reason or other dried up, it would devolve on the water authority to show that the drying-up was not caused by anything done at their water-works. It might, and in some cases it would, be extremely difficult for the water company to prove the negative; and if they failed to do so, they would be required by the clause to pay compensation. The compensation, failing agreement, was to be settled by arbitration. Thus the expense which local authorities might incur would be so considerable as effectively to prevent them developing or extending their works for the supply of water. In a dry season, the effect of the clause might be disastrous. Under clause 5, the undertakers were to be liable not only to give a bulk supply to the county district from which they drew their water, but also to every county district through which their line of pipes might pass. In some cases they would possibly have to give more water to areas through which their pipes passed than they wanted for their own district; and in any case the obligation to supply to every county district in which the pipes were laid would impose a very heavy burden on them. A proposal had long been under consideration for conveying water to London from Wales. While there was something to be said in favour of the Metropolitan water authority giving water to the Welsh districts from which the supply was to be drawn, and while something might be said in favour of giving a supply of water to the county districts bordering on these areas, it was difficult to see why the Metropolitan authority should supply water to county districts which would never think of going to Wales for their supply, merely because the Metropolitan authority's pipes happened to pass through those county districts. Assuming, for instance, that the Wales to London pipes passed through Oxfordshire, Gloucestershire, and Buckinghamshire into Middlesex, it was difficult to see why the Metropolitan authority should supply the county districts of these counties with water which the London ratepayers had paid to bring from Wales. There was a clause in the Metropolitan Water Act of 1902 which authorized the supplying of water by the Metropolitan Water Board in certain areas in Herts through which the pipes of the Board passed. This was to some extent a precedent for clause 5 of the present Bill. There were numerous other cases in which, by agreement, water companies supplied not only in the area from which they drew their supply, but to various authorities on the route of their pipes. It being suggested that a claim to a supply under clause 5 could only be sustained if the Local Government Board approved of it, witness pointed out that if it were laid down as a general principle that a certain thing should be done, and that then power were given to the Local Government Board to adjudicate in exceptional cases, no doubt the general position would be to a certain extent relieved. But the Local Government Board, in approaching (say) an application from Oxfordshire, would have to consider that, unless some special reason were shown, the general principle of the Act would govern.

LEGAL INTELLIGENCE.

CONNECTION OF GAS-MAINS TO PUBLIC LAMPS.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Wednesday, April 20.

(Before Mr. Justice PHILLIMORE.)

Liverpool United Gaslight Company v. Corporation of Liverpool.

This was a case stated by Mr. Frederick Arthur Greer, the Umpire in an arbitration between the parties, for the opinion of the Court, under the following circumstances. The Company claimed to be entitled to £5063 13s. for work done and material supplied, at the request of the Liverpool Corporation, in making, between their mains and lamps erected by the Corporation in certain passages in the city, the connections required for the purpose of supplying gas to the lamps. The Umpire found that (1) it was not proved that at the time when the orders were given, and the work was done, the unadopted passages had not become public highways; and (2) that at all such times the public had in fact free access to the passages, though it was not proved that they had acquired any legal right to use such of them as were unadopted without the consent of the owner of the soil. He also held that the Company were under statutory duty to do the work at their own expense in all cases where the lamps were public lamps; that the lamps in the adopted passages were public lamps; and that the Corporation, by requesting the Company to do the work in the adopted and unadopted passages, impliedly promised to pay the Company the fair and reasonable price if it should turn out that the Company were not under statutory duty to do the same at their own expense. He awarded £5063 13s. as the amount of the work done and for labour; and the question for the Court was whether he was right.

Mr. MACMORRAN, K.C., and Mr. RYDE appeared for the Company; and the Corporation were represented by Mr. DANCKWERTS, K.C., Mr. F. E. SMITH, K.C., and Mr. COURTHOPE MUNROE.

Mr. MACMORRAN said the question raised by this case was whether

a gas company who were under statutory obligation to supply gas to public lamps must do so at their own cost in the way of supplying the pipes necessary for the conveyance of the gas to the lamps; and there might also be another question as to whether certain of the lamps dealt with were public lamps. Having read the special case, and called attention to the provisions of various Acts of Parliament, Counsel submitted that it was the duty of the Corporation to provide the lamps and of the Company to supply the gas.

Mr. DANCKWERTS argued that the lamps in question were "public," as they had been put up by the Local Authority at the expense of the ratepayers for the convenience and use of the public or for sanitary and police reasons.

Thursday, April 21.

Mr. DANCKWERTS, resuming his argument this morning, contended that the word "street" in the Act included not only highways but all private streets, and as such were bound to be lighted. He referred to the case of the *Alliance and Dublin Consumers' Gas Company v. Corporation of Dublin* decided by the Irish Courts in May, 1895 (which he said was reported in the "JOURNAL OF GAS LIGHTING" only*), as showing that it was the duty of the Gas Company to lay the pipes within a certain distance without making any charge, as under section 24 of the Gas-Works Clauses Act, 1847, they were bound to supply gas to the public lamps. With regard to the question of whether the price charged for the gas was to include the cost of laying the mains, he said he did not propose to trouble the Court with any argument, as the Corporation had left themselves entirely in his hands in this matter.

At this stage a consultation took place between Counsel. As the result,

Mr. MACMORRAN said he did not know whether or not his Lordship could help them, but he had suggested terms to his learned friend which would deal with the dispute in the future, though there was some difficulty with regard to past charges.

Justice PHILLIMORE said he was rather inclined to favour the contention raised by the Corporation as to lamps in adopted and unadopted streets; but his difficulty was as to what the parties meant by the agreement into which they had entered. He could not find that they ever made an agreement except with respect to court and street lamps, as to which the Corporation had to pay for the former and the Company for the latter. When the Company were asked to light the passages, they said they were not bound to do this. After some negotiation, the work was done; and surely the Company were entitled to a reasonable sum for it.

Mr. DANCKWERTS said there was no difference between street lamps and passage lamps.

Justice PHILLIMORE did not say there was in law, but the parties had evidently made a bargain. When the Corporation were settling the price they should pay, it was conceivable that they might say, as to certain parts of the town, that they would pay 10 per cent. less than the private consumers paid, and as to another part 5 per cent. less. And so, in the same way, it was conceivable that when they were bargaining the Corporation might have said to the Gas Company: "You shall put the pipes into the streets, and be paid the price for putting gas into the courts and half the expense for putting the pipes in the passages." If the parties only agreed about the courts and streets, they never agreed about the passages. This seemed to be the difficulty. Very early in the negotiations, the Company said they had agreed about the courts and streets, but did not recognize the passages.

Mr. DANCKWERTS remarked that this was because they were not public lamps. His view was that the question of whether there was a difference between street and passage lamps had not been considered, and they had not all the materials before them to decide it. The most satisfactory way of dealing with the difficulty would be either to arrange it between themselves or to send it back to the Umpire. The question was not as between street or non-street lamps, but as between public and non-public lamps. The only question which had been discussed was as to whether the lamps in question were public lamps; and, if so, whether the charge by virtue of section 24 covered the cost of laying the pipes.

Justice PHILLIMORE said he thought that must be so.

After a further conference between Counsel, Mr. MACMORRAN said the parties had negotiated, and terms had been suggested; but there was a little difficulty on both sides about the question of authority to make a settlement. Under these circumstances, he suggested that there should be a short adjournment.

His LORDSHIP ordered the case to stand over till Tuesday, May 3.

* See "JOURNAL," Vols. LXV. and LXVI.

Action in Respect of Gunning's Controllers.

In the King's Bench Division of the High Court of Justice, at the close of last week, Mr. Justice Walton had before him an action brought by the British, Foreign, and Automatic Light-Controlling Company, against Messrs. J., M., & D. Fellheimer, for damages for alleged breach of contract. Mr. Marshall Hall, K.C., who appeared for the plaintiffs, said that in 1905 the defendants entered into a contract to supply 10,000 clock movements to the Company, whose business was bought by the plaintiffs, together with this contract and the sole patent rights in Gunning's patent controllers. They claimed damages in respect of the non-delivery of 8000 movements according to sample within the contract time; and they also asked for an injunction to restrain the defendants from using Gunning's patent. The defendants, for whom Mr. Clavell-Salter, K.C., appeared, denied that they entered into the contract, which, they said, was made with the Union Clock Company, whose works are in Germany, and for whom they were merely agents. They admitted that there had been a breach of contract, but denied responsibility; and, furthermore, they said that the damages claimed were excessive. They also denied the allegations made against them in respect of Gunning's patent. Evidence on both sides having been given, it was announced that a settlement had been come to—judgment to be given for the plaintiffs for £50, with costs on the High Court scale. His Lordship entered judgment accordingly.

WATER COMPANY'S RIGHT TO SINK A WELL.

Successful Appeal by the Barnet Company.

Early in July last year, Mr. Justice Ridley had before him, in the King's Bench Division of the High Court of Justice, an application made by the Attorney-General for an injunction to restrain the Barnet District Gas and Water Company from constructing or using, upon a piece of land acquired by them at Colney Heath, "a well or other works for the purpose of raising, collecting, or storing water, and from carrying the same away for the purpose of their general undertaking." The action was brought at the relation of the Marquis of Salisbury, who is the tenant for life in possession of Hatfield House, which includes nearly the whole of the town of Hatfield and the village of Essendon, and who has had for many years upon his estate wells which supply the town with water. By an Act obtained in 1904, the Company were empowered to construct a reservoir and make certain subsidiary works; and by section 15 it was provided that if the reservoir was not completed within three years from the passing of the Act, the powers granted by it should cease. But nothing therein contained was to restrict the Company from at any time renewing, extending, enlarging, altering, reconstructing, or removing certain of their existing works, increasing or improving the supply of water, or exercising any of the powers with respect to the construction of works from time to time as occasion might require. They had acquired a piece of land at Colney Heath, and had commenced to sink a well for the purpose of obtaining a new water supply. It was alleged that this well was outside their statutory powers, and that its construction would cause damage to the relator. The case for the Attorney-General was argued by Sir Alfred Cripps, K.C., Mr. Danckwerts, K.C., and Mr. Eustace Hill; Sir Robert Finlay, K.C., Mr. Balfour Browne, K.C., and Mr. J. D. Crawford representing the defendants. His Lordship's attention was directed to the now well-known *Frimley* and *East Grinstead* cases; and it was submitted for the plaintiff that the one under consideration could not be distinguished from them. On behalf of the defendants, however, it was contended that it was of a totally different character. In the result, his Lordship acquiesced in the former view, granted the injunction, and ordered the defendants to pay the costs. These proceedings were reported in the "JOURNAL" for July 13, 1909 (p. 125).

The Company appealed; and the arguments were heard by Lords Justices Vaughan Williams, Buckley, and Kennedy on the resumption of the sittings in October last. They reserved judgment; and it was delivered a few weeks later. Unfortunately, their Lordships were not unanimous; Lord Justice Vaughan Williams considering that the judgment of the Court below should be affirmed, while his learned brethren were of the contrary opinion. Lord Justice Buckley said he thought that in sinking the well in question the Company were not acting *ultra vires*; and that therefore the injunction which had been granted was wrong. The order made must be discharged, and judgment entered for the defendants, with costs. Lord Justice Kennedy, who had perused and considered the written judgment of Lord Justice Buckley, said it so completely and exactly expressed the reasoning which appeared to him to be correct, that he desired simply to express his concurrence with it. It was intimated that the Attorney-General proposed taking the opinion of the House of Lords on the question at issue; but it was decided that meanwhile the sinking of the well should not be stayed. The judgments above referred to were given in the "JOURNAL" for Nov. 16 (p. 480).

The further appeal came before the Lord Chancellor, the Earl of Halsbury, Lord Shaw, Lord Atkinson, and Lord Mersey on Monday last week; and, after hearing Sir Alfred Cripps, K.C., and Mr. Danckwerts, K.C., for the appellant, they dismissed it, without calling upon the respondents' Counsel.

Winding-Up of the Automatic Gas-Lighter, Limited.

A petition presented by Mr. E. E. Jessel, the former Secretary, asking for the compulsory winding-up of the above-named Company, came before Mr. Justice Swinfen Eady last Tuesday. Mr. Luxmore stated that the petitioner was a creditor who had obtained judgment in the King's Bench Division for £158 10s. 10d. and costs, as damages for wrongful dismissal, and moneys paid on behalf of the Company. This judgment was still unsatisfied; and the petition alleged that the Company was insolvent, and had no goods or effects upon which execution could be levied. His Lordship made the usual compulsory order.

Liquidation of the Bens Gas Company, Limited.

The statutory meetings of creditors and contributories concerned in this liquidation took place at the London Bankruptcy Court last Thursday, before Mr. E. W. J. Saville, the Official Receiver for the Brighton district. The statement of affairs showed gross liabilities amounting to £1632, of which £406 was due to unsecured creditors. The other liabilities were £1102; making the total expected to rank against the estate for dividend amount to £1509. The assets were estimated to produce £766, from which £123 had to be deducted for the claims of preferential creditors payable in full, leaving the net assets at £642; thus showing a deficiency as regards creditors of £866. Among the principal creditors are the Davis Gas-Stove Company, Limited, for £31. With respect to the contributories, the total capital issued amounted to £3994, to which must be added the above-mentioned sum of £866; making the total deficiency as regards contributories £4860. The Official Receiver, in his report upon the case, stated that the Company was incorporated on Aug. 25, 1908, to acquire as a going concern the business of manufacturers of a gas-producing apparatus then being carried on under the style of the Bens Gas Company, Limited, and for other objects. Their insolvency was stated to be due to the loss of an action for damages; but in the Official Receiver's opinion it was probable that, while this was the immediate cause of the filing of the petition, the chief cause of the Company's failure was want of capital. The working expenses were exceedingly heavy, and the business was only kept going by means of loans. In the result, the matter was left in the hands of the Official Receiver; and at a meeting of contributories he was also appointed Liquidator.

MISCELLANEOUS NEWS.

EXAMINATIONS IN GAS ENGINEERING AND SUPPLY.

The City and Guilds Question Papers.

Readers are aware that the examinations in "Gas Manufacture," which have been for so many years conducted by the City and Guilds of London Institute, are now held on two branches of the subject—"Gas Engineering" and "Gas Supply." The Examiner for the former is Mr. Thomas Glover, of Norwich, who has succeeded in this capacity Mr. W. Doig Gibb, now the Chief Engineer of the South Metropolitan Gas Company; and for the latter, Mr. J. H. Brearley, of Longwood. The examinations in "Engineering" were held on the 16th inst.; and those in "Supply" last Saturday. The following were the questions set by Mr. Glover; the candidates being directed to confine themselves to one grade only, and not to attempt to answer more than eight of the numbered questions and only one of the alternative questions in the four hours allowed.

- GAS ENGINEERING.
- HONOURS GRADE.
1. Describe any modern method, and name the principle on which the method is based, for preparing a coal, inferior as regards purity, for gas and coke making. [30 marks.]

2. Name some possible disadvantages which may follow the use of very small coal in the process of carbonization. How may these disadvantages be minimized? What would be the effect (a) on the gas, (b) on the residuals, and (c) on some parts of the carbonizing plant, of endeavouring to reduce, by the use of high temperatures, the period of carbonization while retaining heavy charges of very small coal? [35.]

3. How do the chemical and physical properties of a coal influence the methods adopted for its safe storage? Where a coal-store is limited in area for the quantity it is desired to store, what precautions would you consider it advisable to adopt when storing coal to a depth of 20 or 30 feet? [30.]

4. (a) Retorting plant is required for a maximum daily output of 2½ million cubic feet, and it has been decided to instal horizontally set retorts and machinery. State what number of settings of eight retorts you would consider it advisable to provide, and what saving in ground space, in square feet, could be effected by the adoption of four-tiered settings in place of three-tiered settings. State what you consider to be the advantages and disadvantages of both types of setting. [45.]

or, (b) Discuss the relative merits of retorts constructed vertically and worked intermittently, as compared with those worked with a continuous feed and a continuous withdrawal of coke. What theoretical and practical considerations are favourable to the continuous method of working? [45.]

5. (a) Give the approximate evaporative value in pounds of water per pound of the following fuels:—

| | |
|---|-----------------------|
| (a) Coke breeze containing 12 p.c. ash and 10 p.c. water. | |
| (b) Coke | 8 " 4 " |
| (c) Coal slack | 15 " 2 " |
| (d) Oil tar | 0.2 " 2 " |
| (e) Creosote oil | 0 " 0 " |

 [35.]

or, (b) Give a description, with sketches (if possible), of any apparatus designed to consume heavy fluid hydrocarbons smokelessly for steam raising. [35.]

6. What would be the results on the quality of the producer gas, on the temperature of a setting, and on the brickwork lining of a furnace, of the following practice: (a) Feeding at too infrequent intervals; (b) omitting to spread the fuel evenly over the area of the grate; (c) omitting to clear the front of the furnace of accumulated refuse; (d) using a fractured feeding door or frame; and (e) using too much chimney draught? [40.]

7. A carburetted water-gas plant, designed for the production of high-grade gas, is required to produce a large volume of low-grade gas containing a small percentage of non-combustibles. State as fully as possible what alterations in the arrangement of the plant and operating conditions would be favourable to efficient working under the new requirements. [45.]

8. Discoloured sulphate of ammonia can be produced in several ways. Enumerate all the wrong conditions you know which lead to the production of discoloured sulphate, and state what alterations in the method of working would remedy the defects enumerated. [40.]

9. Describe any details of design and method of governing a gas-

engine intended to overcome fluctuations in voltage where an engine is used for generating electric current. [35.]

10. Sketch, in plan, a general arrangement of purifiers for dealing with 2½ million cubic feet of coal gas per day, using oxide only. Draw a section of one of the boxes, giving chief measurements, and showing the method of fastening a rubber-jointed cover. [40.]

- ORDINARY GRADE.
1. With what impurity in coal is arsenic likely to be associated, and how can this impurity be eliminated from the coal, or the proportion reduced? [30 marks.]

2. How is the temperature of a setting of retorts and working of the furnace affected by the quality of fuel used for firing? What percentage of ash in the fuel would you consider satisfactory, and how could the furnace be adapted to give high temperatures with fuel containing a high percentage of ash? [35.]

3. Sketch a front and side elevation of a self-sealing retort mouth-piece, and describe two methods of attaching the mouthpiece to the retort. What jointing material is used for the retort and mouthpiece and for the ascension-pipes? [30.]

4. Describe the essential difference between a "retort-house" and a "district" governor. In what position, relative to the retorts, would you fix the former, and why? [35.]

5. Describe the method of collecting and accurately testing the waste or flue gases from a gas-fired setting of retorts. From what part of the setting would you collect the sample of flue gases, and what precautions would you take to ensure accuracy? [40.]

6. What conditions in the process of carbonization are favourable to the production of the following: Ammonia cyanide, sulphuretted hydrogen, carbon bisulphide, and other sulphur compounds? Briefly describe the methods usually adopted for removing these impurities from the gas? [45.]

7. How would you test the specific gravity of tar, and how would you determine the percentage of water occluded? [40.]

8. Describe the Referees' sulphur test, and give the chemical formulæ on which the test is based. If the condensed liquor from 5 cubic feet of gas, measured at normal temperature and pressure, gives 10.6 grains of barium sulphate, how many grains of sulphur would 100 cubic feet of the gas contain? (Ba = 137; S = 32; O = 16.) [45.]

9. Give a simple sketch, with measurements, of the cup and grip of a telescopic gasholder. State what considerations regulate the depth of the cup when designing a gasholder? [40.]

10. Describe a method for automatically regulating the speed of an exhaustor to maintain a steady vacuum with a varying volume of gas coming from the retorts and a varying resistance on the outlet. [45.]

GAS SUPPLY.

The following were the questions set by Mr. Brearley. In his instructions, he stated that in answering those marked with an asterisk sketches were to be used; and that, whenever possible, and pertinent to the question, sketches would also enhance the value of other answers. As in the "Gas Engineering" paper, not more than eight of the numbered questions, and only one of the alternative questions, were to be attempted in the four hours allowed.

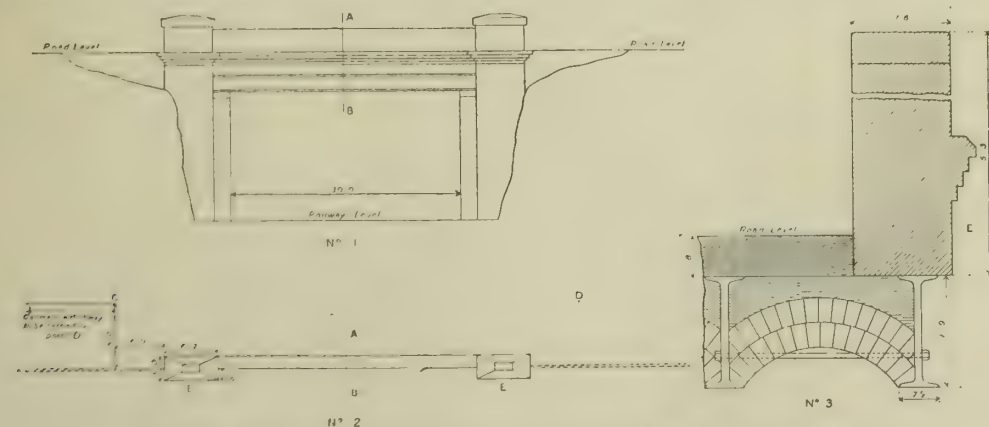
- HONOURS GRADE.
- *1. (a) Describe fully the operation of fixing a service clamp or clamps to a high-pressure main, and give sketches of the type of clamp or clamps you would employ. What tools and fittings will be required to complete the service connection? [33 marks.]

or, * (b) Give sketch and description of a governor suitable for reducing the gas in a high-pressure main to normal pressure, and state the precautions necessary to ensure satisfactory working. [33.]

*2. Show, by means of sketch in elevation, a circulating gas water-heater with the connections to compensating tank and a hot-water radiator as used in heating public buildings. What fixing precautions are necessary when a complete installation is carried out? Give calculation of the gas required to heat, by hot-water system, the air in a hall of the following dimensions: Length 150 ft., width 60 ft., height to apex 25 ft., and to eaves 13 ft., assuming the rate of air change to be five times per hour and the average increased temperature required 10° Fahr. [45.]

3. (a) What tests should be employed to ascertain the thermal efficiency of gas cooking stoves and the hygienic effect upon the air of rooms? [30.]

or, (b) What are the advantages and disadvantages of flue pipes used in conjunction with gas cooking stoves? [30.]



Sketch referred to in Question 8 of the Gas Supply Paper—Honours Grade.

4. Assuming either of the two following types of gas compressors is equally convenient for the lighting of business premises, which would you prefer, and why: (a) gas driven rotary; (b) hydraulic? If a compressor of the last-named type failed, how would you proceed to ascertain the cause and to remedy the defect or defects? [39.]

5. (a) Give the equivalent of 54 inches of water pressure in pounds per square inch. (b) Define explosion and state the explosive limits of coal gas and air. (c) What is the law in reference to the diffusion of gases? [33.]

6. (a) How may the variations of flame temperature be measured? (b) State briefly a method of estimating radiant energy sensible as heat from a gas-fire. (c) Why is a highly aerated bunsen flame hotter than a less aerated one? [33.]

7. A 10 H.P. gas-engine requires overhauling. Describe in detail the operation of taking off, repairing, and replacing the valve box, gas, air, and exhaust valves, piston, and connecting rod. Why should a suction-gas engine have an auxiliary supply of town gas? [45.]

*8. The drawings [p. 253] are (1) elevation, (2) plan, and (3) enlarged section at AB of the parapet which surmounts a railway bridge. Show by sketches in plan and section how you would carry an 8-inch main from point C in the highway to point D and support it to the wall on side E of parapet. State, with reasons, what class of main you would employ, how expansion and contraction would be provided for, what specials would be necessary, and what tools and other materials would be required to complete the work. [45.]

*9. (a) Give diagram showing the candle power at different angles below the horizontal of (a) any inverted burner, and (b) any upturned burner, each working at ordinary (say, 2 inches) pressure and consuming not more than 4 cubic feet of gas per hour. A simple sketch in sectional elevation of each burner must also be given. [39.]

or, (b) State generally how you would carry out lighting installations for any two of the following, having regard to the effect of artificial light on the eyesight: (a) Dining room, (b) brass finisher's workshop, (c) draper's shop window. What type of burners and globes or shades (if any) would you adopt in each case, and why? [39.]

10. (a) What quantity by volume of carbonic acid and what weight of water is produced by the combustion of 1000 cubic feet of average coal gas? What volume per hour of carbonic acid, and what weight per hour of water, is given off by the respiration of an adult under normal conditions, and how many British thermal units of heat does he give out? In what ways respectively do the products of coal gas and the respiration of human beings affect the atmosphere of dwelling rooms? [36.]

or, (b) Compare the relative fire risks of (a) town gas, (b) petrol air gas, (c) acetylene, (d) oil-lamps, and (e) electricity. State what you know of the general effect of each on insurance rates. [36.]

ORDINARY GRADE.

1. (a) Describe one form of leakage indicator suitable for locating escapes from gas-mains. A gas-main 200 yards long supplies 50 consumers and is connected to the distribution system at both ends; how would you ascertain the amount of leakage (if any) from same? [36 marks]

or, (b) Describe fully the operation of temporarily stopping the leakage from a split 8-inch main, permanent repairs being impossible for some days. [30.]

2. A five-light wet meter brought from a consumer's premises is found to be registering 25 per cent. slow; to what causes may this be ascribed? How would you proceed to put the meter into a thoroughly satisfactory condition and to certify the result of the work by testing on completion? [42.]

3. State, in percentages, the composition of the following alloys and the influence which each component has upon the finished alloy:—Brass, gunmetal or bronze, solder. In what way are two pieces of composition (lead) pipe joined by means of a blow-pipe, and what precautions have to be observed? [39.]

*4. (a) Why is it desirable to have pressures at consumers' premises regulated? Describe, with the aid of a sketch, one form of house-service governor. [36.]

or, (b) How would you proceed to prove the presence of a leakage in the fittings of a consumer; the leakage being too small to be readily indicated by the index of the meter? [30.]

5. A room with 2000 cubic feet of air space is lit with one inverted burner consuming 3 cubic feet of gas per hour. What quantity of air will be required for combustion, and what will be the proportion by volume of its chief constituents? Assuming the air of the room is changed twice per hour, what percentage will the air required by the burner bear to the total quantity passing through the room? [36.]

6. (a) In practice, bunsen flames with luminous tips are met with. Give three cases, explaining in each the cause and the remedy to be applied. [36.]

or, (b) How is efficiency best secured in the construction and use of (a) top burners of gas-cookers, and (b) gas-irons? State the proportion of primary air to gas in a well-constructed bunsen, and the essentials of a good flame. [39.]

*7. (a) State concisely the construction of ordinary types of (a) flat-flame, (b) argand, and (c) regenerative gas-burners. [33.]

or, (b) In the maintenance of incandescent burners (inverted and upturned), what are the points to be observed to secure a low mantle account without sacrificing efficiency? [36.]

8. Describe the operation of starting a gas-engine, including the regulation of gas into cylinder after engine has been "overhauled." Which form of ignition-tube do you consider most satisfactory, and why? [42.]

*9. Describe the following: (a) Anti-pulsator, (b) adjustable die-stock, (c) service-cleanser, (d) expansion gas-main joint (with sketch), (e) the operation of making a gas-main joint with lead wool. [40.]

*10. What are the common difficulties encountered in fixing brackets for outside shop suspension lamps and the conditions which govern the position of such lamps? Describe, with the aid of a sketch or sketches, the operation of attaching a shop suspension lamp to the masonry above a window casement, and state the tools and fittings required to complete the work. [45.]

BELFAST GAS-WORKS SCHEME.

Harbour Commissioners and the Twin Island Site.

At a Meeting of the Belfast Harbour Board last week, under the chairmanship of Mr. ROBERT THOMPSON, M.P., the minutes submitted by the Works Committee contained the following: "A deputation attended from the Gas and Law Committees of the Belfast Corporation. The Chairman of the Gas Committee (Mr. J. A. Doran) stated that the deputation were empowered to negotiate for the purchase of the plot of ground suggested as a site for the gas-works, lying between East Twin Island and the north end of the Musgrave Channel, and asked if the Commissioners are prepared to confirm the answers, including £750 per acre as the price of the ground, given to several queries of the Town Clerk. The Chairman informed the deputation that he believed the Commissioners, although not unanimous, might be taken as being favourable to the arrangement, subject to the satisfactory settlement of details; and, the deputation having retired, it was recommended that the Solicitor be instructed to prepare, in conjunction with the Town Solicitor, the necessary provisional agreement in the matter for the consideration of the Committee."

Mr. HERDMAN, in moving the adoption of the minutes, said the meeting between the representatives of the two bodies had been of the most harmonious and agreeable description; and he thought there was no doubt that the conference would lead to the completion of the business, to the satisfaction of all parties concerned. In making the offer of the ground to the Corporation, the Commissioners were largely actuated by public motives, as they felt that the price at which they were proposing to give it was far below its intrinsic value. But as it was a matter between two important public Boards, their feeling was to assist their friends of the Corporation in what was for the public good. It would be seen that the Solicitors were instructed to draw up the necessary documents; and then the matter would come before the Board again.

Mr. ANDREWS wished to enter his protest against the proposal. He objected to the site, both as a Harbour Commissioner and as a ratepayer. Not one of the members of the Board could form a remote idea as to how they might want to use the land in days to come. As a ratepayer, he objected strongly to the enormous amount of money it was proposed to spend on this Twin Island site. He thought the great majority of the ratepayers believed that the proper place for the extension of the gas-works was Ormeau Park. However, experts who were brought over declared for the Twin Island site. Still, the opinions of experts depended largely upon how the matter was placed before them. The foundations of the works on the Twin Island site would cost an enormous sum; and though it was not the province of the Harbour Commissioners to dictate to the Corporation how they should conduct their business, yet, speaking as a ratepayer, and not as a Commissioner, he thought they ought to use any influence they possessed with the Corporation to try and get them to reconsider this matter. He would like the opinion of the Board on the general principle whether they should give this land away for all time; and this seemed to be the principle submitted in the minutes.

Mr. HERDMAN said probably Mr. Andrews was aware that before the arrangement could be carried out the consent of Parliament legalizing the transfer would have to be obtained. As for Ormeau Park, surely Mr. Andrews had been long enough associated with the town to know that this question had been before the public for eighteen years. It was decided by the public eighteen years ago, when they declared in a very decisive way that they would not allow any portion of the park to be taken for gas-works. Moreover, since then the park had been specifically excluded by a vote of the Corporation, following upon a very significant expression of popular feeling. Mr. Andrews might take it from him that he would never see any extension of gas-works in Ormeau Park. As far as the desirability of the site was concerned, he thought they must admit that the Twin Island was the right place, when they had not only the officials of the works and the Corporation strongly in favour of it, but experts specially engaged to examine and report upon the sites equally strong in recommending it.

The CHAIRMAN said when the question first came before the Board, they looked at it from a commercial point of view; and they asked the Corporation what they thought was a fair price for the land. After the matter had been discussed at various meetings of the Council, and when the Board began to see that the Corporation thought seriously of the Twin Island site, they reconsidered the question of value, and came to the conclusion that it was their duty to reduce the price to a minimum. They were not animated by the motive of making money by the transaction, but by the desire to do that which would be for the public benefit. It should be made clear that they could not utilize a farthing of the money that they received either in connection with the docks or other harbour property. Their first duty after receiving it would be to buy harbour stock which was at present in the market to a similar extent, so as to wipe out the whole of the amount. The Ormeau Park site, to which Mr. Andrews had alluded, had been eliminated from consideration by the Corporation; and consequently the Board could not raise it. Even assuming that it was the best site, next to that the Twin Island site could not be ignored (after the opinion expressed by the experts) as the best, the most suitable, and the cheapest in the interests of the ratepayers.

The resolution was then put to the meeting and passed; Mr. Andrews dissenting.

Reference was made in the "JOURNAL" a few weeks ago, to the departure made by the South African Lighting Association, Limited, in the manufacture of liquid (sp. gr. 880) and cloudy ammonia; the claim made for the latter being that it is much stronger, cheaper, and of greater volume than that which is imported. The Association's Manager (Mr. W. Arnott) showed samples of these and other products on a very effectively arranged stand, of which he has sent us photographs, at the Port Elizabeth Agricultural Show, as well as at the Grahamstown Show, for each of which a gold medal has been awarded.

THE WARSOP GAS INQUIRY.

Local Government Board Refuse the Order.

Reference was made in the "JOURNAL" for the 29th ult. to a Local Government Board inquiry extending over two days, which had been held at Warsop by Major C. E. NORTON, with regard to an application by the Urban District Council for a Provisional Order authorizing them to borrow £10,000 for the construction of gas-works. As was then stated, the scheme encountered great opposition. We are now in a position to give a fuller account of the proceedings than was at that time practicable—together with the intimation that the Local Government Board have refused to grant the Order.

The Council were represented by Mr. C. C. HUTCHINSON, Mr. L. MACASSEY opposed on behalf of the Staveley Coal and Iron Company; Mr. R. S. CLEAVE for the Shirebrook and District Gas Company; and Mr. W. H. MOLE for the Great Central and Midland Railway Companies.

Mr. J. Harrop White, the Clerk to the Warsop Urban District Council, at the outset, said that, of the estimated population of 4,400, 800 were in the area which was supplied by the Shirebrook and District Gas Company. The population of the district was likely to increase by reason of the sinking of another pit.

Mr. HUTCHINSON, in opening for the Council, remarked that the inquiry resulted from an application by that body to enable them to fulfil the duties that were cast upon them by section 161 of the Public Health Act. This dealt with the lighting of the streets. The second part of the section read: "Where there is not any company or person other than the urban authority authorized by, or in pursuance of, any Act of Parliament or any Order confirmed by Parliament to supply gas for public and private purposes, supplying gas within any part of the district of such authority, such authority may themselves undertake to supply gas for such purposes, or any of them, throughout the whole or any part of their district; and if there is any such company or person so supplying gas, but the limits of supply of such company or person include part only of the district, then the urban authority may themselves undertake to supply gas throughout any part of the district not included within such limits of supply." With regard to the part of the urban district which embraced the area in which five-sixths of the total population resided, the Local Authority, as there was no company supplying, might themselves undertake to furnish gas. At present a part of the district in respect to which the application was made was within the limits of supply of an adjoining gas authority—the Mansfield Corporation. Under the provisions of the Mansfield Gas Act, 1878, they might supply gas in an area embracing the parish of Warsop; but they could not supply gas beyond the district of Mansfield without the consent in writing of the Sanitary Authority in whose district gas was proposed to be supplied. This consent might be revoked upon payment by the Sanitary Authority to Mansfield of the sums expended by them in mains, &c. It was further provided that if at any time after the passing of the Act, upon six months' notice in writing being given to Mansfield of the desire to purchase the portion of the undertaking which was contained in their district, the Local Authority should obtain the consent of the Local Government Board to such purchase, and should apply to Parliament or the Board to purchase such portions of the undertaking and to supply gas within such district, then it should not be lawful for Mansfield to oppose. No statutory powers in regard to the supply of gas were necessary, because as soon as Warsop obtained the consent of the Local Government Board, they became endowed with all the powers of supply within the district that still remained in the area of the Mansfield Corporation. These powers were modified in some respects by the Mansfield Corporation Act of 1901. The proviso that Mansfield should not supply gas without the consent of the Local Authority was repealed; and, of course, with or without the consent of the Sanitary Authority of Warsop, Mansfield could have come in and supplied gas. But if Mansfield had covered the whole district, after six months' notice the urban district of Warsop could, in respect of this part of their area, have resumed the right of supply given them by the Public Health Act. Of course, this was the position that arose. The purchase from the Mansfield Corporation of so much of their undertaking as consisted of the rights and privileges of supplying this part of the Warsop urban district had been agreed to—the purchase money to be £300.

The INSPECTOR remarked that in clause 6 it was stated, among other things, that a Provisional Order was asked for to confirm an agreement with Mansfield for transfer of rights. In the Order, however, beyond mere reference in the recital, there was no allusion whatever made to the application to obtain the Local Government Board's consent.

Mr. HUTCHINSON replied that it was not necessary, because the provisions were already made by Parliament. It was for the Board to see whether the conditions laid down by Parliament in 1878 had been complied with. He had not dealt with one part of the area, because it would have been seen from the objections of a somewhat energetic, though alien, Company that part of the district had already come within the scope of supply of their profitable operations. In 1899, some promoters entered into a bargain with the Mansfield Corporation; purchasing from them for the sum of £500 such rights and privileges as the Corporation had not then exercised over the part of Warsop known as Warsop Vale, which comprised a small area of some 300 or 400 acres, and contained only one-sixth of the total population. This made no difference to the position of the Urban District Council in the present application; and, strictly speaking, he ventured to say that, if this were a proceeding before a Committee of Parliament, the alien Company, having themselves no interest in the part of Warsop over which the Council sought to exercise their own natural legal rights, would not be heard. It was proposed that borrowing powers should be applied for to the extent of £10,000. Though it was calculated that an expenditure of £8000 would be ample for the works, it would be necessary to keep £2000 in reserve for anything that might arise. It was estimated that 14-candle gas could be supplied for sale at 3s. 4d. or 3s. 6d. per 1000 cubic feet; and after payment of interest and sinking fund, there would be a margin left.

Mr. White then gave evidence as to the increase of population, and the further growth that would likely take place on the sinking of another colliery. Except Warsop Vale, the area was at present lighted by oil-lamps. A site of 2½ acres had been secured for the erection of gas-works; the price paid being about £220. This land adjoined the Great Central Railway. In 1907, the Council, upon their initiative, proceeded to consider the question of supplying gas; and negotiations were entered into with Mansfield. These negotiations took place between the two bodies before there was any public intimation, or any knowledge acquired, of the fact that the Shirebrook Company intended to apply for powers over the area. There was no idea of forestalling that Company. No overtures were made by the Shirebrook Company to the Warsop Council. In the autumn of last year, the Company held a meeting in Warsop; and this was the first knowledge that the Council directly acquired as to the intention of the Company. This meeting resolved that it was desirable that there should be a better system of lighting at Warsop. It was not stated whether it should be gas or electricity. The Council were left to deal with the matter. The Council thereupon unanimously decided that they should themselves apply for an Order to enable them to supply gas.

Mr. CLEAVE: What are you going to get for the £300?

Witness: We get the relinquishment by the Mansfield Corporation of their rights. We also get the support of Mansfield to this application, instead of their opposing, as they might have done.

Mr. CLEAVE: A statutory authority cannot sell its right under Act of Parliament.

Mr. HUTCHINSON: The express right has been conferred by Act of Parliament.

Further questioned by Mr. CLEAVE, witness said it was possible that a definite offer was made by the Shirebrook Company to supply this portion of Warsop at the same rate as the rest of their district.

Mr. HUTCHINSON: From my point of view, I do not know whether the Company have made an offer, or whether the Council knew about it. It does not matter to me one brass button.

Mr. MACASSEY: You know, of course, that under the Public Health Act a local authority are entitled to supply gas inside their district if there is no company, body, or person authorized to supply gas in the district, and, in fact, supplying. Now, section 161 of the Act states: "Where an urban authority may under this Act themselves undertake to supply gas for the whole or any part of their district, a Provisional Order authorizing a gas undertaking may be obtained by such authority under, and subject to, the provisions of the Gas and Water Works Facilities Act, 1870." Under this Act, a Provisional Order can only be granted by the Local Government Board authorizing any local authority to construct or to maintain works to manufacture gas in any district within which there is an existing company, corporation, body, or commissioners or persons empowered by Act of Parliament to construct such works. Am I right in thinking that the Mansfield Corporation are a corporation entitled to supply gas in your area of supply?

Witness: Yes.

Do you appreciate the fact that at the present moment there is no jurisdiction to the Local Government Board to make this Order?—We are advised that there is.

The INSPECTOR: The Local Government Board have directed an inquiry upon it.

Mr. MACASSEY: Of course, you will note my objection; and having made it, I would refer you to the West Houghton case, which was decided in 1877. It was a case where the Local Government Board made the Provisional Order under those circumstances, and where the Commissioners refused to proceed with the Order, on the ground that it was *ultra vires*. It is a leading case; and I put it very strongly that this Provisional Order cannot legally be granted.

Further cross-examined, witness said he knew the Staveley Company paid a considerable proportion of the total rates of the parish; but he did not know it was 65 per cent. The colliery was in the area at present supplied by the Shirebrook Gas Company; but he did not think it unfair to subject them to the liability of a rate-in-aid. Many of their workpeople lived in Warsop.

Mr. J. W. Wigram, estate agent to Sir Hugo Fitzherbert, Lord of the Manor of Warsop, and a large landowner, spoke as to the probability of a new colliery being sunk. He regarded the negotiations for this as being in a very advanced stage.

Mr. John Renshaw, a member of the Warsop Urban District Council, said the members were quite unanimous with regard to the application. It was their desire to have the supply of gas, or whatever the illuminant might be, in their own hands. It was not until lately that there had been a demand for gas in this part of the district. No representation whatever had been made to the Council on the subject, either by ratepayers or any other person. There had never been, in any way or shape, either directly or indirectly, any communication between the Shirebrook Gas Company and the Council. At the meeting which had been referred to, Mr. J. N. Derbyshire, as the representative of the Shirebrook Company, said the Company would be prepared, if the Mansfield Corporation, who had the right to supply gas to Warsop, would not do so, to apply to Parliament for an Act whereby the Company could supply Warsop with gas. The Company, seeing that their mains were already in the parish of Warsop, were quite prepared to supply the village. If the parish desired gas from them, then, as business men, terms and other matters could be discussed later. "But," continued Mr. Derbyshire, "we do not want to force ourselves upon you. We are here because we are close to your borders. If you want us, we are willing to come; but if you do not desire us, we shall stay where we are, and remain as good friends as now." On that occasion, the Chairman of the Council was asked to call a meeting at a later date; and this was done. It was then decided that the Council should adopt a better system of lighting; the choice of an illuminant being left to them. The meeting determined that the Council were the proper people to supply light in the district. He himself objected strongly to the introduction of any private company.

Mr. CLEAVE: Before embarking on a large expenditure on a scheme like this, would it not have been wiser to lay the matter before the ratepayers publicly, showing them what the cost would be, what the estimated price would be, and what light they were going to get for it?

Witness: We did not see the necessity.

I put it to you that at the first meeting called there was a definite offer made, but not to the Council, that the Shirebrook Company would be prepared to supply this portion of Warsop at the same rate as they supplied the other part of the district?—Yes; they made a statement.

Mr. MACASSEY: Assuming that one-half of the total rateable value of the district is in the Shirebrook Company's area of supply, do you think it fair that the gas undertaking should be established for one-half of the district, and that the other half should be rated in respect of the undertaking from which they derive no benefit?

Witness: There are a lot of the Staveley Company's men living in this part of Warsop. They should receive some consideration, as well as those who live in Warsop Vale.

Mr. Arthur Graham, Gas Engineer and Manager to the Mansfield Corporation, who had been engaged by the Warsop Council as their expert for the purpose of carrying out the gas supply scheme, said the proposed site was satisfactory and convenient in every way. It was alongside the railway sidings; and the land was lower than the railway, so that the coal could be wheeled into the works without much expense. The site was rather too far away to provide a siding without an outlay of £250 or £300. For his calculations, he had taken a maximum of 8,000,000 cubic feet a year; and the cost of the works would be about £8050. He thought the Council would be able to sell gas remuneratively at 3s. 6d. per 1000 cubic feet by ordinary meter, and 4s. 2d. to slot consumers. He had made an estimate showing receipts of £1620 and an expenditure of £840—leaving a balance of about £780. This was based on ordinary gas sales of 2,250,000 cubic feet, and prepayment sales amounting to 4,400,000 feet, in addition to the public lighting. The revenue from ordinary sales he put at £394, from prepayment consumers at £917, and from street lamps at £100. Then there were meter-rents £15, and sales of residuals £200. They would supply 14-candle gas with the No. 2 burner, as against the 15-candle gas with a No. 1 burner of the Shirebrook Company. The net revenue he arrived at, after payment of all expenses and interest and sinking fund, was £185. He saw no reason why the revenue should not progress. A 14-candle gas on a No. 2 burner could be manufactured more cheaply than a 15-candle gas on a No. 1 burner. In his opinion, Warsop ought to have their own gas-works; and he did not see why Shirebrook should want to come in and take their rights away. If judiciously managed, an undertaking of the proposed size could be worked in the district without imposing any burden on the rates. They were successful in other places. In the first year the concern might not pay its way; but there was no reason why it should not afterwards do so. He had calculated that there would be some 150 ordinary, and 550 prepayment consumers. There had been no canvass; and these figures were simply taken from the population, and the number of houses, &c. There would be room on the site for extensions to meet an output of quite three times the 8,000,000 cubic feet he had mentioned. His estimated cost of the gas into the holder was 14d. per 1000 cubic feet.

Mr. MACASSEY: You are of opinion that an undertaking of this magnitude can be worked so as not to produce any burden upon the rates if judiciously managed. If not so managed, do you not agree that it is more than probable it will be a burden on the rates?

Witness: It might be for the first or second year; but after that it should not be.

Unless you had the portion of the parish of Shirebrook which is within the limits of the Shirebrook Company's area of supply as a district that can if necessary be rated in aid, would you as an Engineer advise the Warsop Council to undertake this scheme for the supply of the district?—Certainly not.

The INSPECTOR: Why did Mansfield cast away an area in which they could supply?

Witness: Because they are increasing so rapidly at home that they did not care a great deal to spend money on coming to Warsop.

Mr. Corbet Woodall, examined by Mr. CLEAVE (for the Shirebrook Gas Company), was asked why Mansfield had never attempted to supply the Warsop area. He said there was a considerable difference in the levels, which would have meant a much higher initial pressure. The difference would also increase the cost of laying the mains. He did not think Parliament would have given Mansfield £300 for their rights. He was emphatically of opinion that it would not be of advantage to the Warsop consumers and ratepayers that the Local Authority should be authorized to supply gas under the provisions of this scheme or any similar scheme; but it would be an advantage to them if the district were supplied by the Shirebrook Company on the basis of the price they charged in their existing area. There was, so far as he could see, no prospect of Warsop ever having a consumption that would enable works of their own to pay; but with a company having a so much larger area as was open to the Shirebrook Company, the position was different. Again, while there was no reason why municipal bodies should not manage very well, a company usually managed better. The pecuniary interest attaching to the position of the Board of Directors was an important factor. The Shirebrook Company supplied within their own area at the present time about 25,000,000 cubic feet of gas per annum for lighting purposes; and the prices ranged from 2s. 9d. to 3s. 4d. per 1000 cubic feet. For power, the charge was from 1s. 6d. to 2s. 6d. In 1902, the Shirebrook Company were making 7,000,000 cubic feet of gas; and the capital was £16,463, or roughly £2400 per million feet. In eight years, the make had gone up to 25,000,000 cubic feet, while the capital had only increased to £26,128. Broadly speaking, the capital per million cubic feet made was now £1030; and it was a fair assumption that the Company's business would continue to grow. His figures as to the cost of production under the Council's scheme differed very largely from Mr. Graham's. Then he had taken a total capital expenditure of £13,000; and upon this, with a sale of gas of 5,000,000 cubic feet, at 4s. 9d. per 1000 cubic feet, it would be almost impossible for the concern to pay its way. The place would get a supply more quickly from the Shirebrook Company—in fact, before next winter. There was no doubt that there was a need for gas in Warsop; and the people would pay a big price for it, especially if the Local Authority had the supply. It was as wrong as could be that the gas consumer should have to pay an excessive price for gas in order that there might be money in hand for the rates.

Mr. CLEAVE: In your estimate, have you allowed for the opposition to our Bill which, of course, will follow?

Witness: No; I have not.

The Shirebrook Company have not tried to bleed their district?—I think the history of this Company, and one or two others that seem to be controlled by the same group of gentlemen, is altogether creditable to them. I have always found the works in admirable order; and there has not been that grasping for immediate profits that would stand in the way of the development of the business. The capacity of the works is well in advance of both their own present needs and those of the part of Warsop that is not supplied.

Mr. HUTCHINSON: It is possible to find a local authority's undertaking which is well conducted?

Witness: Certainly. I said at the outset that I am not disposed to find fault with municipal management; but the tendency is to greater economy under the management of a company than of a corporation. I should say the works in some of the large towns—such, for instance, as Leicester and Birmingham—are admirably conducted by the Municipalities; and also some of the smaller ones.

Mr. CLEAVE: If you had virgin soil here—no company, no local authority supplying—it is possible that you could devise a scheme for a local authority who wanted a supply, and a scheme which would be justifiable?

Witness: Yes.

But the Company are here supplying a part of this very parish, and the capital expenditure that the Local Authority would be put to in supplying the parish would amount to £3000 or £4000 more than the capital that the Company would have to spend if they were supplying this portion of the area. In these circumstances, are the Local Authority justified in attempting to supply?—That is for the ratepayers to decide; but I say emphatically that they are not justified, as long as they can get their gas cheaper under a company.

Will the ratepayers benefit if the Company carry out their proposal to supply at the price they are already charging, rather than that the Local Authority should carry out a scheme?—Certainly. The Council's proposal is one to get a very high price from the consumer for an idea.

Mr. Graham having been re-called to put in further information with regard to his estimate, said that he now brought out a total outlay of £10,750, including engineer's fees, contingencies, legal expenses, &c., in place of £10,000.

Mr. R. G. Shadbolt, Engineer and Manager of the Grantham Gas-Works, questioned by Mr. HUTCHINSON, said he thought, from his experience of works of the size of those proposed, gas could be fairly expected to cost the consumers about 3s. 4d. per 1000 cubic feet, when once the undertaking had got beyond the initial stage—say, after the first two full years' working. At the end of this time, it could be reasonably expected that, with the natural development of the district, the consumption of gas would run to 7,000,000 cubic feet. For such an undertaking as this, about £1250 per million cubic feet capacity of works would be a fair capital to take. There were varied classes of houses in the district—mostly cottages. But taking it as a whole, it would be a better yielding area than Warsop Vale. He had made a revenue estimate for the Council's works; and it showed that, after allowing for interest and sinking fund, there would be a small surplus of £137 per annum, reckoning the gas to be sold at 3s. 4d. to ordinary and 4s. to prepayment consumers.

Mr. HUTCHINSON: Looking at it as a matter of policy, do you think this is a wise step for the Council to take?

Witness: I consider the situation is such that the Council would be well advised to take advantage of the present opportunity to obtain the privilege of supplying gas to the district.

Mr. MACASSEY: You notice that this capital expenditure of £10,000 is to be incurred in respect of a district where the assessable value is only £6000—that is, excluding the portion of the parish in the area supplied by the Shirebrook Company. That is a pretty heavy capital expenditure?

Witness: It would be, if it were a speculative concern, but not in an established business.

Mr. Sleight, a Warsop Vale schoolmaster, and a member of the Urban District Council, said his house was supplied with gas by the Shirebrook Company; but, in his opinion, the supply was unsatisfactory. This was one of the main reasons why he was desirous of seeing the Council undertake a gas scheme. Whatever the cost, it would be preferable for Warsop to be supplied with gas by the Council, rather than that it should be furnished by the Company. He had frequently complained to the Shirebrook Company's Manager of the character of the supply.

The INSPECTOR said he would like to have another witness to deal with the question of the existing supply of gas, in order to corroborate Mr. Sleight.

Mr. Renshaw was thereupon called, and stated that the present supply was anything but satisfactory. In fact, from his own observation it was a thorough failure. He had seen the street-lamps with just a glimmer. They had complained as a Council to the Gas Manager many times about the inefficiency of the lighting at Warsop Vale; and in reply they were told that it was due to the interference of mischievous boys.

Mr. MACASSEY: Do you know that the Staveley Company have 175 houses supplied with gas in Warsop by the Shirebrook Company, and that the supply is perfectly satisfactory?

Witness: I do not. I know some people who have complained.

Mr. J. N. Derbyshire, the Chairman of the Shirebrook Gas Company, testified that they were able and willing to give a supply of gas as soon as they had power to do so; and they would give it to the district at the same price as was charged in the present area of supply. The Company had promoted a Bill to embrace the whole area. It included a portion of Bolsover, Cuckney, and Norton, and the remainder of Warsop. The only opposition so far was from Warsop. The Company's charge was 3s. 6d. per 1000 cubic feet maximum until the end of last year; it was now 3s. 4d. As to the consumption, in 1909 the ordinary consumers took 10,225,000 cubic feet, and the prepayment consumers 12,544,300 feet. The average per consumer was 6602 cubic feet. In Warsop Vale, the average was 5800 feet. The total authorized capital was £50,000, of which £25,000 was taken up. They had 2½ acres at present for the works; but an option had been secured on a further piece of ground.

They had not yet got a siding into the works; but the carting cost only 8d. per ton. The total number of consumers was 2072. Of these, 1897 had prepayment meters, and 175 ordinary. The average consumption per consumer might be 11,000 feet for the whole area, as the Great Central Railway took a large quantity of gas.

Mr. HUTCHINSON: You made a speech at Warsop, and said you did not want to force yourself upon them?

Witness: Perhaps "forcing" is a comparative term. My view of the matter is this. If we can supply gas in this district cheaper than the Council can supply it, then we think, when the people of Warsop really understand it, they will wish us to come. If we cannot prove we can supply it cheaper, we have no right to come.

I suppose you told them how cheaply you could supply them. You have not had much encouragement up to the present?—We had 75 per cent. of the ratepayers with us.

This completed the evidence.

Mr. CLEAVE, addressing the Inspector, said that it was quite evident Mansfield never intended to exercise their powers of supply; so they might be eliminated from the discussion. He thought, too, that the Warsop Council would never have contemplated supplying, but for the fact that they heard the Company were in the field. This was not a good reason for giving a Provisional Order to a Local Authority who had failed in their duties. In one case, the money was to be found by the Local Authority; in the other, whether the Company lost or gained was not a matter for the community or the Local Government Board. He submitted that the Council had not made out their case; and the Order should not be granted.

Mr. MACASSEY contended that the Order was *ultra vires*. The Council had doubtless done much for the district; but it was felt that, from the circumstances of the case, they could not possibly operate the proposed gas undertaking at a profit. No evidence had been given of there being an urgent demand for a supply of gas in the district; but if it was thought that a supply was necessary, then obviously it could be better given by the Shirebrook Company than by the Council. The Staveley Company were satisfied with the supply furnished by the Company; and they said that if the supply of gas was given by the Council it would result in gross inequality, because the Council would charge the Staveley Company in respect of money borrowed for the undertaking. Here they had 75 per cent. of the total rateable value of the parish opposed to the Council's scheme to supply gas to a portion of the district representing only a quarter of the assessable value. It was not a case where the whole gas supply of the parish could be vested in the hands of the Council. The proper time to approach the matter would be when the Council could put forward a comprehensive scheme showing that they could better than anyone else supply the whole of the parish. The application was premature.

Mr. MOLE, after remarking that he did not propose to call evidence, said that for the year to Dec. 31, 1909, the Great Central Railway took considerably over 2,500,000 cubic feet of gas from the Shirebrook Company. They had no fault to find with the existing supply in Warsop Vale, either with regard to service or price. The Great Central and Midland Railway Companies felt strongly that, as a satisfactory supply could already be had on fair terms, it would not be right for the Council to embark on a scheme which would no doubt result in the levying of a rate-in-aid.

Mr. HUTCHINSON, in reply, argued that as soon as the Mansfield Corporation were dispossessed of their rights, either by agreeing to relinquish them or being paid, the rights they had held were automatically transferred to the Warsop Council. So soon as the consent of the Local Government Board was obtained, the process became effective. The Council had the confidence of the ratepayers, who had declared that they should be entrusted with the powers of lighting the district. Why should three big ratepayers, however large their financial interests, be allowed to dominate the express wishes of at least 700 of the others? As to the Shirebrook Company, he did not wish to say anything against them. But were they to say that, for the sake of them getting extra dividends, the Council's powers under the Public Health Act, in regard to establishing a gas undertaking, should be abrogated? If they were enabled to do this, a very dangerous precedent would be set.

After it was known that the Local Government Board had refused to grant the Order, a public meeting was convened by the Urban District Council; and thereat the following resolutions were unanimously carried: "That this meeting authorize the Warsop Urban District Council to oppose the Shirebrook Gas Company's Bill, with the object of getting the best protective clauses they can;" and "that the Council endeavour to enter into negotiations with the Staveley Coal and Iron Company, the Great Central Railway, the Mansfield Corporation, and all the opposing parties at the recent inquiry, with a view to enlisting their co-operation to secure a protective clause favourable to the future interests of the parish."

Water Scheme for Baku.—Among other public works which are to be carried out at Baku, for which the town authorities have raised a loan of 27 million roubles, is a scheme of water supply. It is proposed to bring the water from the springs at Shollar, about 120 miles from Baku. This water, which has undergone natural filtration, will be delivered untreated. The pumps required for the work will have to be imported, as Russia cannot supply them.

Portchester Water Supply.—The Admiralty officials in Portsmouth Dockyard have called upon the Fareham Rural District Council to furnish a sufficient and proper water supply to Portchester, which is within the Council's jurisdiction. The case for the Admiralty is that the coastguard well at Portchester is so foul that the water has become unfit for domestic use, as proved by analysis; and owing to this, at great inconvenience, a supply has had to be obtained from the Portsmouth Water Company's mains. The Council are, however, of opinion that the Company have no such right of service as that mentioned, and that the laying of a special main to Portchester could not be undertaken because of the great expense. The Fareham Council have resolved to undertake a separate analysis of the water from the well in question.

LONDON COUNTY COUNCIL AND THE NEW BURNER.

At the Meeting of the London County Council last Tuesday, the Public Control Committee presented a report on the Gas Companies (Standard Burner) Bill (No. 1). They pointed out that, as introduced, the Bill sought to provide, in the case of the Brentford and Wandsworth and Putney Gas Companies, and certain companies who do not supply gas in London, for the adoption of the "Metropolitan" argand burner No. 2 as a standard, in substitution for the various burners now in use for the official testing of the illuminating power of gas supplied by them. The Council on the 1st of March resolved that an amendment should be sought in the Bill, to provide that the gas supplied by the Wandsworth and Putney Company should in future be tested by the Council instead of by the Wandsworth Metropolitan Borough Council. Other amendments were proposed on behalf of the Council, the chief of which was one having for its object the setting up of a standard of calorific power. The Committee reported that the Wandsworth and Putney Gas Company and the Brentford Gas Company had withdrawn their names from the schedule to the Bill, and that it was not possible, therefore, to proceed with the Council's amendments. The report was received without comment.

MANCHESTER AND ITS GAS PROFITS.

Call for £1000 a Week in Aid of Rates.

Faced with an inevitable increase in the rates for the present year the Finance Committee of the Manchester City Council are bringing pressure to bear on the trading Committees to hand over out of profits a larger sum than has been decided upon. An intimation has also been made to the spending departments to revise their estimates; it being hoped by such means to keep the advance in rates down to 1d. instead of 3d., as at present shown by the accounts. As matters stand at present, there is a net decrease of £22,250 in the contributions from the trading Committees; and the increases in estimates of other departments total £120,400. The Gas Committee propose to allocate out of profits, in aid of the rates, a sum of £40,000, which is £10,000 less than was handed over last year; and the Tramways Committee have decided to reduce their contribution by £15,000. The Electricity Committee have resolved that their contribution shall be the same as before—viz., £12,000.

Last Friday a deputation from the Finance Committee waited upon the Gas Committee and asked that a larger sum than £40,000 should be handed over from the profits of the department. After having had the position explained to them by the Lord Mayor and members of the deputation, and following a long discussion on the points raised, a resolution was adopted by the Gas Committee that they could not see their way to handing over more than £40,000; the suggestion being made that the Electricity Committee should contribute a larger sum than £12,000.

The estimated profit for the year on the working of the Gas Department is put down at £43,000; but provision has to be made for a sum of £9000 expended on works for which there are no borrowing powers. A diminution in the receipts for the past year is attributed to the keen competition of the Electricity Committee. Interviewed on the subject, Alderman Gibson, the Chairman of the Gas Committee, said: "During the past two years, owing to the price of coal and the demands made by the Finance Committee, our reserve fund has been depleted. Last year we had a decrease of 1 per cent. in gas consumption, though there has been an increase of 4000 in the number of consumers. This 1 per cent. is equal to £9000 a year. In my opinion, this reduction arises from the keen competition of the Electricity Committee—a Committee which is permitted to borrow what it wants and when it wants, and to sell its product at whatever price it likes, without being compelled to pay anything towards the reduction of the rates. On the other hand, the Gas Committee is expected to take £1000 a week out of its profits in aid of rates, and is not able to sell gas at a price to allow it to compete fairly with the Electricity Committee. Upon the face of it, this seems to be very much like subsidizing one department and penalizing another. I think this is neither a wise policy nor a fair system of trading." Alderman Gibson added the information that since the gas undertaking became the property of the Corporation in 1844 a sum of £2,846,787 has been paid out of profits in relief of the rates.

The Electricity Committee's accounts for the year ended March 31 show a surplus of £35,220, of which £12,000 has been handed over. The Committee have decided that the balance of £23,220 shall be placed to a renewals account. During the past year, the sales exceeded all previous records, despite the fact that there had been a reduction of more than a million units of electricity used for traction purposes. On lighting there was an increase of more than half-a-million units; and on power sales, an increase of 5 millions.

ROCHDALE GAS PROFITS.

Larger Grant Required in Aid of the Rates.

At a Special Meeting of Rochdale Town Council next Thursday, the Finance Committee will submit a series of recommendations by which it is hoped to avoid any increase in the rates for the year. One of the proposals is that "an extra amount be taken from the gas and electricity profits." If the estimates of the various Committees were accepted as they stand at present, and the contributions from the Gas and Electricity Departments remain as fixed by the Committee, the rates would be at least 6d. in the pound more than they were last year; bringing them up to 8s. 3d. This is in consequence of the increased demands of the spending departments, and a deficit of £2990 on the water-works undertaking—the latter being £1741 more than it was twelve months ago.

On the past year's working of the gas undertaking there was a gross profit of £25,326, compared with £22,927 for the previous twelve

months. After deducting interest, sinking-fund charges, &c., there remains a net surplus of £13,664, out of which the Committee propose to give £8000 in relief of rates; placing the balance to reserve. Last year the Gas Committee handed over £10,000; and the lessened contribution equals a rate of 1½d. in the pound. The reason the Gas Committee have decided to contribute a smaller sum this year is because of their requirements in the way of new plant.

It should be explained that the large deficit on the water-works department is due to the necessary renewal of mains.

GAS, WATER, AND GENERAL INVESTMENT TRUST.

The Work of the New Board.

It may be remembered that some twelve months ago the Board of the Gas, Water, and General Investment Trust resigned in a body; and last June the following new Directors took their places: The Hon. Arthur Stanley, M.P. (Chairman), Mr. Claude E. S. Bishop, Mr. Percy Cross, Mr. Frederick Hill, and Mr. Michael B. Snell. At the general meeting last Thursday, these gentlemen presented their first annual report, which stated that they accepted office at a time when the credit of the Trust was at a very low ebb. Large loans from bankers and brokers, coupled with the unliquid state of the Trust's assets, greatly impeded the Directors in their efforts to place affairs on a more reasonable and businesslike footing. They had succeeded in reducing the loans to £111,319, as against £155,592 in the previous year, and the other outstanding liabilities to £40,359, as against £61,024. This reduction had been effected as far as possible by the sale of non-dividend bearing securities. The affairs of the United Railway and Trading Company, Limited, in which the Trust had embarked a sum of approximately £250,000, had occupied a considerable amount of attention, and negotiations were pending which might result in placing this Company on a much sounder footing. Since the end of the year, the liquidation of the City of Wellington Electric Light and Power Company had been completed; and a further return of 9s. 9d. per share would be received, which the Board considered most satisfactory. Had the revenue of the Trust been calculated on the same lines as in the previous year, there would have been a loss of £3989, as compared with £5528; but owing to the non-inclusion of a sum of £1818 received which had been placed to suspense account, the accounts showed a loss on the year of £5807, which had been deducted from the amount brought forward from last account, and left £2666 to be carried forward. The Board had devoted considerable time and attention to an investigation of the circumstances attending the acquisition by the Trust of certain of its largest investments. The opinion of eminent Counsel had been taken on the subject; and their advice had been adopted. They regretted to report the death of the Secretary (Mr. David Sluter), in whose place Mr. William Parker had been appointed.

In moving the adoption of the report and accounts, the Chairman said the new Board had taken office with a feeling of considerable responsibility, as it was a matter of public knowledge that the affairs of the Trust were not in a very good condition. He did not wish in any way to exaggerate; but it was a fact that this responsibility had not proved to be any less than they thought. Indeed, the position as they found it was every bit as bad as, if not worse than, they had been led to believe. He considered, however, there was a basis on which the Trust could be worked. It would take a great deal of trouble; but in course of time he thought they would be able to produce some satisfactory results. An enormous amount of money was invested in securities which did not bring in any return. This was a sort of dead-weight; and the Board were anxious as far as possible to get rid of the non-dividend paying securities, thereby diminishing the loan from the bank. The year before the present Directors took office, the Trust failed to earn the debenture interest by £5500; but they had since come appreciably nearer the point at which they would meet this charge. He hoped that by this time next year (when the present Board had taken the opinion of the very best Counsel; and though he was not in a position just then to make a definite statement, he confidently hoped that before long this action would have borne some fruit. Before sitting down, the Chairman pointed out that it had been intended to proceed with the alteration of the name of the Trust; but some question had arisen with the authorities regarding the new title chosen. If, however, they could hit upon another name that would suit them, steps would at some future time be taken to make the change. He explained that the reason for desiring the alteration of the name was that, in the first place, the Trust was, he believed, started to deal mostly with gas and water securities. This, however, had now ceased to be the principal part of its business; and so the name was rather misleading.

After the motion had been seconded, several shareholders addressed the meeting. The first suggested that it would be better to form a new Trust to take over the assets of the present one. Another thought the question of name was not very important. What was required to secure good business was a good Board; and this they now had. Still on the subject of the name, a proprietor suggested that the change of title would offer a good opportunity for altering the Articles of Association so that the amount of money placed in any one investment should be limited. Yet another speaker expressed the opinion that, while changing the name, they should also re-arrange the capital and everything else connected with the Trust. The Chairman, in his reply, said he quite agreed that a reorganization of the Trust would be necessary at some time.

The report and accounts were unanimously adopted; and the other business of the meeting was then transacted.

Though no shareholder said as much, there must have been some in the room who thought it would have been better if the Trust had put more money into "gas" and "water," and less into "general" securities. Had a very much larger sum been invested, and retained, in

sound gas and water undertakings, the affairs of the Trust could not very well have reached their present admittedly deplorable condition. Accompanying the report was a schedule of investments held by the Trust on Jan. 28 last; and from this it appeared that the holdings in gas and water companies' securities are not of an extensive character.

PRIMITIVA GAS COMPANY OF BUENOS AYRES, LIMITED

Good Prospects for the Amalgamated Company.

The Annual General Meeting of the Company was held last Friday at the River Plate House—Mr. A. E. BOWEN (Chairman of the new amalgamated Company) in the chair.

The SECRETARY (Mr. J. M. Macmorran) read the notice convening the meeting.

The SOLICITOR next read a number of extraordinary resolutions to be submitted to the meeting, the first of which changes the name of the Company from the Primitiva Gas and Electric Lighting Company of Buenos Ayres, Limited, to the Primitiva Gas Company, Limited. The remaining resolutions referred to variations in the Articles of Association to make them conform with the requirements of the amalgamated Company.

The CHAIRMAN, in moving the adoption of the report and accounts said he did not think it would be necessary for him to keep the shareholders very long, as, of course, they were only dealing with the accounts of the old Primitiva Company to Dec. 31 last; and, as the shareholders were aware, the situation changed radically on the 1st of January this year, inasmuch as on that day the Primitiva Company took over the working of the other two Companies—the River Plate and the Buenos Ayres (New) Gas Companies. Since then they had all been very busy getting the new organization into shape. As could be easily imagined, this was quite a big business, as all the staffs, both in London and in Buenos Ayres, had had to be re-arranged. Some of this re-arrangement was still pending; and therefore he did not propose to deal with it that day. But if he was fortunate enough to meet the shareholders next year, he should without doubt be able to give them full details and a satisfactory account of what had been done in this direction. Owing to the amalgamation, neither the Buenos Ayres (New) nor the River Plate Company would publish balance-sheets or reports because their final dividends, for the year 1909, were provided for in the amalgamation with this Company. These dividends would be paid next day, at the same time that the Primitiva Company got their dividend. But the shareholders would, no doubt, like a few words about these Companies. They both did extremely well in 1909—better than was expected in face of the reduction which the Companies were all compelled to make in the selling prices of their gas. As from Jan. 1 this year, the three sets of figures had been put together; and he was very glad to be able to say that the surplus, after paying the dividends, was a substantial and satisfactory one. With regard to the business of the old Primitiva Company (he said "old" as it was the first Gas Company in Buenos Ayres, and was known as the old Company there), it would be seen that in the report it was stated that the demand for cooking stoves and heating apparatus continued to show a steady increase. It was hardly worth while troubling about figures this year, as next year they would be given for the amalgamated Company. As far as they had gone in the present year, business promised very well, although, owing to the partial failure of the crops on the other side, outward freights had been and still were, very high. Although he did not like to be too sanguine he was able to say that, in his opinion, this amalgamation was going to be a successful one, and that they would do quite as well as, perhaps better than, was anticipated when the shareholders were asked to agree to the amalgamation. The City of Buenos Ayres, in which they had virtually a monopoly of the gas business, continued to increase in size and in population. Business had been prosperous this year, though perhaps not so much so as in previous years, owing to the partial failure of the wheat and other crops; but there was really nothing to worry about, because, after all, the quantity of grain available for export was still very considerable. The political situation in Argentina was satisfactory and defined, inasmuch as the election for the renewal of the Chamber of Deputies, and for the election of the President, who was to take office in October next, passed off last month very satisfactorily. There was no disturbance of any kind; and the country seemed to be quite satisfied with the President and Vice President elect. Politics, as they all knew to their cost, had a very strong bearing upon business prosperity, so the Directors were very glad to see that any chance of things going wrong in this direction in the Company's field of action was over for the present. Turning to the financial statements, on the right-hand side of the profit and loss account, the revenue showed an improvement over the previous year of £9912, at £107,325. The interest received from the Electric Company was £400 less, owing, of course, to the amortization. On the left-hand side, the interest paid on the debentures was also less by some £280; interests, discounts, &c., were £536 less than last year; the London office expenses, Directors' fees, &c., were up some £360 owing to an extra amount of cablegrams in connection with the amalgamation, to a slight increase in salaries, and to a small subscription given towards a memorial in commemoration of the Argentine Centenary. The income-tax was higher by some £600. This left a balance to be carried to the balance-sheet (£9398 more than last year) of £98,420. On the left-hand side of the balance-sheet, the capital authorized and issued was the same as last year; but the next balance-sheet would, of course, tell a very different story in this respect. The debentures were down by £8200; this amount having been redeemed during the year. The sundry creditors and credit balances showed an increase of £4755. On the other side, the capital cost of additions to works, &c., was more by £21,372, owing to the increases made during the year; the additions consisting principally of 15½ miles of mains. Stocks of coals, &c., were higher by £13,430; but this, of course, was another fluctuating item which varied from hour to hour. Investments were lower by £30,000, owing to sales made to provide capital for the extensions. Sundry debtors and debit balances were up £13,100; but this also was

accidental. The bills receivable were £24,000 better than last year, £34,000; and the cash was down £1129. The next item—in a suspense account—was money spent before the end of the year on the demolition of the Retiro works, which, as the shareholders knew, had to be dismantled, and the land handed over to the Municipality as soon as possible after June 30 this year. This would be dealt with in the accounts for the current year. Now, with regard to the profit and loss account, the Directors had to deal with an available total of £156,675, which was £20,500 better than last year. After deducting the debenture interest, London expenses, &c., and the preference dividend and interim dividend of 2s. 6d. per share paid on Oct. 31 last, there was a balance of £75,323, which was £30,000 more than last year. Out of this, it was proposed to pay the usual balance dividend of 4s. 6d. per share on the ordinary shares, making a total distribution of 7 per cent. for the year; and this, of course, was free of income-tax as usual. There was only one further item of interest with which he need trouble the shareholders, and that was that they proposed to pay the preference dividends in future on July 1 and Jan. 1 each year. It would be noticed that the carry-forward was £57,323 this year, against £26,903, that they had a substantial amount in hand towards the payment of the preference dividend due on July 1.

Mr. H. E. JONES, in seconding, said a more eloquent comment on the position of the Company than any speech that could be made was the appreciation of the shares in the market since the amalgamation. The Directors had been very busy; and they had still a great deal of work before them. It was an important and not a light thing to have to demolish the Retiro works, and re-establish the plant elsewhere within twelve months.

The CHAIRMAN, replying to a shareholder who desired to know when the share certificates would be exchanged, said they were now being written out; and as soon as they were finished, they would be distributed. This, he thought, would be some time in May.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. C. H. SANFORD, final dividend was declared at the rate of 4s. 6d. per share, on the ordinary shares (free of income-tax), making 7 per cent. for the year.

The retiring Directors (Mr. H. E. Jones, Mr. C. H. Sanford, and Mr. W. W. Phipps) were re-elected, as were also the Auditors (Messrs. J. A. Touche and Co.).

On the motion of the CHAIRMAN, seconded by Mr. J. MURRAY BULLOCK, the extraordinary resolutions referred to at the commencement of this report were unanimously passed.

The CHAIRMAN asked the shareholders to join with the Board in a vote of thanks to the London staff, the staff in Buenos Ayres, and especially to the Local Committee and the Chairman, Mr. S. Hale Pearson. In his remarks, he said he thought the shareholders could hardly fully realize the amount of work, trouble, and worry that had had to be met to bring about the amalgamation. He must say that Mr. Pearson had worked like a slave over it; and for that matter so had everybody else. But Mr. Pearson had had to bear the heat and burden of the day.

Mr. JONES said he was pleased to second the motion. They owed much to their Local Committee; and the delicate negotiations had been conducted by Mr. Pearson with extreme success. They were also fortunate in their Secretary, who had the assistance of the Secretary of the River Plate Company.

The motion was cordially agreed to.

The SECRETARY having responded,

Mr. SANFORD remarked that they could not separate without passing a vote of thanks to their Chairman; and he moved accordingly.

Mr. JAMES ANDERSON, in seconding, said he should like to include the remaining members of the Board. This was the first time they had met before them the entire Board; and the shareholders ought to express their gratification at the way the amalgamation had been carried out. It was, to say the least, an eloquent testimony to the great diplomatic skill of the members of the Board. He knew that it was a fairly easy business to amalgamate two companies; but it was a difficult thing to amalgamate three. The Board had done a great work. They had eliminated the element of competition; and they could now present a strong front against any local trouble that might arise.

The motion was heartily passed.

The CHAIRMAN, in acknowledging the vote on behalf of himself and his colleagues, said that it had indeed been a big job to get the amalgamation through; but he was sanguine it would be satisfactory and would produce good returns. There would, however, be no more amalgamations for him. It was too big a task.

Inspection of Oldham Corporation Gas and Water Accounts.—At the last meeting of the Leeds Urban District Council, a resolution was passed at a joint conference of representatives of District Councils recently held at Chadderton. In their opposition to the Oldham Corporation Bill last year, they obtained the insertion of a clause giving power to the out-townships to inspect the gas and water accounts. At the joint conference, a recommendation was made to appoint a chartered accountant as a joint inspector to undertake the work. The Council decided to acquiesce in the recommendation. The Crompton District Council came to a similar decision.

Trial of Inverted Gas-Burners in Islington.—At the last meeting of the Islington Borough Council, the Lighting Committee reported having considered a letter from the Gaslight and Coke Company calling attention to the greater efficiency and economy which may be obtained by substituting inverted for upright incandescent gas-burners in the public lamps, and stating that they would be prepared to convert 50 of the existing lamps, so that the Council might have an opportunity of observing the effect before entering into negotiations. The Company proposed not to charge anything in respect of these trial lamps if those in the borough generally are afterwards fitted with inverted burners; but failing this, a charge of 15s. per lamp will be made. The Committee understood, however, that if this charge is made it will be covered by the saving that will have been effected by reason of the smaller quantity of gas consumed. The Committee have deemed it desirable to arrange with the Company to fix inverted burners as suggested; and they will report to the Council again at a later stage.

RADCLIFFE ELECTRICITY SUPPLY.

Encroachment by the Lancashire Electric Power Company.

Early in the present month, an inquiry was opened at Radcliffe, by Mr. Archibald Read, on behalf of the Board of Trade, in regard to an application made by the Lancashire Electric Power Company for a Provisional Order to enable them to supply electricity in the area of the Radcliffe Urban District Council. The Council have the monopoly of the supply of electricity in their district; and the Power Company, who erected a generating station just outside the boundary six years ago, are seeking to deprive them of it. They have latterly made many efforts to supply current in Radcliffe; but the Council have declined to allow them to enter into unrestricted competition with their municipal works. The application was opposed both by the Council and by the Radcliffe and Pilkington Gas Company. The inquiry extended over five days at Radcliffe; and it was resumed and concluded on the 16th inst., at the chambers of the Inspector in London.

The position taken up by the Council was explained by Mr. F. N. Keen, who represented them. He said the exact point submitted to the Inspector was not whether or not the Order the Power Company were asking for should be granted, but whether the consent of the Council ought to be dispensed with. He argued that, under the General Act of 1888, the Company should have the consent of the Local Authority before they could come into their district. The application was vague in character. The draft Order, as deposited, was in the ordinary form of an Order for general supply involving competition with the Local Authority in all branches of their business, whether for lighting, power, heating, or traction. He thought the arguments on behalf of the Council against the Order might be classified under four main heads. The first was that the Electric Lighting Acts did not warrant the making of an Order of this character—in other words, that they were in fact as well as in name electric "lighting" and not electric "power" Acts; the second was that the Order asked for would be contrary to the spirit and intention of the Private Acts of the Power Company; the third was that the application was contrary to general parliamentary practice and precedent; and the fourth was that there was no urgent demand for electricity for power in Radcliffe. He submitted that there were strong reasons in favour of a supply in bulk from Bury, and leaving the entire distribution in the hands of the Council, as opposed to the granting of an Order which would give the Company the right to distribute electricity in detail. In conclusion, he asked the Inspector to advise that the Board of Trade should not dispense with the Council's consent, and should trust them to supply the needs of the districts in such a way as they might think best, and allow them to continue to exercise the powers with which Parliament had thought fit to invest them.

The case for the Gas Company was submitted by Mr. Thomas, of the Parliamentary Bar (instructed by Messrs. Grundy, Son, and Co.). He said the Company objected to the Order applied for on two grounds—first on the ground of the competition which would be involved with their own undertaking; and, secondly, as ratepayers, and the largest in the district, who would, therefore, suffer more than any others through any financial injury which might result to the electrical undertaking of the Council. The Company had already been required by Parliament to face the competition of the electric light undertaking of the Council. They did not like it; but they recognized that gas and electricity had to compete, and they had to make the best of the competition, and meet it as best they could. But what they were asking to be protected from was the altogether new and unprecedented type of competition which would be set up if they had a third party coming with powers of distribution in the district, and producing such active competition—and, he ventured to submit, such unfair competition—both with the existing conductors of the electric light undertaking and the Company, as would result in undue cutting of prices, and considerable injury to the Company for whom he appeared. The Order they had to deal with was one for a general supply of electricity in the district; and he proposed to argue that it was only for the purposes of general supply that the procedure of a Provisional Order was properly applicable. But the promoters had indicated to the Inspector that it was not their wish to become suppliers of electricity generally in the district; and he was therefore content to argue upon what they asked for—viz., a limited Order which would exclude them from the provision of electrical energy for lighting purposes or for power purposes below 30 H.P. Even for these purposes, he argued, there would be substantial competition between the Power Company and the Gas Company. Gas was by no means out of the competition for power; it was still a thoroughly practicable and an economical way of driving. Counsel referred to certain evidence given on this point, and argued that the Power Company would be in a position, if they were so inclined, to bring the price down to an absolutely impossible figure for an undertaking such as that of the Council or of the Gas Company to compete with on anything like even terms. Interests had to be measured according to their relative importance; and the first was the interest of the ratepayers. This was the statutory position which governed the matter. Parliament and the Board of Trade had, he submitted, deprecated competition between power companies and local authorities. They had also made it the universal practice—of which the present application was the first really attempted exception—to make the rights of power companies dependent upon strictly parliamentary Statutes. A power company was relieved from the general law which made it necessary to charge equally to all customers in their area, and—what was still more important—such a company was relieved from the obligation of being purchasable by a local authority. In conclusion, Counsel contended that the applicants had not shown any substantial body of power users who were ready to take electricity, and argued that for purposes of cotton mills and paper making, which were some of the principal industrial purposes of the mills in the Radcliffe district, it was still an open question whether electricity was cheaper than steam, or steam cheaper than gas plant. There was no evidence before the Inspector to justify him in taking the view that the Council had abused the discretion Parliament had given them.

Replying, on behalf of the Power Company, to the legal arguments

against the application, Mr. C. H. Pickstone contended that the Company were properly applying for the Order under the powers Parliament had reserved to them in their Act of 1900. They were expressly authorized, in addition to furnishing a bulk supply, to sell in a general supply district, which was defined as that of an urban district council in precisely the same position as Radcliffe. Asked by the Inspector what he had to say as to any evidence of demand, Counsel replied that the inquiry was not to depend upon the small *minutiae* of the business; it was a general broad estimate as to whether or not they had made out a demand. Unless they had been able to satisfy the Inspector that there was a demand, and no other reasonably available means of satisfying it except by the granting of the Order, then there was no ground for the application. But the demand was there; and the Radcliffe undertaking would not, either now or by any development that could be anticipated as possible, be able to meet it. He contended that if the development of industry was arrested by the absence of a cheap supply of electricity, it was not in the best interests of the ratepayers in the district.

At the close of the inquiry, the Inspector said he would give his decision as soon as possible.

UNPROFITABLE ELECTRIC LIGHTING IN DUBLIN.

The Right to Charge Deficiency in the Rates.

Readers of the "JOURNAL" are aware that the electricity supply undertaking of the Dublin Corporation is being carried on at a loss. Within the past two years, the Corporation have taken from the rates no less than £14,000 to make up for the loss; and prior to this the rates were drawn upon to the extent of upwards of £50,000. In view of these large levies, some of the citizens are asking whether the Corporation are acting within their legal rights in this respect, and whether there is no way to put a stop to their action. Mr. J. Picton Bradshaw recently addressed to the City Council a letter on the subject; and it brought from the Town Clerk a statement to the effect that, under section 54 of their Provisional Order, they have power to charge any deficiency upon the rates. This statement and the Town Clerk's reading of the Order have been challenged by Mr. Bradshaw, a letter by whom appeared in the "Dublin Evening Telegraph" last Tuesday. He complains that the whole of the section was not read, but only portions and the concluding words; the full conditions which must be complied with before the words came into force being suppressed. He contends that section 25 and Part I. of the Fourth Schedule of the Order, which regulates the price of current, must be read in conjunction with section 54; otherwise the interpretation is misleading and unfair. He advises every ratepayer to procure a copy of the Order, and see for himself how the Corporation have been and are now "safeguarding his interests" in this matter. He points out that the undertaking is purely and simply a trading concern, the profits of which should go to the reduction of the rates; and he submits that it should be run on up-to-date business lines.

After these introductory remarks, Mr. Bradshaw proceeds to direct attention to the portions of the Order specially bearing upon the subject. Section 25, together with Part I of the Fourth Schedule, regulates the price to be charged; while section 54 provides how the revenue thus obtained is to be applied. The Schedule sets forth that "where the Corporation charge any consumer by the actual amount of energy supplied to him, they shall be entitled to charge him at the following rate per quarter: For any amount up to 60 units £2, and for each unit over 60, 7d." This is clear; but how have the Corporation carried out their obligation? Not only have they ignored the £2 per quarter minimum charge, but have reduced the price from 7d. or 8d. per unit to an average charge of 2½d.; thus selling under cost price. Mr. Bradshaw asks: "Is there a single member of the Corporation who would do this with his own business?"

Turning to section 54, Mr. Bradshaw points out that it specifies that all moneys received are to be applied in paying working expenses and the cost of maintaining the undertaking, in paying interest or dividends on moneys borrowed, in providing a sinking fund, and also a reserve fund amounting in the aggregate to one-tenth of the capital. With regard to the first matter, he expresses doubt as to the works having been properly maintained; while as to the reserve fund, which would amount to £60,000, it only stands at the absurd figure of £1332. The reserve is to be applicable to answer any deficit or any extraordinary claim at any time arising against the Corporation; and should this fund be reduced, it may be restored to the prescribed limit as often as such reduction happens. In face of this proviso, Mr. Bradshaw says: "Is there a business-like trading concern that would act as the Corporation have done? Compare Belfast. Notwithstanding that their works are more modern and their capital is about half that of Dublin, they have not only provided a reserve fund amounting to £42,000, but contributed to the relief of the rates last year no less a sum than £8282."

Dealing further with section 54, Mr. Bradshaw points out that the Corporation are to carry any surplus remaining in any one year to the credit of the rates for the improvement of the district, or to reduce the borrowed moneys for the electric undertaking. This, he says, they have completely ignored and disobeyed. Next comes the proviso—a most important one—to the effect that should this surplus in any year exceed 5 per cent. on the capital (in the case of Dublin this would mean some £30,000 in any one year), the Corporation are to make such a rateable reduction in the price of current as in their judgment will reduce the surplus to the maximum rate of profit. It is then, and only then, in the writer's opinion, that the Council can reduce the price, and that to such an extent as will, in their judgment, keep the profits only sufficient to provide the sums named. In other words, the profits are not to exceed a given sum, which is clearly defined.

Mr. Bradshaw now comes to the clause quoted by the Town Clerk: "Any deficiency of income in any year, when not answered out of the reserve fund, shall be charged and payable out of the local rate." He says from this it is clear that any deficit occurring after the maximum price is charged, and after depleting the reserve fund, can be chargeable to the rates. Could anything be clearer? The Corporation contend,

however, that, even before they provide the reserve, properly provide for maintenance, or provide the 5 per cent. on the capital, they can, by beginning at the wrong end, first reduce the current under cost, and charge the loss to the ratepayers, many of whom cannot afford to use this luxury. He quite appreciates the fact that the Corporation have to compete with gas, and thinks they should do it, as long as it is fair competition. The more consumers there are, the better will the concern pay, and the cheaper can current be supplied. As the consumers increase and the consumption warrants it, reduce the price; but he holds that the Corporation have no power to reduce until this time arrives. Further, he understands they have offered a preferential rate of 3d. per unit for a term of five years to several large public institutions; and this he considers to be illegal.

He closes his letter with a few figures showing the results of conducting electricity supply undertakings elsewhere.

PUBLIC LIGHTING OF LONDONDERRY.

Gas v. Electricity.

The Manager and Secretary of the Londonderry Gas Company (Mr. R. J. Skinner) recently addressed a letter to the Town Clerk on the subject of the public lighting of the city, and it was subsequently published in the "Londonderry Sentinel." It appears that at a Local Government Board inquiry held a short time ago in regard to the raising of £10,000 for the electricity undertaking of the Corporation, the Electrical Engineer said current was being supplied to private consumers at less than the cost of production, and that the deficit was debited to the expenditure on public lighting. Mr. Skinner said he considered this grossly unfair to the Gas Company, they being among the largest ratepayers in the city, and also unfair to the citizens generally, as it benefited a favoured few at the expense of the vast majority. It was therefore something to which all had very good reason to take exception. The writer went on to refute a statement made by a member of the Council, that if the Corporation paid treble the price they were paying for the public lighting, they could not get the same light with gas. This, said Mr. Skinner, was not so; and, on behalf of the Gas Company, he made the following offer to the Corporation for the street lighting of the city.

There are in the city 185 electric arc lamps, costing £18 18s. per lamp per annum to maintain, or a total sum of £3496 10s.; and half the number are extinguished at midnight—often earlier. We are safe in assuming that the lamps are not lighted more than 10½ hours every day throughout the year; and allowing for those extinguished at midnight, or 5½ hours, the average then becomes as follows: 93 lamps for 10½ hours; 92 lamps for 5½ hours—an average of less than eight hours per day throughout the year. There is no appreciable difference in appearance and effect between the gas-lamp erected at the ferry landing-stage and the arc lamps in the streets; and upon lamps of a similar nature to this we will base our estimate and make our offer. We will undertake to supply gas, mantles, and globes, clean, light, and extinguish, keep in order generally, replace breakages (except from wanton damage), the same number of lamps as the existing arc lamps for a similar number of hours for the sum of £16 3s. 6d. per lamp per annum, which would mean a gross saving to the city of £2 14s. 6d. per lamp per annum, or a total saving for 185 lamps of £504 2s. 6d. This is no small sum; and it is worth consideration not only by the Corporation, but by the ratepayers generally.

In a post-script to his letter, Mr. Skinner said that in reckoning the number of electric lamps, no notice had been taken of "those that are always out."

Commenting upon the Company's offer, the "Sentinel" expressed the hope that it would receive the serious attention it deserved, as it would largely obviate the necessity of borrowing for an extension of the electric lighting, and save a further £400 or £500 a year to the ratepayers. The writer supported Mr. Skinner's protest against the policy of using money belonging to the ratepayers generally for the benefit of private light consumers, and for enabling the electric light to compete with gas. The article concluded as follows: "When it is realized that the acceptance of the offer would mean an immediate and permanent saving of 1½d. in the pound, the Corporation, in the interests of the citizens, should deal with it on its merits. The present public lighting system is ruinously expensive."

PUBLIC LIGHTING AT CHICHESTER.

Electricity v. Gas.

At the last Meeting of the Chichester City Council, the question of the public lighting came up in a report of the Council in committee which was presented for confirmation.

Confirmation of the proceedings in committee having been moved, Alderman GIBBINGS inquired whether the tenders were exactly in accordance with the advertisement, and whether they were in order.

The TOWN CLERK (Mr. J. W. Loader Cooper), in reply, said the period of supply was "for one year or upwards." The Gas Company tendered for one, three, or five years, and the Electric Light Company for five years. So far as the period was concerned, both were in order. He had received a letter from the Gas Company; but the Council decided that, for the moment, at any rate, it should not be read.

Alderman GIBBINGS said he thought any ordinary man reading the terms of tenders would take it that he had to tender for one year, and to go on until he was stopped. He held no brief for the Gas Company—in fact, his feelings were entirely with the Electric Light Company on what he had heard had taken place. He thought, however, with regard to the period for tendering, that there should be no suggestion of unfairness.

Mr. C. FOWLER, in view of the divergence of opinion on the question before the Council, and since there was no urgency, moved, as

an amendment, that the matter be referred back to the Council in committee. He said he did this so that both Companies might tender on the one basis. They had had a long and interesting discussion on the matter, and more light was thrown upon it then than at any time before. They had a tender for five years; and it seemed to him, if economy was in their mind, that they would find just as much in gas, if the Company tendered for five years certain. At all events, they might give it a trial. They stood to lose nothing, but they stood to gain. Supposing they came to an arrangement with the Gas Company, there would be no upheaval of the streets, because everything was ready. A saving of £1000 a year was being effected at Victoria Station by the return to gas from electricity; and the men engaged at the station considered it a saving to their eyesight. At Brighton also they had reverted to gas, though the Railway Company were in a position to supply their own electricity. They found it cheaper to buy gas than to generate their own electricity. If the Electric Light Company's tender was accepted, who would pay for the upkeep of the electric lamps?

The TOWN CLERK: They do.

Mr. FOWLER quoted other places which he said had reverted to gas. Berlin had spent £350,000 in doing so; and Hastings had also gone back.

Alderman HOLT seconded the amendment; remarking that no harm would follow by putting the matter off for a month.

Mr. R. BOTTRILL did not think it would be businesslike to refer the question back now. He read a communication from the Gas Company, in which it was stated that the Company had not realized any profit from the public lighting; and therefore it was not expected they would get better terms than those shown in their tender. If they referred the matter back, the Gas Company would tender again, knowing the price tendered by the Electric Light Company; and this would be unfair.

Mr. W. BUTLER agreed with the previous speaker that it would be unfair to the Electric Light Company to allow the Gas Company to tender afresh.

Mr. H. S. AYLMORE also opposed the amendment. He said they had had the tenders before them, and the Council ought to decide forthwith which they should accept. If the matter was deferred, it would be to their disadvantage.

Mr. F. HILL said the main point was the extent of the saving to the ratepayers. There would be £80 a year saved upon the cost of lighting by accepting the tender of the Electric Light Company; and then, too, the new mains, when they were laid, would have to be taxed, which would mean further profit to the city. Moreover, the lamps would belong to the Council at the end of the five years. He had also been given to understand by the Manager of the Electric Light Company that if their tender was accepted, the price of current for ordinary house consumers would undoubtedly be reduced to about 4½d. per unit, which would also be a great benefit to the city.

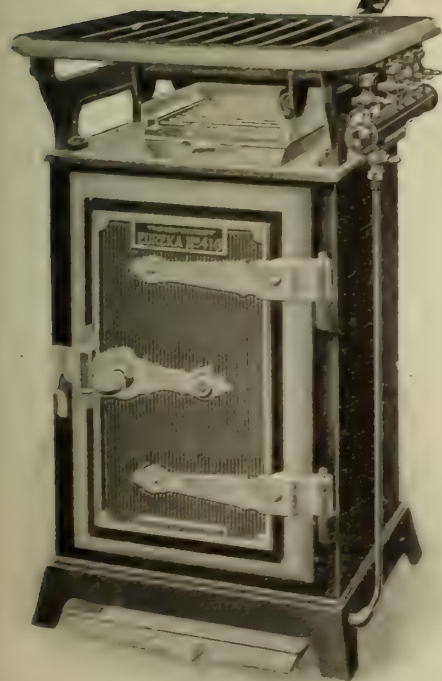
The amendment was then put and lost by 12 votes to 5, and the tender of the Electric Light Company accepted.

ELECTRICITY AND GAS SUPPLY AT FELIXSTOWE.

More Money Wanted—Reply to Mr. Napier Prentice's Circular.

Last Tuesday, Mr. H. R. Hooper, M. Inst. C.E., one of the Inspectors of the Local Government Board, held an inquiry at Felixstowe relative to an application by the Urban District Council for sanction to borrow £4500 for the provision of additional plant in connection with the electricity supply undertaking. The Accountant to the Council (Mr. Arthur Griffiths) produced statistics with regard to the district; and Mr. Napier Prentice, the Engineer of the Suffolk Electric Supply Company, who carry on the works under the Council, gave evidence as to the progress of the Company—stating that a sum of £2250 would shortly be required for extensions to mains. The Inspector said, before dealing with the present loan, he must satisfy himself that the previous sanctions had been expended for items authorized by the Board. Mr. Griffiths explained that a lump sum of £8000 was paid to the Company for the purchase of the works during 1904. Since that time a further £6500 had been expended; but no steam plant, which appeared in the original application, had been put in. He gave details of this further expenditure, and said that the Engineer would explain in his evidence that they had an equivalent in generating power and storage. The Inspector, however, took exception to the action of the Council, as the periods for repayment of loans for accumulators, meters, &c., were much shorter than those for the works sanctioned by the Board. He would require the balance of the existing loan to be repaid and a short-period loan to be applied for. He said the Council had no right to obtain sanction of a loan for certain specific items, and spend the money on others. Mr. Griffiths pointed out the loss which would accrue to the ratepayers if the Board insisted upon the Inspector's suggestion, inasmuch as the amount received from the Suffolk Company would be the same, whereas the Council would have to pay a much larger sum for the repayment of the loan, in addition to the mortgagees' costs and those consequent upon the creation of a sinking fund. Mr. Prentice then gave details of the various engineering specifications, and mentioned that the Council were going to erect a ventilating shaft which would carry above the houses all the fumes coming from the gas-producer plant. Mr. S. Alexander (the Chairman of the Gas Company) complained that he owned property of the value of £1000 which could not be sold in consequence of the annoyance caused by the fumes. He prophesied that the only result of the shaft would be to spread the fumes over a larger area.

At the meeting of the Council next day, Mr. Clarke, in accordance with notice, asked the Chairman of the Lighting Committee whether the circular issued in the name of Mr. Napier Prentice, to which reference was made in the "JOURNAL" for the 5th inst. (p. 20), was the truth, and whether the Council had done their best under the circumstances. Mr. Cowles replied that all he could say was that of the two lighting tenders the Gas Company's was the better and safer to accept. The Suffolk Electricity Supply Company, moreover, could not carry



The "EUREKA"

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Generally and in detail—

They would understand WHY the "Eureka" maintains its recognized superiority of position.

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JOHN WRIGHT & CO.,

Essex Works,
BIRMINGHAM.

the thing through without the assistance of the Council; and this would involve them in considerable capital expenditure beyond paying for the light. It must be remembered that the Council had not only to advance the capital that the Company required, but in a certain number of years they would have to pay 25 per cent. on all they had advanced, if they wanted to buy the business.

INVESTMENT OF GAS COMPANIES' RENEWAL FUNDS.

It will doubtless be remembered that a few weeks ago Mr. Justice Swinfen Eady had before him an action brought by a shareholder in the Worthing Gas Company to compel the Directors to invest their renewal fund in Government or other securities; and his Lordship ordered that this should be done. The question has been raised by correspondents in the "Accountant;" and in some comments in a recent issue the judgment in the Worthing case was cited as a complete answer to their inquiry. We give our contemporary's observations on the judgment.

It shows that, in the event of directors failing to invest instalments of renewal funds in accordance with the regulations of the company, any shareholder, no matter how small his holding may be, may successfully proceed against them by way of action, and obtain a declaration that the instalments so set aside must be invested, and the interest on the investments accumulated until such time as it is necessary to have recourse to the fund for the purpose of meeting expenditure in respect of renewals. To have held otherwise would have been to hold that the words providing for the investment of renewal instalments are meaningless; for if directors have a discretion to postpone investment until a convenient time occurs, they have for all practical purposes the right to postpone indefinitely.

We are, of course, not at all unmindful of the fact that the past few years have been singularly unprofitable to investors; that gilt-edged securities have been suffering more or less from a steady decline in values, which has, roughly speaking, entirely eaten up any appreciation of the funds arising from the accumulation of interest. But that, of course, does not dispose of the whole matter. Probably no Court would attempt to enforce such a declaration against the directors of a company until after the lapse of some reasonable time. It would never be seriously suggested that, whatever the market conditions might be, the Investment of the funds of all gas companies must be effected on the 1st of January, or any other special date. But there is a broad distinction between waiting for the most suitable moment to purchase securities, having decided as a question of policy to do so at the earliest suitable date, and the avowed policy of the Directors of the Worthing Gaslight and Coke Company to use their renewal funds for purposes of extension, in order to keep their capital issues down to the lowest possible figure.

Clearly, the whole object of the Legislature in providing for the investment of these funds is to ensure their availability at short notice

when the need arises. If, when the need arises, no moneys are available without having recourse to borrowing from the bank, or to a further issue of capital, with its attendant delays, it cannot be said that the moneys are in a readily available form. It might even be that they could not be raised at all without further statutory authority. While we thoroughly appreciate the wisdom of a policy which aims at keeping capital commitments as low as practicable, we must confess that it seems to us to be altogether wrong to divert what are virtually trust moneys ear-marked for the purpose of future renewals, and apply them to an altogether different purpose.

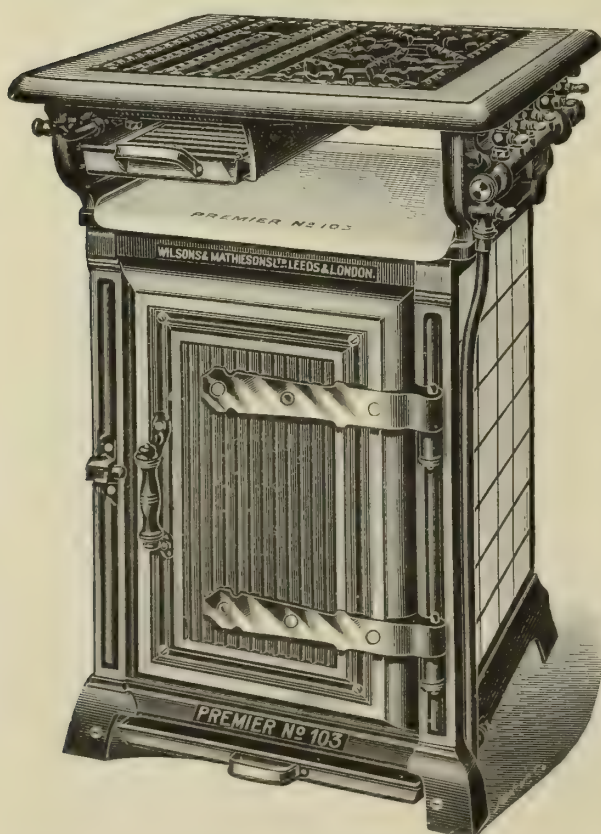
METROPOLITAN WATER BOARD.

New Supply Scheme Approved—Quinquennial Revaluation.

At the Meeting of the Metropolitan Water Board last Friday, the subject of the future water supply of the Metropolis, on which a report was presented by the Works and Stores Committee a few weeks ago, as recorded in the "JOURNAL" for the 15th ult. (p. 752), was again under consideration. According to the scheme submitted, provision is made for a supply of water by means of large reservoirs throughout the Thames Valley, sufficient to give, in 1916, a thirty days' supply for the population which it is estimated will then live in London. The scheme, which would not be completed in its entirety until twenty years hence, is intended to provide water for the needs of London up to 1941, at a cost of £6,273,710. The Finance Committee reported that to this amount must be added the sum of £15,000 to cover the cost of the promotion of the necessary Bill in Parliament, and that the capital outlay on ordinary main extensions and other operations of the Board, not included in the scheme, will probably amount to an additional £150,000 per annum. A total capital outlay of £10,938,710 is therefore contemplated between the years 1911 and 1941. After some discussion, the following recommendation was agreed to, with two dissentients: "That the Board do approve the scheme now submitted by the Works and Stores Committee for the future supply of the Metropolis by means of the construction of reservoirs in the valley of the River Thames in progressive stages." A resolution was also passed authorizing the Law and Parliamentary Committee to prepare a draft Bill to be introduced next session.

This year the quinquennial revaluation of the Metropolis takes place, and the Board have invited representatives of the London County Council and the Metropolitan rating authorities to attend a conference next month with regard to the rating of the Board's property. Five years ago a similar conference was held, and though no decision was arrived at as to the basis on which the water undertaking should be valued—this, it may be remembered, being subsequently decided by Quarter Sessions and the High Court—the exchange of views had beneficial results in bringing about agreements with many of the assessment authorities. Roughly speaking, the rateable value of the Board's property is £1,250,000.

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A New Series of Gas Cookers **most advantageous** to you and your Consumer.

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LARGE "PROTECTED" GRILLER, REMOVABLE
"STAR" BURNERS, IMPROVED "HINGED" HOT
PLATE, SPACIOUS OVEN, &c., &c.

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WOTTON-UNDER-EDGE WATER SUPPLY.**A New Scheme.**

The quaint and picturesque town of Wotton-under-Edge, which is within the area of the Dursley Rural District Council, has just been furnished with an abundant supply of water of excellent quality, in accordance with a scheme prepared by Mr. H. J. Weaver.

The town has a population of about 3000; and the summer supply, derived more or less from surface springs, had, before the scheme was carried out, so diminished as to afford water for only from three to four hours' consumption per day in the autumn. After making a careful geological survey of the several valleys in the district, and testing the yield of the springs, the Engineer selected a spot for driving a short heading, and advised the Council to spend a sum not exceeding £250 in carrying out the work, and for testing the quantity of water obtainable from this source. The work was accordingly undertaken. The yield was taken for a period of twelve months; and it showed that a constant and equal quantity of water per day could be obtained, irrespective of the season of the year, with a tendency to neither increase nor decrease. Samples were taken and submitted to the County Analyst (Mr. George Embrey, F.I.C., F.C.S.), who reported that the waters were unusually pure, and contained less organic matter than any natural water he had hitherto examined. They were well suited for a public supply. The quantity of water obtainable and its quality being both most satisfactory, the Engineer was instructed to prepare the necessary plans, specifications, and quantities, for submission to the Local Government Board; and, after the usual inquiry by an Inspector of the Board, the scheme was approved, and sanction was given for obtaining a loan for carrying out the work—the term of repayment being extended over thirty years.

Briefly described, the new scheme consists in obtaining the water by means of headings driven into the hillside, just above an impervious stratum, at which point the lower springs of the district break out. From these headings the water is conveyed by gravitation, through conduits and cast-iron pipes, to a ferro-concrete sump, having a capacity of 35,000 gallons, whence it is raised to a height of 300 feet to a covered concrete service reservoir capable of holding 90,000 gallons. The contracts were divided into four: (1) Pipe laying and construction of conduit; (2) engine and gas-producer house; (3) pumping machinery; (4) ferro-concrete sump.

Contract No. 1 was carried out by Messrs. Beaven and Sons, Limited, of Gloucester, and consisted in driving headings into the hillside and the construction of a brick conduit set in cement mortar, and laid with open joints, the interstices of which are protected by broken stone laid 12 inches thick over the top and sides of the conduit. The bottom consists of a slit pipe invert, laid on a cement concrete foundation. The receiving chamber is accessible by means of a manhole, and is fitted with a copper weir to register the quantity of water flowing; and means

of inspection are provided by manholes and lamp-eyes. The spigot and socket pumping main, which is 7 inches in diameter and of cast iron, is jointed with lead. It was tested to a hydraulic pressure of 500 feet head, and conveys the water which is pumped from the ferro-concrete sump to the service reservoir.

Contract No. 2 (for the engine-house) was carried out by Mr. A. J. Dolman, of Gloucester. Very great difficulty was experienced in securing a reliable foundation; the site having apparently at some time been a mill-pond. It therefore became necessary to drive piles under the whole of the footings to an average depth of 19 feet. The piles were of pitch pine, and 9 inches square. The concrete placed on the top of these piles was reinforced with steel bars. The building is of pressed bricks and Bath stone, laid in black mortar. The roof is covered with Broseley tiles, and the floor is of cement concrete.

Contract No. 3 was for the pumping machinery. The installation consists of a suction-gas engine and plant and a horizontal three-throw ram pump, capable of discharging 10,000 gallons of water per hour against a total head of about 300 feet. The engine is of the standard horizontal type, made by Messrs. Fielding and Platt, Limited, and is fitted with a single heavy fly-wheel and third bearing, and geared direct to the pumps by means of a clutch. The engine has valves and valve areas specially designed to give the best results when working with suction gas; the valves being arranged so that they may be readily examined or cleaned. The heavy fly-wheel is 7 feet in diameter, weighing about three tons; and the result is a set of engine and pumps running very steadily.

The gas-producing plant, which is also by Messrs. Fielding and Platt, is made suitable for using either anthracite coal or clean gas-works coke. Its leading feature is the regulation of the water supply in accordance with the load on the engine. There is no continuous steam-boiler, but the steam is made as gas is required; consequently there is no surplus of steam on light loads, and the calorific value of the gas is practically constant. The pumps were also manufactured by Messrs. Fielding and Platt, and are of the horizontal pattern, fitted with three rams, 8 inches in diameter. The speed of the pumps is 37 revolutions per minute. The engine uses 0.875 lb. of anthracite coal per brake horse power per hour at full load; and, approximately, for a week of 50 hours the consumption, including stand-by losses, would be three-quarters of a ton of anthracite.

Contract No. 4—that for the ferro-concrete sump—was carried out by Messrs. Hobrough and Co., contractors for the Hennebique system of ferro-concrete. The sump, which has a capacity of 35,000 gallons, is circular in shape, and is constructed on the above-named system. It is wholly in the ground, and at such a level as to permit of the water from the springs gravitating to it. Thence it is pumped to the service reservoir. Messrs. Hobrough and Co. also carried out the pile-driving needed for the engine-house as well as the engine and pump bed foundations.

The Resident Engineers for the work during construction were Messrs. F. G. Church and A. M. Davies, from the office of the Consulting Engineer.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The fate of the Glasgow Gas Consolidation Bill has not yet been decided upon by the Corporation of Glasgow. The subject was before the Town Council on Thursday, when Mr. Battersby asked if the members of the Corporation would be furnished with a full report of the various alterations in the Bill by the Committee of the House of Commons, and if an opportunity would be given of discussing the Bill before further steps were taken in regard to it. Mr. J. Macfarlane, the Convener of the Parliamentary Bills Committee, replied that the revised Bill that passed the Committee had reached him that morning, and that he had called a meeting of the Parliamentary Bills Committee for Monday. The parliamentary recess would take place shortly, and there would be two or three weeks for the consideration of the Bill. When it reached the hands of the members, he hoped they would give it very careful attention, for there was much in it that would be advantageous to Glasgow. He would not like it to be rejected without due deliberation. The Corporation would certainly have an opportunity of discussing it.

For some time there have been incipient troubles in Falkirk, not with the men employed in the gas-works, for they have declared their content with their employment, but with some men who were dismissed in the middle and end of February, and who have asserted that they were dismissed because they were members of the Gas Workers and General Labourers' Union. The Gas Committee had the subject before them quite a number of times, and then, on the 12th inst., they adopted a resolution and reported: (1) That the electrician at the gas-works resigned his position verbally on Feb. 12, and gave one week's warning, and that he handed in to the gas office on the Monday following a written resignation, which the Manager ignored, as he had accepted the verbal resignation on the Saturday; (2) that, after consultation with the Convener and Vice-Convener, the Manager paid the electrician a week's wages on the Monday, and allowed him to go instead of working his week's warning; (3) that in the ordinary course of reducing the gas workers at this season of the year, four men were dismissed by the Gas Manager on Feb. 26, and he paid them one week's wages in lieu of warning; (4) that there was no evidence that the Gas Manager acted in any other way than in the interests of the gas-works; (5) that there was no evidence that the Manager was prejudiced against the men in consequence of their being Trade Unionists, but, on the other hand, the Committee accepted the Manager's assurance that he was not so prejudiced. In the Council, Bailie Boyle, the Convener of the Committee, moved approval of this report. He said the Committee sat for five-and-a-half-hours, and considered the subject in all its bearings; and they came to the conclusion that what the Manager did was right and proper in the circumstances. Mr. Muirhead moved that the subject be sent back to the Committee for consideration on the evidence

which was laid before them. After discussion, the report of the Committee was adopted by seven votes to three.

The Gas Committee recommended that the Council advertise for an Assistant Gas Manager to succeed Mr. H. Rule. Treasurer Wallace moved that they do not, but that the present staff be rearranged and a junior clerk engaged. In support of the appointment, Bailie Boyle said it was obvious that they must have some one at the works able, in the absence of the Manager, to deal with certain eventualities which might arise, and also to do chemical analyses. It was true, as had been said in the Council, that they were not taking all they ought to do out of the works. The residual products might be very much better utilized; but if they made their staff useless, there could be no hope of this being done. The Council adopted the recommendation by seven votes to four.

A danger in connection with the use of prepayment gas-meters was disclosed by an unfortunate incident which took place in Dundee on the night between Saturday and Sunday last. On Sunday morning, a woman who lives in a common tenement in Wallace Street perceived a smell of gas in the entry to her dwelling. She traced the escape to the house of an elderly woman named Higgins, who, with her daughter and granddaughter, lived in the back apartment on the ground floor. Failing to get admission to this dwelling, the woman informed the neighbours; and one of them entered the place by the window. There was a strong odour of gas in the house. Mrs. Higgins was found dead in bed. The daughter was lying on the floor, and her child was in its cot, both unconscious. These were taken to the Infirmary and recovered. The prepayment meter was found to have been pulled off the shelf beside the window, on which it stood, and to be hanging by the connecting-pipes, which were half broken through, allowing the gas to escape. On the corner of the meter there was blood, and a penny was sticking in the slot. There was a slight cut on the head of the old woman. The surmise is that she had been in the act of putting a penny into the meter, and had either pulled this off the shelf, or it had fallen upon her, striking her on the head, and stunning her, but that she had been able to get into bed without seeking assistance.

The Grangemouth Town Council on Monday agreed to recommendations relating to proposed extensions at the Corporation gas-works. These included a boundary wall on the north and west sides of the works, at a cost of £160; a retort-bench, with settings of eights, which, with the excavations, foundations, and ironwork, will cost £420; a 75-feet chimney, with hoops and lightning conductor, at a cost of £193; four 18-feet square purifiers, with 12-inch pipes and connections, and a purifier-house, at a cost of £1300; a drain-pipe from the retort-house, at a cost of £40; and the telescoping of an 80 feet gasholder, at a cost of £700—a total of £2818. The telescoping of the holder was deferred till next year; making the outlay this year £2118. The number of retorts will be increased from 24 to 64. The capacity of the purifiers will be raised from 170,000 to 600,000 cubic feet of gas per day; and the gasholder, when telescoped, will be of 221,000 cubic feet capacity, as against 125,000 cubic feet at present.



RICHMOND'S "NEW CRUSADER,"
showing Fitter reversing hotplate.

FORWARD

BUILDERS of houses nowadays often provide kitchens of very limited area, and it frequently happens there is not room for a gas cooker with taps at the side. To avoid making it necessary to specially order a cooker with "tap-rail in front" we have produced a reversible hot-plate.

Q Simply by the removal of the union at the side connection and the loosening of four screws which secure the hot-plate to the bridges, the whole of the top can be reversed by the gasfitter *in situ*, converting the gas cooker from taps at side to taps at front. **CHANGE EFFECTED IN 5 MINUTES.**

THE RICHMOND GAS STOVE & METER CO., LTD.,

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, April 23.

There has been a quiet tone in the market all through the week, and the tendency of prices has been in favour of buyers; the month's export requirements being already for the most part covered. Home demand has been well sustained, but the bulk of it has not been enough to uphold the market. The closing quotations are, consequently, £12 per ton f.o.b. Hull, £12 2s. 6d. to £12 3s. 9d. per ton f.o.b. Liverpool, and £12 2s. 6d. per ton f.o.b. Leith. The forward position has not attracted attention, and no important business has transpired.

Nitrate of Soda.

This article is steady on spot Liverpool at 9s. 7½d. per cwt. for 95 per cent. and 9s. 10½d. for refined quality, less 2½ per cent.

Tar Products.

LONDON, April 25.

The markets for tar products have been very firm during the week. Pitch is exceedingly strong, both for this season's and for forward delivery. Crude carbolic acid remains in about the same position, and makers are still not inclined to sell at present figures, except in one or two instances. Benzols and solvent naphtha are firm, and prices are fairly well maintained. In creosote, there are one or two inquiries; but prices are not altered.

The average values during the week were: Tar, 16s. 9d. to 20s. 9d., ex works. Pitch, London, 34s. to 35s.; east coast, 34s. to 34s. 6d.; west coast, 34s. to 35s. f.a.s. Mersey ports, 35s. f.o.b. others. Benzol, 90 per cent., casks included, London, 8d. to 8½d.; North, 8d.; 50-90 per cent., casks included, London and North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4½d. to 4¾d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit; packages included and delivered.

[We further learn that 37s. 6d. per ton has been paid in one important instance for business in pitch for this and next year, and that 40s. has also been paid for other large business for this year only—net, f.o.b. in the Thames. Also that, for delivery this year, 9d. per gallon, ordinary terms, has been paid for important business in 90 per cent. benzol.]

Sulphate of Ammonia.

The market for this article is certainly quiet, and manufacturers in all quarters have been more inclined to listen to lower prices.

To-day actual Beckton is quoted at £12 5s. Outside makes, upon Beckton terms, are £11 15s. In Hull, £12 to £12 2s. 6d. is quoted; Liverpool, £12 2s. 6d. to £12 3s. 9d.; Leith, £12 5s. to £12 7s. 6d.; and Middlesbrough, £12 to £12 2s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

With a fuller output, the demand for coals is well maintained; but the prices are occasionally weaker. For best Northumbrian steam coals, from 11s. 6d. to 11s. 7½d. per ton f.o.b. is now quoted; second-class steams are 10s. 6d. to 11s.; and steam smalls from 6s. 6d. to 7s. 6d. The production is near that which is normal; but the opening-out of the Baltic and Northern trades has enlarged the demand. In the gas coal trade, the home consumption is only moderate, as is usual at this season; but the exports are steady, and seem to be increasing. Durham gas coal varies in price according to quality. The usual classes are now about 10s. 3d. to 11s. per ton f.o.b.; while for "Wear specials," up to 11s. 6d. is quoted. There have been some negotiations as to coals for the London gas supply, and it is said that about 9s. 6d. per ton f.o.b. has been offered by the users. The exact position is not yet known, however, though some settlement is expected shortly—the sellers' quotations being higher. One or two small contracts have been settled for export, at rather better rates, and others are also pending. In the coke trade, the demand is steady; and as there is a lessened production of gas coke, this is firmer. The quotation for good gas coke is from 14s. 3d. to 14s. 6d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

The market was quiet during the week, the inquiry for shipment having fallen off. The home demand for ell and splint was also easier, and prices were, in consequence, not so firm. For small sorts, prices were well maintained. The quotations are: Ell, 9s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. to 10s. 6d.; and steam, 10s. to 10s. 6d. The shipments for the week amounted to 315,292 tons—a decrease of 4241 tons upon the previous week, but an increase of 2207 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,397,725 tons—an increase of 676,677 tons upon the corresponding period.

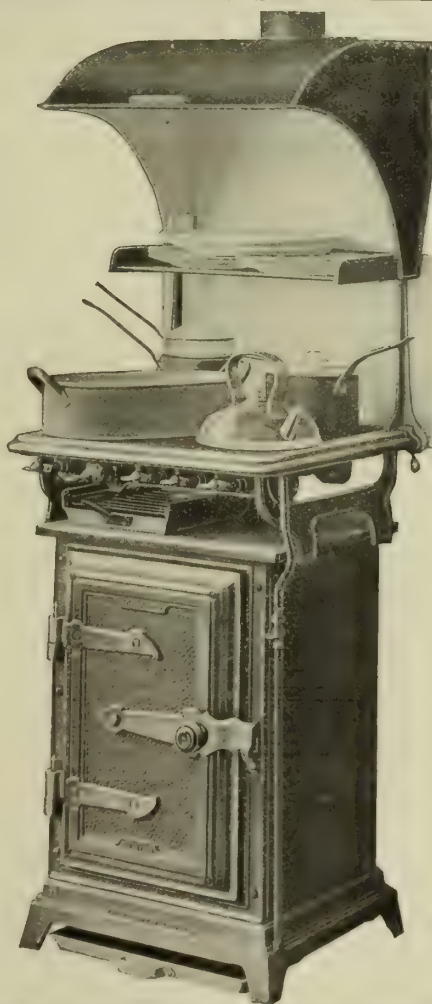
The summer booklet of the Richmond Gas Stove and Meter Company, with a bright cover, printed in eight colours, is very pleasing and attractive. The articles described in its 48 inside pages are effectively illustrated; an art surface paper being used in printing. A page for memoranda, either by the consumer or by the show-room assistant when handing a booklet to a customer, is a commendable feature. The Company's "New Crusader" cooker, with reversible hot-plate, is specially dealt with at the commencement.

MOVEMENTS

ANOTHER improvement we have introduced this Season is a combination plate-rack, removable back and hood, which combination can be fixed to the cookers of any make complete, or the plate-rack alone without the hood. These accessories are bound to commend themselves to the housewife.

The plate rack has two sides which clip on to cooker cornice and are held with a thumb screw rigidly in position. The rack holding plates is movable and can be swung back out of the way. The hood slides into grooves in the plate-rack. Thus the whole of the combination is built up to the complete structure, ALL PARTS BEING REMOVABLE.

The Inventors of the White Enamelled Crown Plate, Screwless Enamels, Removable and Screwless Gas Tap Rail, and NOW THE REVERSIBLE HOTPLATE, AND COMBINATION HOOD AND PLATE RACK.



Trade Union Funds.—A Bill presented by Mr. W. Johnson, and supported by Mr. Shackleton and other Labour Members, has been issued. It is entitled the Trade Union Law Amendment (No. 2) Bill; and it provides for the application of Trade Union funds to the maintenance of Members of Parliament and other public bodies. The clause on the subject is as follows: "A Trade Union, as defined by section 16 of the Trade Union Act Amendment Act, 1876, may, notwithstanding any of the provisions of the Trade Union Acts, 1871 and 1876, either acting by itself or in conjunction with any other Trade Union, association, or body, apply its funds for or towards the purpose of procuring the return and providing for the maintenance of members of Parliament, or public or local authority, or of any other public body, and may do such other acts as may be necessary to forward the interests of workmen by political action or otherwise."

Prepayment Meters at Morecambe.—On the minutes of the Gas Committee coming before the Morecambe Town Council, Mr. Dickinson drew attention to a resolution that no slot-meter be fixed in any house over £18 rateable value. He said he understood that users of slot-meters paid a higher price for gas than ordinary consumers. If this was so, why should not the occupier of a house over £18 be allowed to have one? He moved that the minute be referred back. Alderman Snowden asked what was the difference in the cost of slot-meters and ordinary meters. He did not want it to go forth that they were charging users of slot-meters considerably more for gas. Mr. Wright asked

if the resolution was retrospective. Did they intend to take any slot-meters out of £18 houses? Mr. Gorton, in reply, said there might be one or two £18 houses that had slot-meters; but there were not many. Mostly, these meters were in cottages. They had sufficient ordinary meters to fit the whole town; and, in addition, they had 2000 slot-meters. A slot-meter cost about 30s.; but it would not supply sufficient gas for a large house, and when one of these meters had been fixed in a large house there had always been a complaint that the gas was poor. The greatest objection, however, was the capital expenditure involved. The difference between gas at 3s. 9d. per 1000 cubic feet per ordinary meter and the price by slot-meter was 5d., which was supposed to cover the capital charges. Mr. Saxton seconded the amendment; remarking that he could not see there was any difference in the capital expenditure between slot-meters and ordinary meters. If slot-meters were a convenience, why should they not be supplied to the higher-rated houses? If people preferred to pay the 5d. extra, and paid ready cash, it would be a benefit to the town. The amendment was rejected, and the minutes approved.

The Barrow-in-Furness Corporation Gas Department have placed with the Richmond Gas Stove and Meter Company the whole of their requirements for cookers during the next twelve months.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT-ENGINEER. No. 5228.
ENGINE MAN. Barnoldswick Gas and Water Department. Applications by May 3.
STOKER. Holmfirth Gas Company.

Agent Wanted. No. 5229.

Plant, &c. (Second Hand), for Sale.

EXHAUSTERS AND STEAM ENGINES, &c. Smethwick Gas Department.
PURIFIERS, &c. Sunbury Gas-Works.
STATION METER. R. Laidlaw and Son, Edinburgh.
TANK WAGGONS. Watson, Sower, and Co., Derby.
WASHER, &c. Whitehouse's Executors, Ilkeston

Plant, &c. (Second-Hand), Wanted.

GAS METERS, STATION METER, &c. 154, c/o T. B. Browne's Advertising Offices.

Stocks and Shares.

CHIGWELL, &c., GAS COMPANY. May 3.
HARROW AND STANMORE GAS COMPANY. May 3.
HORLEY GAS COMPANY. May 3.
LEA BRIDGE GAS COMPANY. May 10.
SOUTHEND GAS COMPANY. May 3.
WALTHAM ABBEY, &c., GAS COMPANY. May 3.

TENDERS FOR

Benzol.

FOR EXPORT TO THE CONTINENT. No. 5226.

Coal and Cannel.

BRENTWOOD GAS COMPANY. Tenders by May 3.
CROMER GAS COMPANY. Tenders by May 7.
DEVONPORT GAS DEPARTMENT. Tenders by May 2.
EASTBOURNE GAS COMPANY. Tenders by May 3.
ELSECAR, WENTWORTH, AND HOYLAND GAS COMPANY. Tenders by May 11.
MOSSLEY GAS DEPARTMENT. Tenders by May 2.
RAMSGATE GAS AND WATER DEPARTMENT. Tenders by May 9.

Incandescent Goods.

CALCUTTA CORPORATION. Tenders by June 6.
DUBLIN CORPORATION. Tenders by April 30.

Lanterns, &c.

CALCUTTA CORPORATION. Tenders by June 6.
DUBLIN CORPORATION. Tenders by April 30.

Iron and Steel Work for Retort-House.

GUILDFORD GASLIGHT AND COKE COMPANY. Tenders by May 12.

Oxide (New and Spent).

DEVONPORT GAS DEPARTMENT. Tenders by April 30.

Pitch. No. 5230.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 230.

| Issue | Share. | When ex-Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue | Share. | When ex-Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|------------|--------|-------------------|--------------------|------------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|--------------------|-------------------------------|-----------------|---------------------|------------------------|
| £ | Stk. | Apl. 1 | p.c. | Alliance & Dublin Ord. | 83-85 | -2 | 5 17 8 | £ | Stk. | Nov. 11 | p.c. | Imperial Continental | 181-183 | .. | 4 7 5 |
| 1,474,000 | Stk. | Jan. 13 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 4,940,000 | Stk. | Feb. 10 | 3 1/2 | Do. 3 1/2 p.c. Deb. Red. | 94-96 | .. | 3 12 11 |
| 310,000 | Stk. | Oct. 28 | 7 1/2 | Bombay, Ltd. | 6 1/2-6 3/4 | .. | 5 5 8 | 1,235,000 | Stk. | Mar. 16 | 6 | Lea Bridge Ord. 5 p.c. | 222-224 | .. | 4 16 9 |
| 200,000 | 5 | .. | 7 1/2 | Do. New, £4 paid | 5-5 1/2 | .. | 5 6 8 | 195,242 | Stk. | Feb. 25 | 10 | Liverpool United A. | 163 1/2-165 1/2 | .. | 4 9 3 |
| 40,000 | 5 | .. | 15 | Bourne-) 10 p.c. | 29-30 | .. | 5 0 0 | 561,000 | " | .. | 7 | Do. B | 103-105 | .. | 4 4 7 |
| 50,000 | 1 1/2 | Feb. 25 | 7 | mouth Gas) B 7 p.c. | 16 1/2-16 3/4 | .. | 4 3 7 | 718,100 | " | Dec. 29 | 4 | Do. Deb. Stk. | 103-105 | .. | 3 16 7 |
| 311,810 | 1 1/2 | .. | 12 1/2 | and Water) Pref. 6 p.c. | 15-15 1/2 | .. | 3 17 5 | 75,000 | 5 | Nov. 26 | 6 | Malta & Mediterranean. | 42-5 | .. | 0 0 0 |
| 75,000 | 10 | .. | 6 | Brentford Consolidated | 251-254 | .. | 4 18 5 | 560,000 | 100 | Apr. 1 | 5 | Met. of 1 5 p.c. Deb. | 100-102 | .. | 4 18 0 |
| 380,000 | Stk. | .. | 12 1/2 | Do. New | 188-190 | .. | 5 0 0 | 250,000 | 100 | .. | 4 1/2 | Melbourne) 4 1/2 p.c. Deb. | 100-102 | .. | 4 8 3 |
| 300,000 | " | .. | 9 1/2 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 0 | 541,920 | 20 | Nov. 11 | 3 1/2 | Monte Video, Ltd. | 12 1/2-13 1/2 | .. | 5 5 8 |
| 50,000 | " | Aug. 12 | 5 | Do. 4 p.c. Deb. | 101-103 | .. | 3 17 8 | 1,775,892 | Stk. | Feb. 25 | 4 1/2 | Newcastle & G'tesh'd Con | 104-105 | .. | 4 3 4 |
| 206,250 | .. | Dec. 29 | 4 | Brighton & Hove Orig. | 213-216 | .. | 5 1 0 | 529,435 | Stk. | Dec. 29 | 3 1/2 | Do. 3 1/2 p.c. Deb. | 91-93 | .. | 3 15 3 |
| 220,000 | Stk. | Mar. 16 | 11 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 55,940 | 10 | Feb. 25 | 7 | North Middlesex 7 p.c. | 12 1/2-13 1/2 | .. | 5 1 10 |
| 246,320 | " | .. | 8 | British | 44-45 | .. | 4 14 8 | 300,000 | Stk. | Nov. 26 | 8 | Oriental, Ltd. | 141-143 | .. | 5 11 11 |
| 469,000 | 2 1/2 | Apl. 1 | 10 1/2 | Bromley, A 5 p.c. | 118-120 | +2 | 5 0 0 | 60,000 | 5 | Apr. 1 | 8 | Ottoman, Ltd. | 6-6 1/2 | .. | 6 8 0 |
| 109,000 | Stk. | Feb. 25 | 6 | Do. B 3 1/2 p.c. | 88-90 | .. | 5 0 0 | 31,800 | 53 | Feb. 25 | 13 | Portsea Island A. | 134-136 | .. | 5 1 0 |
| 165,700 | " | .. | 4 1/2 | Do. C 5 p.c. | 105-107 | +1 | 5 2 10 | 60,000 | 50 | .. | 13 | Do. B | 126-128 | .. | 5 1 7 |
| 82,278 | " | .. | 5 1/2 | Do. 3 1/2 p.c. Deb. | 87-89 | .. | 3 18 8 | 100,000 | 50 | .. | 12 | Do. C | 119-121 | .. | 4 19 2 |
| 54,000 | " | Dec. 29 | 3 1/2 | Buenos Ayres (New) Ltd. | .. | .. | .. | 114,800 | 50 | .. | 10 | Do. D and E. | 100-102 | .. | 4 18 0 |
| 500,000 | 10 | Oct. 14 | 7 | Cape Town & Dis., Ltd. | 4-5 | .. | .. | 398,490 | 5 | Oct. 28 | 7 | Primitiva Ord. | 7 1/2-8 | .. | 4 7 6 |
| 250,000 | Stk. | Dec. 29 | 4 | Do. 4 1/2 p.c. Pref. | 98-100 | .. | 4 0 0 | 796,980 | 5 | Jan. 27 | 5 | Do. 5 p.c. Pref. | 51 1/2-51 3/4 | -1 1/4 | 4 9 11 |
| 100,000 | 10 | .. | .. | Do. 6 p.c. 1st Mort. | 49 1/2-50 1/2 | .. | 5 18 10 | 488,900 | 100 | Dec. 1 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 100,000 | 10 | .. | .. | Do. 4 1/2 p.c. Deb. Stk. | 96-98 | .. | 5 2 3 | 1,000,000 | 10 | Oct. 14 | 8 | River Plate Ord. | .. | .. | .. |
| 50,000 | 50 | Nov. 2 | 6 | Chester 5 p.c. Ord. | 108-110 | +2 | 4 10 11 | 312,650 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 100,000 | Stk. | Dec. 29 | 4 1/2 | Commercial 4 p.c. Stk. | 106-108 | .. | 4 16 4 | 250,000 | 10 | Apl. 1 | 9 | San Paulo, Ltd. | 151-152 | .. | 5 14 3 |
| 157 1/2 | Stk. | Feb. 25 | 5 | Do. 3 1/2 p.c. do. | 103-105 | .. | 4 15 3 | 62,500 | 10 | .. | 6 | Do. 6 p.c. Pref. | 111-122 | + 1/2 | 3 18 0 |
| 1,513,280 | Stk. | Feb. 25 | 5 1/2 | Do. 3 p.c. Deb. Stk. | 81-83 | .. | 3 12 3 | 125,000 | 50 | Jan. 3 | 5 | Do. 5 p.c. Deb. | 51 1/2-51 3/4 | .. | 4 17 1 |
| 560,000 | " | .. | 5 | Continental Union, Ltd. | 98-100 | .. | 5 0 0 | 135,000 | Stk. | Mch. 16 | 10 | Sheffield A | 232-234 | .. | 4 5 5 |
| 475,000 | " | Dec. 29 | 3 | Do. 7 p.c. Pref. | 138-140 | .. | 5 0 0 | 209,984 | " | .. | 10 | Do. B | 232-234 | .. | 4 5 5 |
| 860,000 | Stk. | Dec. 10 | 5 | Derby Con. Stk. | 121-123 | .. | 4 9 5 | 523,500 | " | .. | 10 | Do. C | 232-234 | .. | 4 5 5 |
| 200,000 | " | .. | 7 | Do. Deb. Stk. | 104-105 | .. | 3 16 2 | 70,000 | 10 | Oct. 14 | 10 | South African | 122-124 | .. | 7 16 11 |
| 492,270 | Stk. | .. | 5 1/2 | East Hull 5 p.c. Ord. | 96-98 | .. | 5 2 0 | 6,429,895 | Stk. | Feb. 10 | 5 9/4 | South Met., 4 p.c. Ord. | 120-122 | .. | 4 9 7 |
| 55,000 | " | .. | 4 | European, Ltd. | 24 1/2-24 1/4 | -1 | 4 17 0 | 1,895,445 | .. | Jan. 13 | 3 | Do. 3 p.c. Deb. | 81-83 | .. | 3 12 3 |
| 145,995 | " | Apl. 1 | 5 | Do. £7 10s. paid. | 182-184 | -4 | 4 16 0 | 209,822 | Stk. | Mar. 16 | 8 | South Shields Con. Stk. | 157-158 | .. | 5 1 3 |
| 486,092 | 10 | Jan. 27 | 12 | Gas 1 1/2 p.c. max. | 88-90 | .. | 3 17 9 | 605,000 | Stk. | Feb. 25 | 5 1/2 | S'th Suburb'n Ord. 5 p.c. | 121-123 | .. | 4 12 0 |
| 354,060 | 10 | .. | 12 | light 3 1/2 p.c. max. | 103-104 1/2 | -1 1/2 | 4 9 3 | 60,000 | " | .. | 5 | Do. 5 p.c. Pref. | 121-123 | .. | 4 1 4 |
| 16,198,671 | Stk. | Feb. 10 | 4 1/2 | and 4 p.c. Con. Pref. | 104-106 | .. | 3 15 6 | 117,058 | .. | Jan. 13 | 5 | Do. 5 p.c. Deb. Stk. | 122-124 | .. | 4 0 8 |
| 2,000,000 | " | .. | 3 1/2 | Coke 3 p.c. Con. Deb. | 81-83 | .. | 3 12 3 | 502,310 | Stk. | Nov. 11 | 5 | Southampton Ord. | 110-112 | .. | 4 9 3 |
| 4,002,235 | " | .. | 4 | Hastings & St. L. 3 1/2 p.c. | 93-95 | .. | 5 5 3 | 120,000 | Stk. | Feb. 10 | 6 1/2 | Tottenham A 5 p.c. | 133-135 | .. | 5 1 9 |
| 4,531,700 | Stk. | Mar. 16 | 5 | Do. do. 5 p.c. | 117-119 | .. | 5 9 3 | 453,940 | " | .. | 5 1/2 | and B 3 1/2 p.c. | 113-115 | .. | 4 13 6 |
| 258,740 | Stk. | .. | 6 1/2 | Hongkong & China, Ltd. | 174-178 | .. | 6 2 3 | 149,470 | " | Dec. 29 | 4 | Edmonton 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 62,500 | " | Sep. 29 | 11 | Ilford A and C | 145-147 | .. | 4 15 3 | 182,380 | 10 | Dec. 29 | 8 | Tuscan, Ltd. | 94-95 | .. | 8 4 2 |
| 131,000 | Stk. | Mar. 16 | 7 | Do. B | 103-110 | .. | 5 0 0 | 149,900 | 10 | Jan. 3 | 5 | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 19 0 |
| 65,781 | " | .. | 5 1/2 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 236,476 | Stk. | Feb. 25 | 5 | Tynemouth, 5 p.c. max. | 113-115 | +1 | 4 0 11 |
| 65,500 | " | Dec. 29 | 4 | .. | .. | .. | .. | 255,636 | Stk. | Feb. 25 | 6 1/2 | Wands- B 3 1/2 p.c. Deb. Stk. | 139-141 | .. | 4 14 0 |
| | | | | | | | | 79,416 | " | Dec. 29 | 3 | .. | 74-76 | .. | 3 18 11 |

† Next dividend will be at this rate.

Hull Water Profits and Rate Relief.—At the last meeting of the Hull Corporation Water Committee, a letter was read from the Hull Retail Grocers' Association calling attention to the desirability of revising the water charges to the general consumers instead of handing over the surplus profits to the relief of the rates, and thus unfairly benefiting some large ratepayers who do not use the water. The Mayor (Mr. H. Feldman) said the question had been fully considered on a former occasion, and the Committee came to the conclusion that it would not be wise to decrease the charges, which were as reasonable as

those in other large towns. Alderman Robson thought it somewhat inconsistent that the North-Eastern Railway Company, who were their only competitors in supplying water to the town, should get (say) one-tenth of the grant of £12,000 from the water undertaking towards the relief of the rates, seeing that the money was contributed by the general ratepayers. The Mayor warned the Committee that if they reduced the charges their profits would vanish, and the water undertaking would become unprofitable. The communication was referred to a Committee.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional line, 6d.

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"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 215.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

WARNER & VAN DER BIESEN,

ZWOLLE, HOLLAND.

DIGGERS AND SUPPLIERS OF THE

FINEST DUTCH BOG-ORE.

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SIMULTANEOUS Discharging-Charger.

The one Machine which Discharges and Charges at One Stroke.

See Advertisement, April 12, p. IV. of Centre.

ALDRIDGE AND RANKEN,

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Telegrams:

Telephone:

"MOTORPATRY, LONDON."

6118 WESTMINSTER.

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Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E. WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.

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General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND

CONTRACTORS,

18 & 20, FARRINGTON ROAD, LONDON, E.C.

Telegrams:

Telephone:

"DACOLIGHT LONDON."

2886 HOLBORN.

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GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

39, VICTORIA STREET, S.W.

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READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of

AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, and STAFFORD.

Address Correspondence and Inquiries to OLDBURY, WORCS.

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OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD.

86, MARK LANE, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.

"NUGEPE" GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,

LOWER MOSS LANE,

MANCHESTER, S.W.

For all Joints in connection with Oil-Gas Plant and Sulphate Plant.

For all Gas Joints.

For all Tar Joints.

For all Ammonia Joints.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,

LONDON, E.C., and 25, BRIDGE END, LEEDS.

PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE OF EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER OF PATENTS," 6d.

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AMMONIA.

Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

OXIDE OF IRON

(NATURAL)

FOR GAS PURIFICATION.

NEW WESTBURY IRON COMPANY, LTD.

WESTBURY, WILTS.

TAR WANTED.

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS,

Albert Chemical Works, BRADFORD,

MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

J. E. C. LORD, Ship Canal Tar Works,
Waste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL.
SUNDERLAND, AND WAKEFIELD.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment, 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding
Oxide Lightly.

See Illustrated Advertisement, April 5, p. 8.

GAS-WORKS requiring Extensions
should Communicate with FIRTH BLAKELEY,
SONS, AND CO., LIMITED, Dewsbury, who make a
Speciality of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
faction Guaranteed.

CAST-IRON Pipes. Spigot and Socket
or Flanged. Special Quality—9 feet or 12 feet
Lengths. When buying, Write us.
A. LOWCOCK, Limited, SHREWSBURY.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

**JOHN RILEY & SONS, Chemical Manu-
facturers, Hapton, near Accrington, are MAKERS**
of Special SULPHURIC ACID, for Sulphate of Am-
monia Making. Highest percentage of Sulphate of
Ammonia obtained from the use of this Vitriol, which
has now been used for upwards of 50 Years. References
given to Gas Companies.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Re-
pairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,
BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

"HALLITE" Asbestos High-Pressure
Sheeting.
HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street,
LONDON, E.C.

SATURATORS made or Repaired.
Reasonable Terms (workmanship guaranteed) by
a 30 Years' Saturator Maker (Labour and Plant only),
at per Hour or Contract. Saturators improved. Per-
fect Mixing and Noiseless.
DAVIES, General Chemical Plumber and Leadburner,
117, Galloway Road, SHEPHERD'S BUSH, W.

APPOINTMENTS.—Ambitious Men of
of Parts invited to write—
HERBERT GREATOR, X,
APPLICATION SPECIALIST,
BEECHWOOD, MATLOCK.
Specimen of many results:—
"Have got the job. Quite a good start.
To you the credit is due, and I think you
see the best Investment I ever made."
BUSINESS IS REVIVING. WRITE NOW.

WANTED, for a 180-Million Feet
Works in the South, an ASSISTANT to the
ENGINEER. Must have had good all-round Experience
in a Medium-Sized Works, and be a good Draughtsman
and Chemist. Salary, £200 per Annum.
Apply, by letter only, stating Age, Experience, and
present Salary, with Copies of not more than Three
recent Testimonials, to No. 5229, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

**WANTED, by the Holmfirth Gas Com-
pany, Yorks, a thoroughly reliable Married**
Man as STOKER. Eight Hours Summer, Twelve
Hours Three Months of Winter. Wages, 37s. 6d. per
week. To a Steady Man used to Shovel Charging,
Boiler, Exhauster, and Engines, the Situation would
be permanent.
Apply, with Testimonials, to A. E. BUCKLEY, Gas-
Works, HOLMFIRTH.

AGENT GESUCHT.

DEUTSCHE Leistungsfähige Fabrik
von Invertbrennern (Innen- & Aussenlampen),
bestes Fabrikat, sucht in England gut eingeführten
Agenten.
Briefe Exped. No. 5229, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

BARNOLDSWICK URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

WANTED, by the above Council, a
competent Man to TAKE CHARGE OF THE
ENGINES at the Pumping Station.
Wages to commence at 30s. per week.
Applications to be in Candidates' own Handwriting,
stating Age, and Experience, together with copies of
Three recent Testimonials, to be forwarded to the
Chairman of the Gas and Water Committee, Town Hall,
Barnoldswick, not later than the 3rd of May, 1910.
J. W. THOMPSON,
Engineer and Manager.
Town Hall, Barnoldswick,
April 18, 1910.

PITCH WANTED—11,500 Tons. This
Season's Delivery.
Replies, stating prices f.o.b. English Ports, also Quan-
tities, to No. 5230, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, a Set of Four Purifiers,
about 30 feet Square, with Valve and Con-
nections.
Full Particulars with Lowest Price to FIRTH
BLAKELEY, SONS, AND CO., LTD., Thornhill, DEWSBURY.

WANTED—Four Second-Hand Small
ROTARY GAS METERS. Capacities, 160,000,
to 170,000 cubic feet each per 24 Hours, with Flanged
Connections. One Second-Hand STATION GAS-
METER, capacity 900,000 to 1,000,000 cubic ft. per 24
Hours. The Meters to be in good Working Condition.
Full Particulars as to the Condition, Price, and where
the Meters can be seen, to be sent to Box 154 care of
T. B. BROWNE'S ADVERTISING OFFICES, 163, Queen
Victoria Street, LONDON.

FOR SALE—Good Order, One Washer
by Kirkham, Hulett, and Chandler, 8-inch Con-
nections, and Engine to drive it. All good.
Address, WHITEHOUSE'S EXECUTORS, LLESTON.

FOR SALE—Four Purifiers, 8 feet
Square, with 8-inch Valves and Connections and
Lifting Gear Complete. All in Good Working Order.
Can be seen at work.
Full Particulars from S. BARK, Engineer and Manager,
Gas-Works, SUNBURY-ON-THAMES.

TANK Waggons for Sale, 8 to 12 Tons,
for Tar, Liquor, &c.
Apply to WATSON, SOWTER, AND CO., 25, Iron Gate,
DERBY.

**GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete**
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap for
immediate Sale.
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

FOR SALE—A Station Meter in Square
Cast-Iron Case, to pass 60,000 Cubic Feet of Gas
per Hour. Can be fitted with New Drum if necessary
and made equal to a New Meter. A low Price will be
accepted.
Address R. LAIDLAW AND SON (EDINBURGH), LIMITED,
LONDON and EDINBURGH.

COUNTY BOROUGH OF SMETHWICK.
(GAS DEPARTMENT.)

SECOND-HAND EXHAUSTERS and STEAM-
ENGINE.

THE Gas Committee of the Corporation
of Smethwick have for DISPOSAL Two DONKIN
EXHAUSTERS, with STEAM-ENGINES Combined,
including Disc Valves, nominal capacity 40,000 and
60,000 Cubic Feet per hour respectively; also a HORI-
ZONTAL HIGH-PRESSURE STEAM-ENGINE
14-inch Bore, 20-inch Stroke, to work at 80 lbs. Steam-
Pressure.

For an Immediate Sale, a low Price will be taken.
The Plant can be seen at the Gas-Works, Rabone
Lane, at work during the next Two or Three Weeks;
and any further Particulars can be obtained on Appli-
cation to Mr. Vincent Hughes, Engineer, at the Gas-
Works.

W. J. STURGES,
Secretary.

Gas Department, Council House,
Smethwick, April 12, 1910.

BRENTWOOD GAS COMPANY.

TENDERS FOR COAL.

THE Directors of the Brentwood Gas
Company are prepared to receive TENDERS for
the Supply of 6000 Tons of Yorkshire Silstone GAS
COAL, to be delivered into the Company's Siding on
the Main Line of the Great Eastern Railway, Free of
all Charges, in such Quantities as may be required
during the Year commencing the 1st of July next.
Forms of Tender are not supplied.
The Directors do not bind themselves to accept the
lowest or any Tender.
Sealed Tenders, endorsed "Tender for Coal," to be
sent, on or before the 3rd day of May next, addressed
to the undersigned.

HENRY A. HALL,
Secretary.

St. James' Road, Brentwood,
Essex, April 22, 1910.

THE Directors of the Elsecar, Went-
worth, and Hoyland Gas Company invite
TENDERS for the Supply of 3000 Tons (more or less)
of Best Screened GAS COAL or NUTS, to be delivered
at Elsecar Station (Great Central Railway) during the
Year ending the 30th of June 1911, at such times and in
such Quantities as required by the Manager.
Tenders to be delivered by the 11th of May, ad-
dressed to the Chairman, 94, King Street, Hoyland, en-
dorsed "Tender for Coal."

ALBERT F. HALL,
Secretary.

Hoyland, near Barnsley,
April 23, 1910.

BOROUGH OF MOSSLEY.

THE Gas Committee of the Borough of
Mossley invite TENDERS for the Supply of
Screened GAS COAL.
Specifications and Forms of Tender may be obtained
from the undersigned.
Sealed Tenders, endorsed "Gas Coal," and addressed
to the Chairman of the Gas Committee, Gas-Works,
Mossley, must be delivered not later than the first post
on Monday morning, May 2, 1910.

JAMES TAYLOR,
Engineer and Manager.

Gas-Works, Mossley,
April 18, 1910.

EASTBOURNE GAS COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive
TENDERS for the Supply of 30,000 Tons of Clean,
Dry, Unscreened, Fresh-Wrought GAS COALS, de-
livered at Eastbourne Railway Station during the Year
ending Aug. 31, 1911.

The Deliveries to be in about equal Monthly Quan-
tities.
Payment in Cash Monthly.
Particulars and Forms of Contract may be obtained
from the Secretary.

The Directors do not bind themselves to accept the
lowest or any Tender.

Tenders, sealed and endorsed "Tender for Coals," to
be addressed to the Chairman of the Company, at the
Offices, 10, Sussex Gardens, Eastbourne, on or before
May 3, next.

By order,
JAMES S. GARRARD,
Secretary.

April 11, 1910.

CORPORATION OF CALCUTTA.

THE Corporation of Calcutta invite
TENDERS for Three Thousand COPPER LAN-
TERNS suitable for Single Light Inverted Incandescent
Gas-Burners.

It is absolutely necessary that the Lanterns should be
insect proof; but the means of making them so is left
to the discretion of the Manufacturer.

The Lanterns should not be painted, as this will be
done locally.

Tenders are to be submitted for shipment c.i.f. direct
to Calcutta; payment being made when the Lanterns
have been passed and accepted in Calcutta.

Samples of what it is proposed to Supply should be
sent with each Tender; but Firms who have already
submitted Samples through Messrs. Mansfield and Sons,
of Liverpool, need not again submit Samples.

Tenderers must state the time for Delivery from
receipt of Order.

Tenders should reach the Corporation, addressed to
the Vice-Chairman, Calcutta Corporation, Calcutta,
India, not later than the 6th of June, 1910.

P. N. MOOKERJEE,
Secretary to the Corporation.

Municipal Office, Calcutta,
March 23, 1910.

CORPORATION OF CALCUTTA.

THE Corporation of Calcutta invite

TENDERS for a total number of 10,000 INCAN-
DESCENT GAS BURNERS, to consume (a) 3 Cubic
Feet Per Hour, (b) 3½ Cubic Feet per Hour, (c) 4 Cubic
Feet Per Hour, and (d) 5 Cubic Feet Per Hour, at 20-lbns
pressure. The Burners must have arrangements by
which the Nipples can be easily and quickly changed to
make the burner suit different pressures; but 20-lbns
will be the minimum pressure on which they will be
used. The Air Inlet should not be adjustable, as it is
found that the Lamp Lighters and Cleaners are apt to
interfere with adjustable openings. The quality of the
Gas is 14-Candle Power when tested with the No. 2
"Metropolitan" burner; and it is of rather Low Calorific
Value.

Tenderers should submit two Samples each of (a), (b),
(c), and (d); one being of the Inverted Type and the
other the Erect Type of Burner, but each must be sub-
mitted Complete with all necessary Glass-Ware, &c.,
and with One Dozen Assorted Nipples suitable for each
Burner, together with One Dozen suitable Mantles for
each.

Tenderers should state their price per 100 for spare
Nipples of any size; the size of each Nipple being
stamped legibly on it by a number representing its
diameter in 1000's of an inch. The Samples will all be
tested carefully for Consumption and Illuminating
Power; and the Order will be given to the Firm supply-
ing the Sample which gives the greatest efficiency per
foot of gas consumed.

Tenders are to be submitted for shipment c.i.f. direct
to Calcutta; Payment being made after receipt in
Calcutta.

Tenderers must state the time they require to deliver
the total number of 10,000 Burners from the date of
order to proceed with the work. The successful Ten-
derer will be informed by Cable; and must then pro-
ceed to carry out the Contract. Samples, however,
should be sent direct to Calcutta.

Tenderers must guarantee that the Burners supplied
will be in every way exactly as per Sample.

Sealed Tenders should reach the Corporation, ad-
dressed to the Vice-Chairman, Calcutta Corporation,
Calcutta, India, not later than the 6th of June, 1910.

P. N. MOOKERJEE,
Secretary to the Corporation.

Municipal Office, Calcutta,
March 23, 1910.

BENZOL.

To Collieries having Bye-Product Recovery Coke-Ovens, or to Tar-Works capable of delivering for Export to the Continent 3000 Tons per Annum (more or less) of 90 per cent. Commercial Benzol under Contract covering a number of Years.

Offers are invited from Firms only who are *bonâ-fide* in a Position to enter into a Contract for the above quantity.

Address, in first instance, No. 5226, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CORPORATION OF DUBLIN.

TENDERS FOR SUPPLIES, FOR THE PUBLIC LIGHTING DEPARTMENT (INCANDESCENT GOODS, SQUARE LANTERNS, WROUGHT-IRON CRADLES, &c.).

THE Corporation of Dublin invite

TENDERS for the above for a period of Twelve Months to end on the 31st of March, 1911.

Specification, with General Conditions and Form of Tender, may be had on Application at the Office of the City Engineer, on payment of the sum of One Shilling for each Form.

Tenders must be addressed to the Chairman of the Supplies Committee, and delivered to me not later than Saturday, the 30th day of April, 1910.

The Committee do not bind themselves to accept the lowest or any Tender.

HENRY CAMPBELL,
Town Clerk.

Town Clerk's Office, City Hall,
Dublin, April 18, 1910.

CROMER, NORFOLK.

TENDERS FOR COAL.

THE Directors of the Cromer Gas Com-

pany are prepared to receive TENDERS, from Colliery Proprietors only, for the Supply of about 2000 Tons of First-Class GAS COAL (in the proportions of two-thirds of Coal and one third of Nuts) to be delivered at the Company's Siding (Midland and Great Northern Railway Station), Cromer, between the 1st of August next and the 30th of June, 1911. Weight given to be stated.

Deliveries to be made in such Quantities and at such times as may be required by the Company.

Payment, net Cash Monthly.

Sealed Tenders, endorsed "Tender for Coal," to be sent to the undersigned on or before the 7th day of May next.

Forms of Tender are not supplied.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
P. E. HANSELL,
Secretary.

Cromer, April 23, 1910.

GUILDFORD GASLIGHT AND COKE COMPANY.

IRON AND STEEL WORK FOR NEW RETORT-HOUSE.

THE Directors of the above Company

invite TENDERS for the Supply, Delivery, and Erection of the IRON and STEEL WORK required for their new Retort-House at the Gas-Works, Onslow Street, Guildford.

Specification, Blue Prints, and further Particulars can be obtained, on deposit of One Guinea (which will not be returned), from Mr. P. C. Cleasby, Gas-Works, Guildford.

Tenders, sealed and endorsed "Tender for Ironwork," addressed to the Chairman of this Company, to be delivered at those Offices not later than Ten a.m. on Thursday, the 12th of May, 1910.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM TITLEY,
Secretary.

Gas Offices, Onslow Street,
Guildford, April 27, 1910.

COUNTY BOROUGH OF DEVONPORT.

(GAS DEPARTMENT.)

THE Gas Committee of the Devonport

Corporation are prepared to receive TENDERS for the Supply of 25,000 Tons of GAS COAL, to be delivered in such Quantities as may from time to time be determined previous to June 30, 1911.

The Coal is to be delivered c.i.f. at Tamar Wharf; and Forms of Tender and Specification may be obtained from the undersigned.

The Committee reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender for Gas Coal," and addressed to R. J. Fittall, Esq., Town Clerk, Devonport, are to be delivered at the Town Clerk's Office on or before Monday, May 2, 1910.

W. P. TERTVET,
Engineer and Manager.

Gas-Works, Devonport.

COUNTY BOROUGH OF DEVONPORT.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for

the Supply of 300 Tons of New OXIDE to be delivered c.i.f. Tamar Wharf, or f.o.r. Keyham Station (Great Western Railway).

Forms of Tender and Specification may be obtained from the undersigned.

TENDERS are also invited for the Purchase of 350 to 400 Tons of SPENT OXIDE. Samples of this may be obtained on Application.

The Committee do not bind themselves to accept the lowest or any Tender.

Tenders to be sent in not later than April 30, addressed to R. J. Fittall, Esq., Town Clerk, Devonport, endorsed "Tender for Oxide."

W. P. TERTVET,
Engineer and Manager.

Gas-Works, Devonport.

PAIGNTON GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Paignton Gas

Company are prepared to receive TENDERS for the Supply of 5000 Tons of best approved GAS COALS, to be delivered in such Quantities and at such times as may be required, and to weigh 20 cwt. to the Ton over the Gas Company's Weigh Bridge.

Tenders to be accompanied by Practical Working Analysis, stating the Price of Coal delivered at Paignton Station, Great Western Railway, free of all Charges.

Forms of Tender are not supplied.

The Directors do not bind themselves to accept the lowest or any Tender.

Further Particulars may be obtained from Mr. C. G. Dawson only.

Sealed Tenders, endorsed "Tender for Coal," specifying the description and quality of Coal, to be sent on or before the 7th day of May next addressed to the undersigned at the Gas Offices, 1A, Victoria Street, Paignton.

F. W. PUDDICOMBE,
Secretary.

Paignton, April 14, 1910.

RAMSGATE CORPORATION.

(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite

TENDERS for 22,000, 44,000, and 66,000 Tons (One, Two, and Three Years' Supply respectively) of Best Quality Soft Caking and Gas Producing Screened Durham or other COAL, delivered free into Carts on the Quay at Ramsgate Harbour, or free into the Stores at the Gas-Works.

Deliveries to be in Monthly Quantities, as set forth in the printed Particulars, and are to commence as from Aug. 1, 1910. A distinct Price to be named for each quantity.

Tenders to be sent in not later than Noon on Monday, May 9, 1910, addressed to the Chairman of the Gas and Water Committee, Gas and Water Offices, Boundary Road, Ramsgate, endorsed "Coals."

The Committee do not bind themselves to accept the lowest or any Tender.

Full Particulars and Form of Tender on Application to the undersigned.

WM. THOMSON,
Engineer and Manager.

Gas and Water Offices,
Ramsgate, April, 1910.

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.

(IN VOLUNTARY LIQUIDATION.)

NOTICE is Hereby Given, that, in

accordance with the Terms of the Agreement with the Primitiva Gas and Electric Lighting Company of Buenos Ayres, Limited, dated Dec. 2, 1909, a Final Dividend at the rate of Eight Shillings per Share (free of Income-Tax) will be payable on and after the 23rd inst.; making, with the Interim Dividend paid on the 21st of October last, 7 per cent. for the Year 1909.

And NOTICE is FURTHER GIVEN, to Holders of Share Warrants to Bearer of this Company, that Coupon No. 40 will be paid by the Company's Bankers, The Union of London and Smiths Bank, Limited, 50, Cornhill, E.C., on and after the 23rd inst., at the rate of Eight Shillings per Coupon.

By order,
F. C. IM THURN, } Liquidators.
ROSE PINSENT.

1, East India Avenue, E.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to

notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Executors of the late H. J. Rydon, Esq.

GAS STOCKS AND SHARES,
of the CAPITAL VALUE of upwards of £10,000
IN THE

HARROW AND STANMORE GAS COMPANY,
SOUTHEND GAS COMPANY,
CHIGWELL, LOUGHTON, AND WOODFORD
GAS COMPANY,
HORLEY DISTRICT GAS COMPANY,
WALTHAM ABBEY AND CHESHUNT GAS
AND COKE COMPANY.

MESSRS. A. & W. RICHARDS will

SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 3, at Two o'clock, in Lots.

Particulars of H. W. RYDON, Esq., Solicitor, 77, Cornhill, E.C., and of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the LEA BRIDGE DISTRICT GAS COMPANY.

ISSUE OF £14,000 NEW CAPITAL COMPRISING:
£4000 Four per Cent. Perpetual Debenture Stock,
£5000 Five per Cent. Preference Stock,
£5000 Consolidated Ordinary Stock.

MESSRS. A. & W. RICHARDS will

SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 10, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

THOMAS DUXBURY & CO.,
16, DEANS GATE, MANCHESTER,
Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND
ALL OTHER GAS APPARATUS.

Inquiries Solicited.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

BIRTLEY IRON COMPANY,

ESTABLISHED 1820,

Owners of the Birtley Iron Works and
Pelaw Main Collieries,

GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of our manufactures, on application.

Works: BIRTLEY, CO. DURHAM.

Newcastle-on-Tyne Offices: MILBURN HOUSE.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS. Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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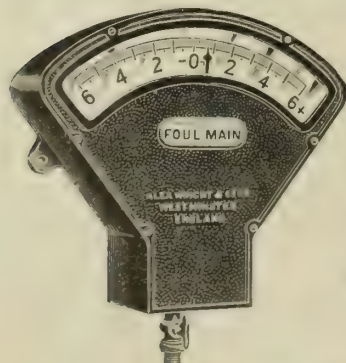
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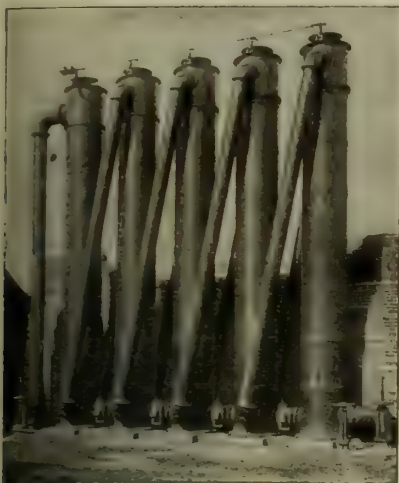


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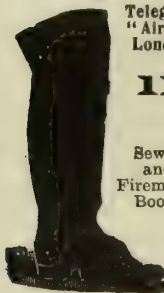
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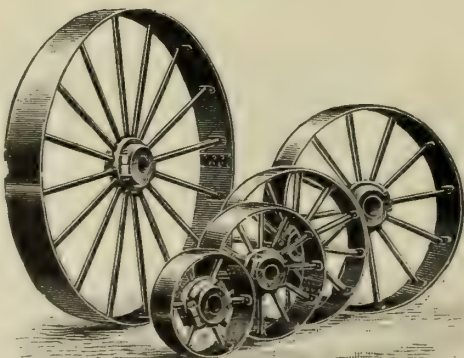
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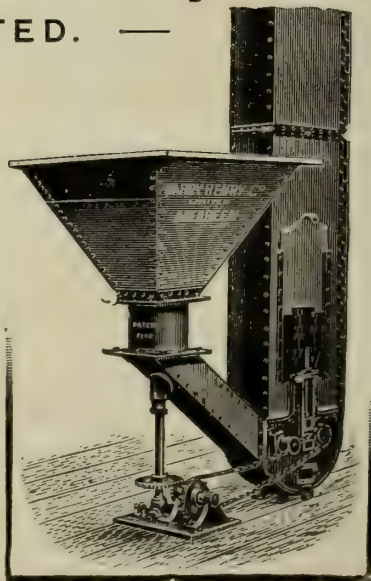
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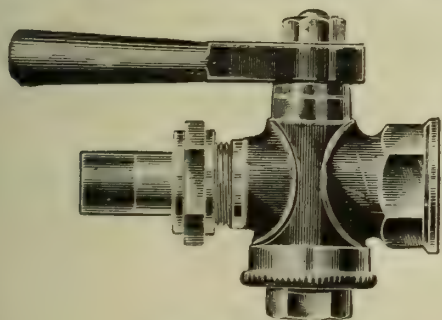
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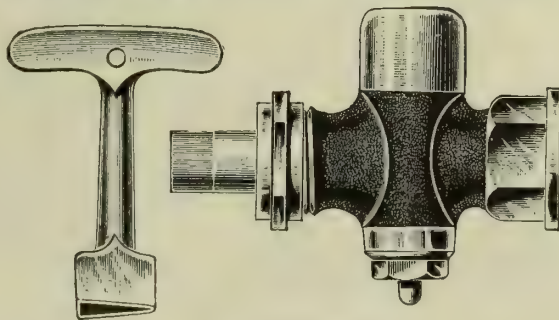
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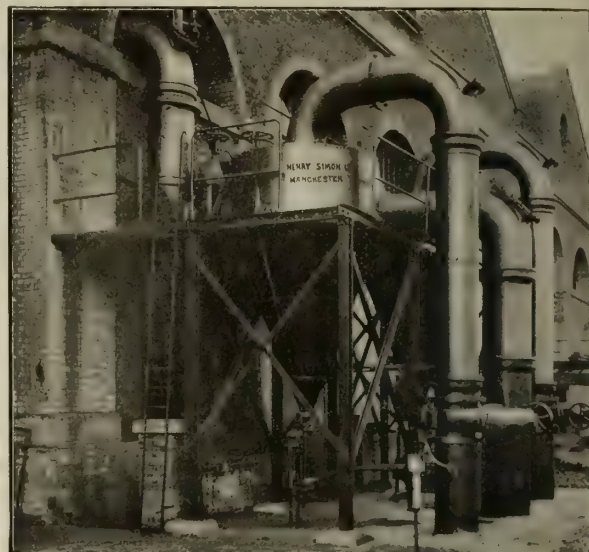
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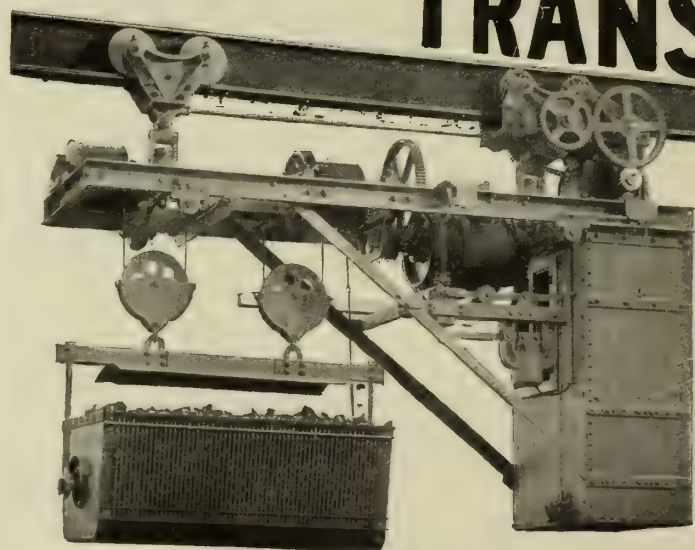
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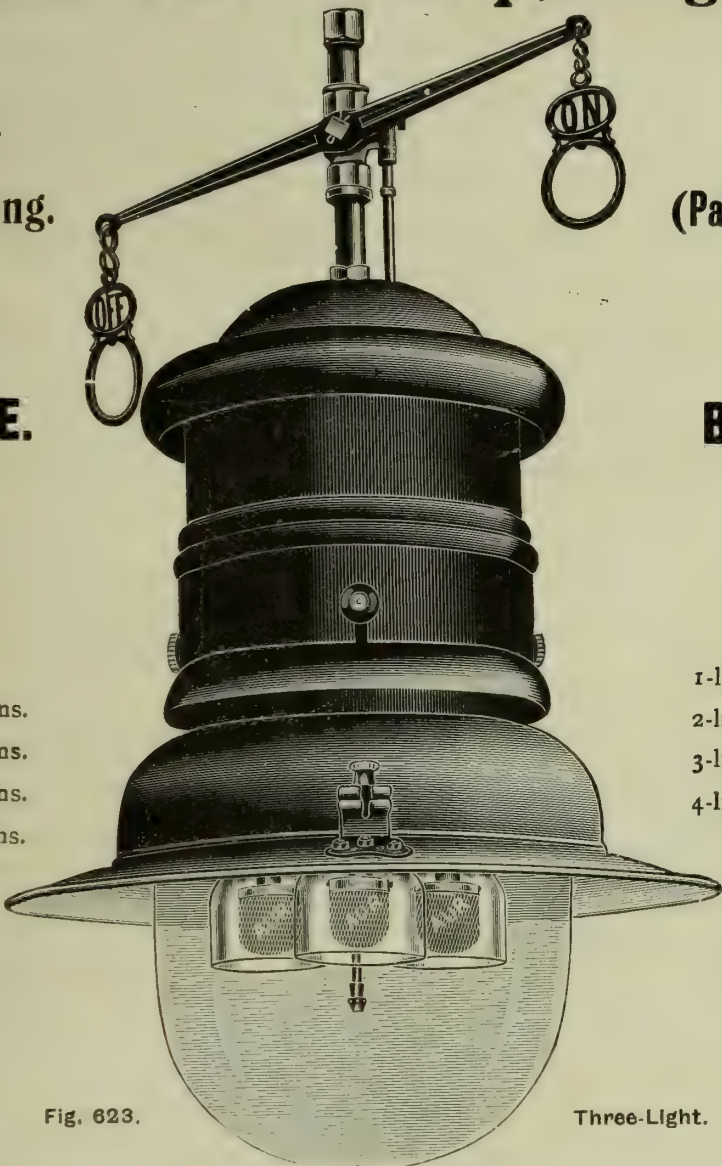
Inverted Arc Lamp, Fig. 623.

Storm Proof—

For Exterior Lighting.

Welsbach-Kern

(Patent) Inverted System



BRITISH MADE.

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Height over all.

- 1-light . . . 1 ft. 8 ins.
- 2-light . . . 2 ft. 4 ins.
- 3-light . . . 2 ft. 4 ins.
- 4-light . . . 2 ft. 7 ins.

Width over all.

- 1-light . . . 1 ft. 1 in.
- 2-light . . . 1 ft. 5 ins.
- 3-light . . . 1 ft. 5 ins.
- 4-light . . . 1 ft. 8 ins.

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

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|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
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All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

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Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

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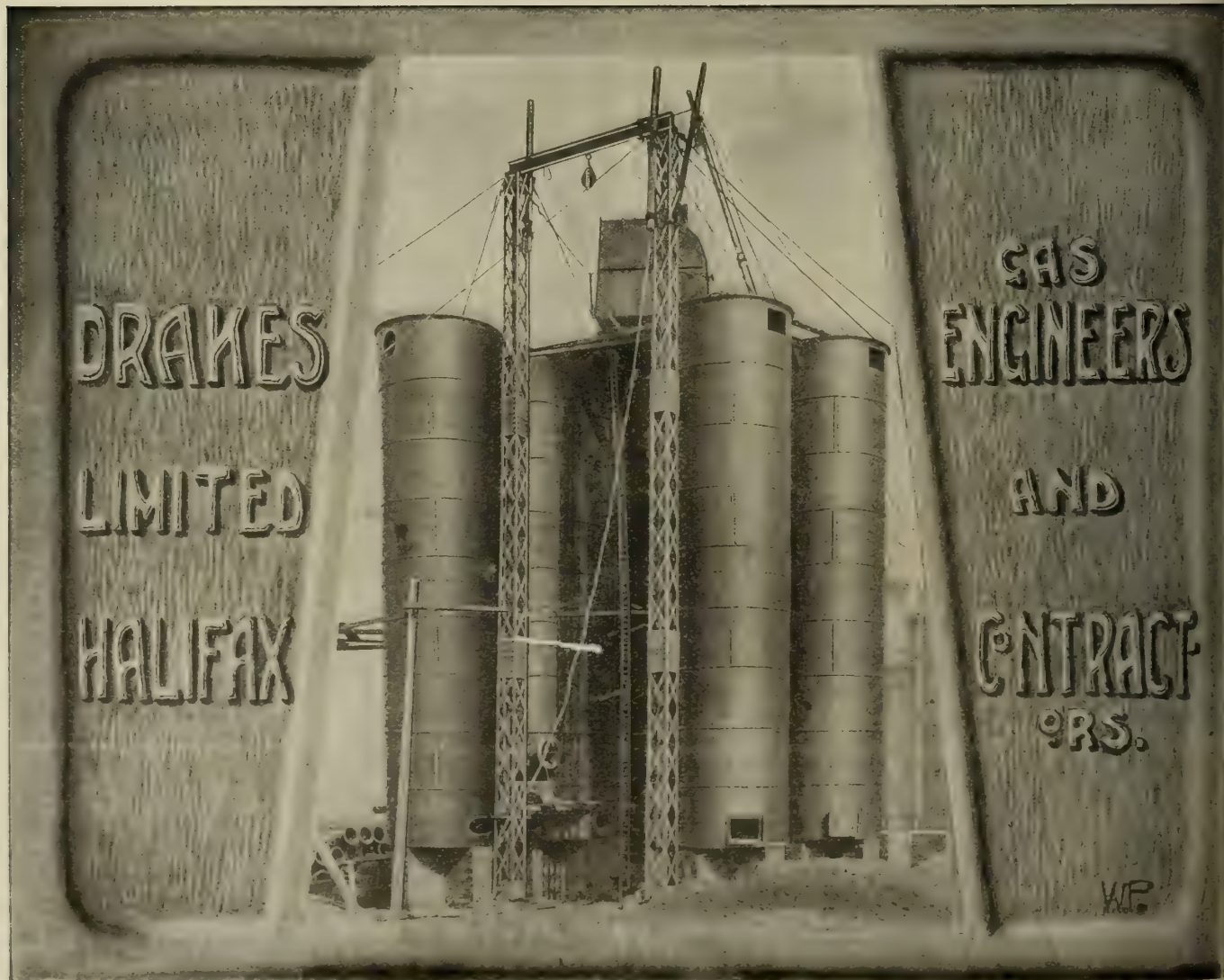
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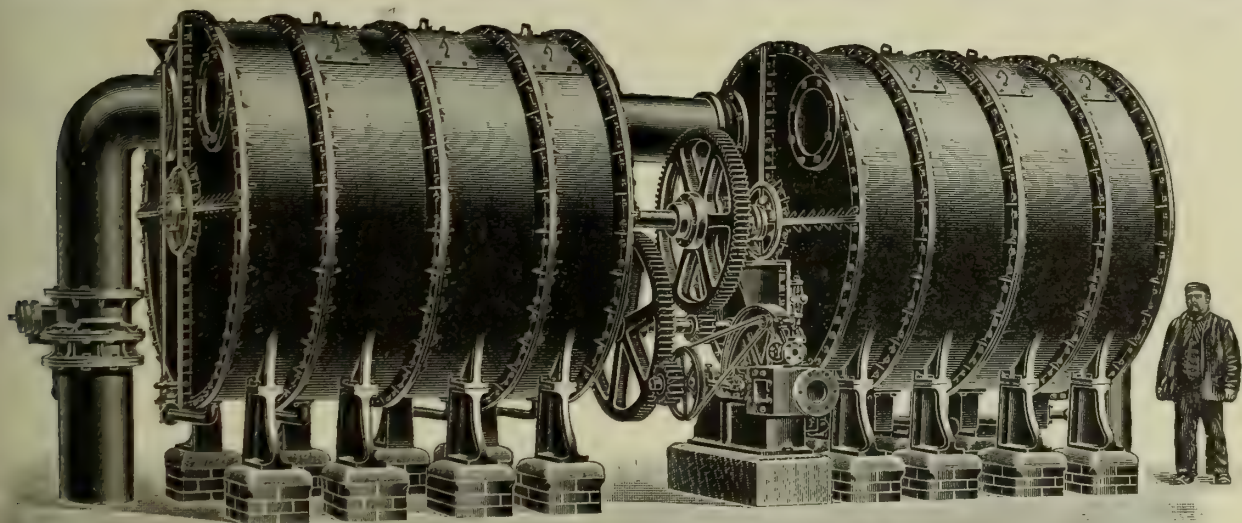
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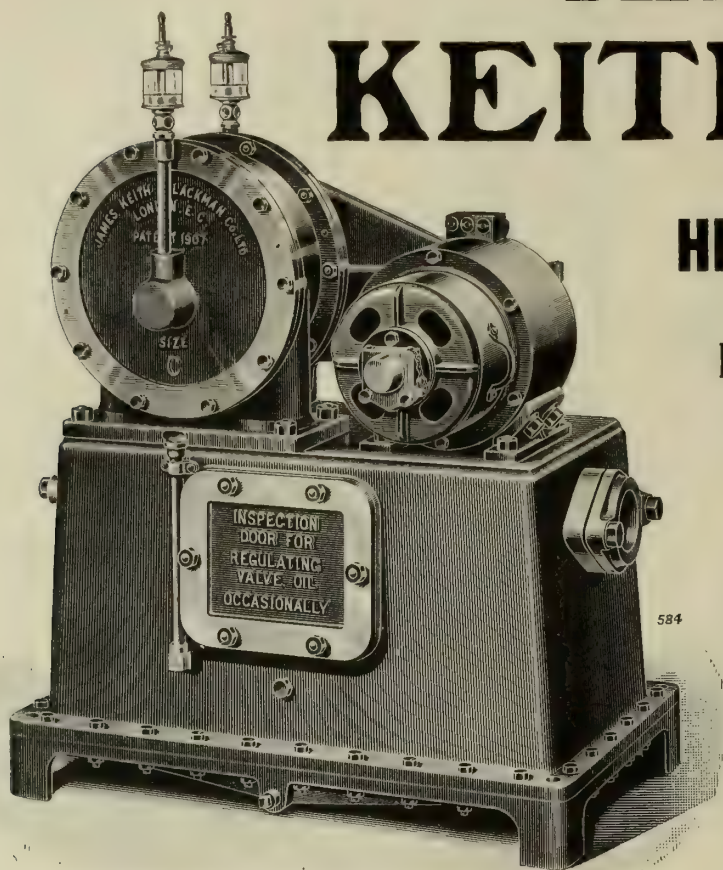
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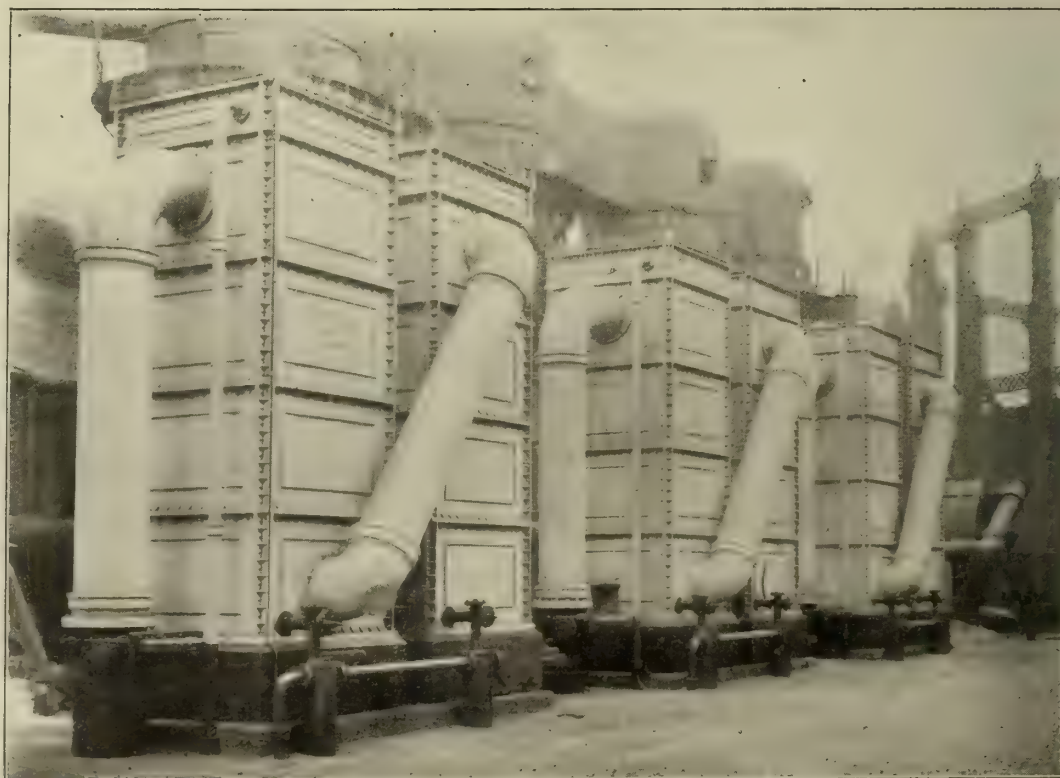
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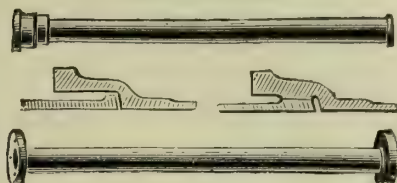
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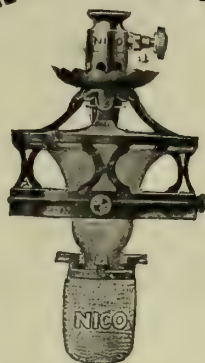
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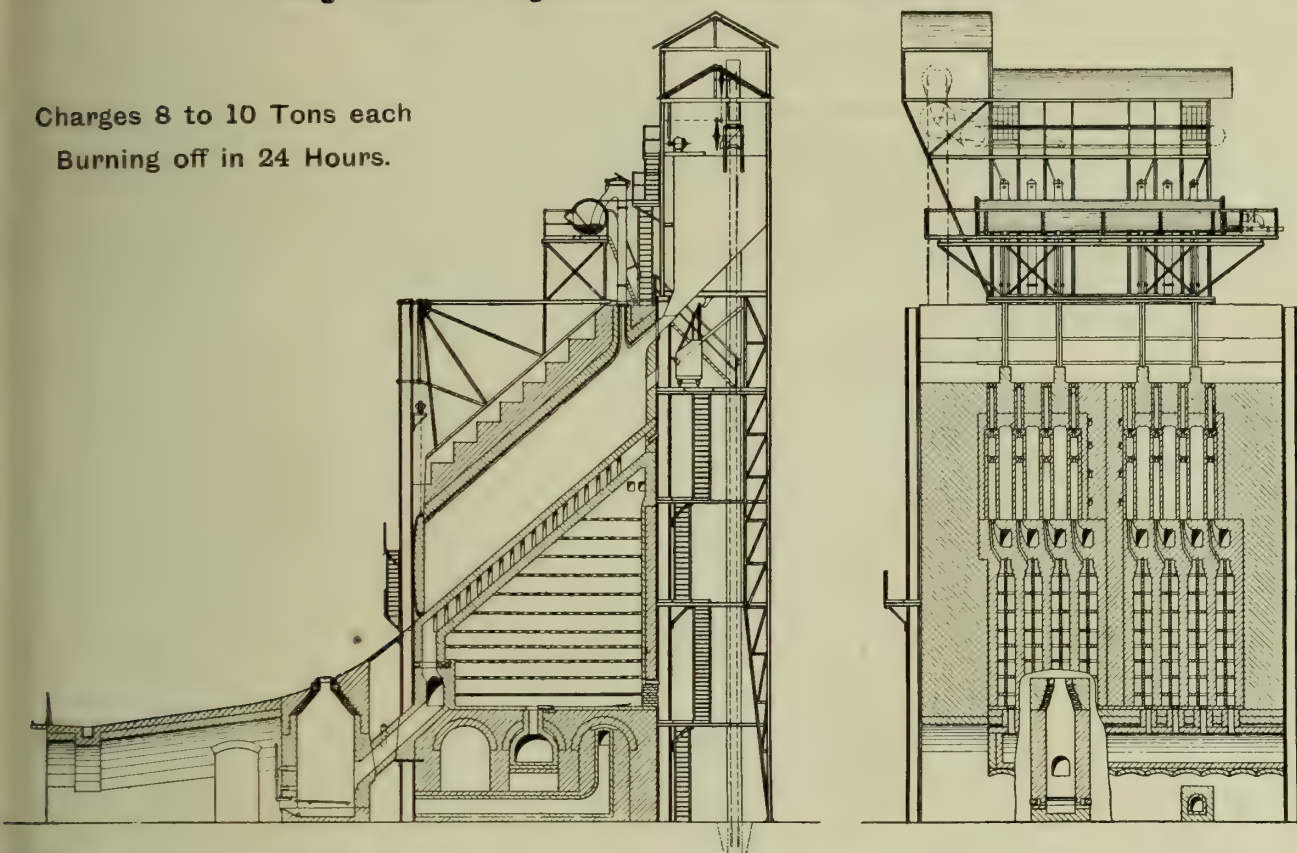
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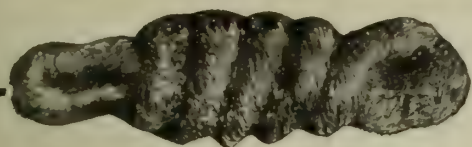
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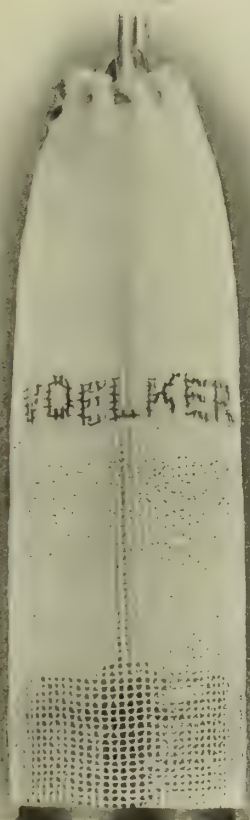
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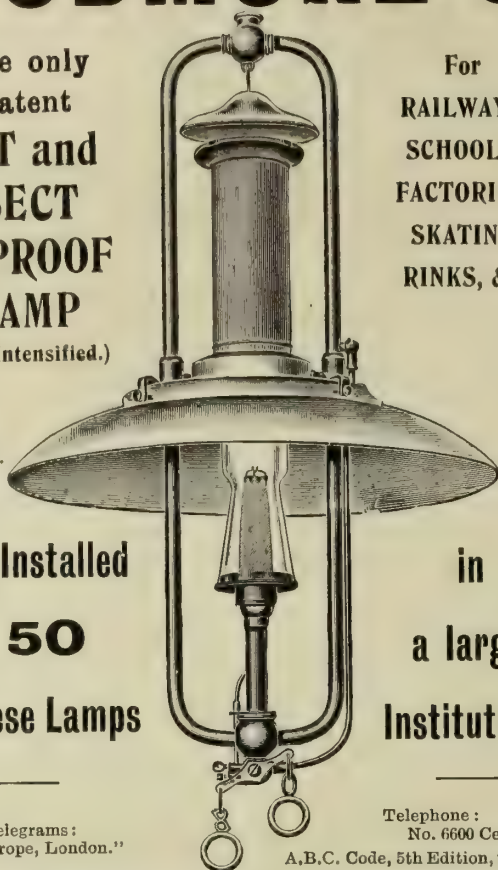
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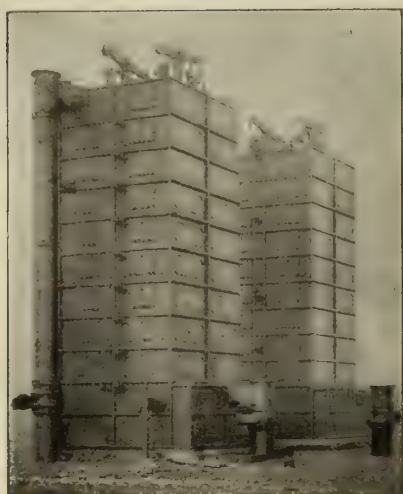
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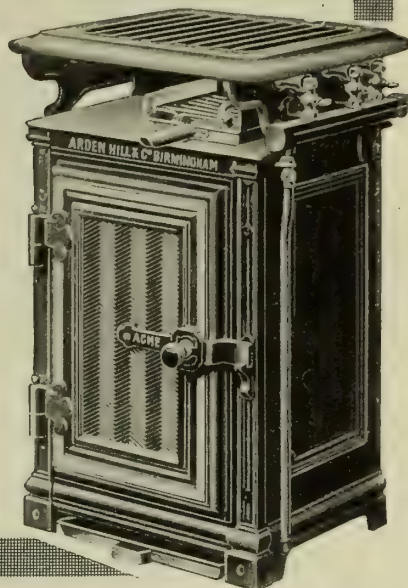
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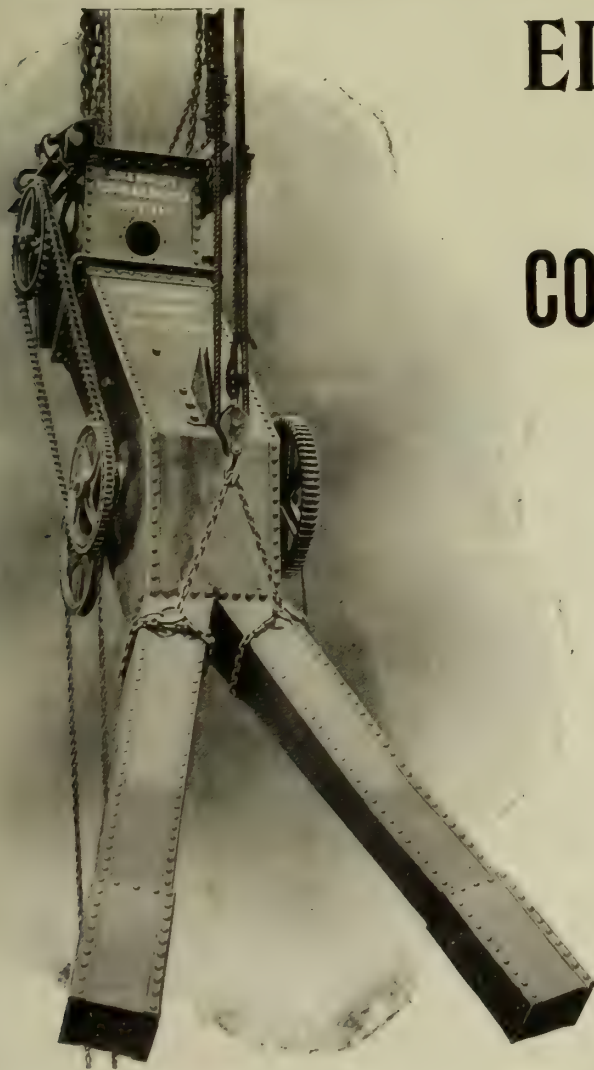
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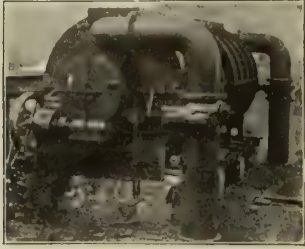
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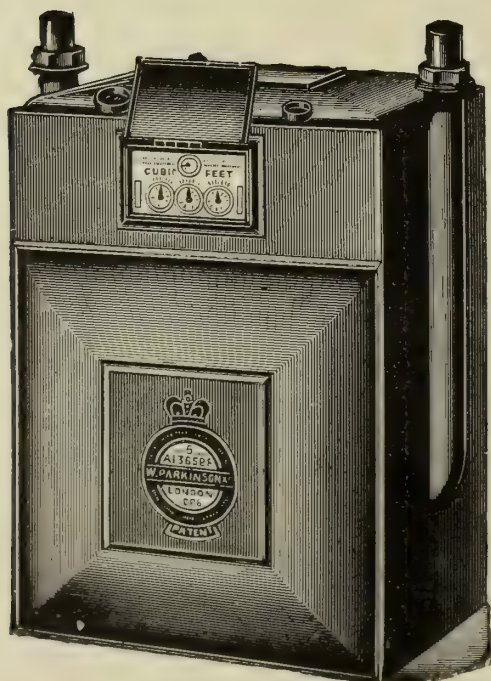
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VOL. CX., No. 2451.—TUESDAY, MAY 3, 1910.

EDITORIAL NOTES—GAS, &c.

Gas Undertakings and Electricity Deficits.

In last week's issue, an epitome of a lecture by Mr. Balfour Burne, K.C., appeared, with some editorial comments, dealing with the evils of State and municipal trading, and urging that the time had arrived when the position of the development should be thoroughly examined, and the brake and remedial measures be applied. In the same issue, in the ordinary news columns, there were reports, referring to Dublin, Londonderry, and Radcliffe, which presented three different phases of the question as applying to municipal traffic in electricity—showing, in the first place, how adventures of the kind can be egregiously harmful to the ratepayers, and, in the second place, where the law is at fault in not applying adequate limitations and regulations. The point of most importance raised by these reports indicates, with extraordinary emphasis, a defect of the law relating to municipal trading, in that there is no definite prescription of the extent either in amount or period to which or during which deficits incurred through trading may be charged upon the general rates before the price of the commodity is raised. With an undertaking in private hands, the ratepayers would not, if revenue did not counterbalance expenditure, suffer one iota. The shareholders would be the first to suffer; afterwards the consumers would be called upon to pay a price sufficient to meet the cost of the service rendered them, and to return a fair profit on the capital invested in providing the service. But in the case of a municipal undertaking—an electricity undertaking, for example—this does not happen. Those who have advanced loans representing the capital receive their interest whether or not the undertaking pays; and quite right, too, for they have no voice in, or power of, selection in the matter of those to whom the management of the concern is confided. Municipal administrations, too, have a peculiar propensity for versifying their policy in respect of prices according to the undertaking concerned. Assuming that they have under their direction both gas and electricity undertakings, there is rarely any hesitation on their part to raise the price of gas to the amount desired in relief of the rates in any way threatened; and likewise there is rarely hesitation on their part in declining to raise the prices—the extraordinarily varying prices—of electricity in the event of there being a deficit. The latter condition also applies where the electricity undertaking is, and the gas undertaking is not, under the control of the local authority.

The result is that in certain cities and towns some very heavy losses have been inflicted upon the ratepayers, owing to the recurring deficits on electricity undertakings, and the inclination to increase the prices charged. These direct charges upon the ratepayers are not the only ones, as, in any instances, they are called upon to pay prices for public electric lighting that are much above those that would have been paid for an equally efficient, and indeed a more efficient, service. It is, however, the direct charge upon the ratepayers with which we are concerned, and the infliction of which, with the open powers granted, can proceed to infinity. It is an infamous and a much-abused liberty. In the case of Dublin, no less than £64,000 has been taken from the ratepayers to finance the electricity undertaking—£14,000 in the past two years, and prior to that £50,000. At Hastings (to give only one other example) the net deficit on the electricity undertaking to March last year was £11,043. This has been charged on the rates; and a further £2000 has been included in the current rate to meet last year's anticipated deficit. There is no justification for this. It is neither morally nor commercially correct; and, in allowing it to continue, there is an absolute dereliction of duty by local authorities. Through it the whole of the ratepayers suffer; and particularly such large ratepayers as gas

undertakings. But where is it to end? There seems to be no effective means of stopping it.

The ratepayers of Dublin—and small wonder, being out of pocket to the tune of some £64,000—are much exercised over the question at the present time. An inquiry has been raised as to whether the Corporation are acting legally in what they are doing; and whether there is any way to put an end to their action in plundering the ratepayers generally, in the interests of electricity consumers. We are afraid there is not; for it is not illegal to do a thing in regard to which the law has provided no check. However, as will have been seen from the report published last week (p. 260), Mr. J. Picton Bradshaw questions the legality of the action of the Corporation in this matter. We wish that we could believe in the correctness of his submission. There may have been a dereliction of duty, and an abuse of privilege, in not charging higher prices within the maximum allowed; but we fail to find—subject to the view of higher authorities—anything that makes it compulsory upon the Corporation to charge the higher prices. The fact that there is provision for the application of surpluses above 5 per cent. on the capital to a reduction of price does not, we think, in any way prohibit the Corporation making reductions before such a surplus is reached; nor do we think such a provision can be interpreted to mean that up to the maximum price must be charged in order to try to arrive at such a surplus before a reduction in price may be made. It is conceivable that in cases a price below the maximum might produce such a surplus quicker than the maximum itself. But the prices charged in Dublin are much lower than the maximum, and heavy deficits are the result, the burden of which the ratepayers have to bear. This is not equitable, nor is it honest. The powers under which the Dublin Corporation conduct their electricity undertaking are much the same as those under which other authorities work; and in order to get what the ratepayers of Dublin now desire, the amended Bermondsey clause known as the Northumberland clause has, in a few instances, been applied. If the contention of Mr. Bradshaw was correct, there would, we imagine, have been no necessity for the Bermondsey, or its successor the Northumberland, clause. However, the power of unlimited extraction from the ratepayers of the wherewithal to make good deficits shows one of the several serious defects in the law regulating municipal trading.

Gas undertakings are interested in this matter both as ratepayers and as competitors. A curious revelation as to the tactics of municipal purveyors of electricity was made in the information regarding Londonderry, as published last week. It appears that, at a Local Government Board inquiry recently, the Corporation Electrical Engineer admitted that electricity was being supplied to private consumers at below cost price, and the deficit was debited to public lighting. There has been a protest against this on the part of the Gas Company, through their Manager and Secretary; and they have submitted a scheme showing how, by the adoption of incandescent gas lighting, a saving of some hundreds of pounds a year could be effected for the ratepayers. The revelation at Londonderry exposes yet another defect in the law that controls municipal electricity supplies.

The Radcliffe matter points out a still further direction in which a gas company carrying on business in a district where there is a municipal electricity supply, may be subjected to grossly unfair competition, as well as be called upon to bear a heavy contribution towards making good the loss incurred by the municipal electricity concern as an effect of the competition. The gas undertaking, in such an event, would stand in a worse position than any other ratepayer, and would be grievously wronged. Radcliffe is an illustration of what may happen. The District Council are the electricity purveyors in the town; the Radcliffe and Pilkington Gas Company are the gas suppliers. And now the Lancashire Electric Power Company are applying for a

Provisional Order to authorize them to supply current in the same area beyond a quantitative minimum per consumer. If the power is allowed, it must inevitably result in price-cutting between the two electricity concerns; and this, in turn, would compel the gas undertaking to protect themselves by adopting the same line of resistance, against both municipal undertaking and Power Company. Moreover, the triangular duel between the concerns would most assuredly result in deficits on the municipal concern; and there again the Gas Company would be badly hit. Competition between one lighting, heating, and power agent and another, cannot be said to be an undesirable thing, so long as it is conducted on terms of equality; but competition such as that proposed at Radcliffe is very undesirable. In competition, a gas company would far sooner meet an electricity company; for the two reasons that the rivalry would be on common ground, and that if, in the competition, losses resulted from the electrical trading, they would not in any part fall upon the ratepayers. What will happen here as the result of the Power Company's application can only as yet be a matter of conjecture; but we should imagine that, in considering the interests of Radcliffe, the Board of Trade will come to the conclusion that cut-prices would be no compensation for inflicting injury upon the general body of ratepayers, and for rendering unprofitable, or less potent and profitable, the electricity and gas undertakings, whose operations are much confined compared with those of the Power Company. We think that there is subject-matter in this article which deserves not only serious reflection, but action on the part of those engaged in the making of the laws controlling municipal electricity undertakings.

Eastern Counties Meeting at Great Yarmouth— Purification and Free Maintenance.

GREAT YARMOUTH bestowed generous greeting and hospitality upon the members of the Eastern Counties Gas Managers' Association on the occasion of their spring meeting last Friday and Saturday. The Great Yarmouth Gas Company, represented by its venerable and learned Chairman (Sir R. H. Inglis Palgrave, F.R.S.), the Gorleston and Southtown Gas Company, and the Great Yarmouth Water-Works Company (of which Sir Inglis is also Chairman), together with his Worship the Mayor (Mr. Councillor T. W. Swindell) and some other of the town's dignitaries, did their utmost in uniting to make the visit a memorable one. But all this good spirit had but one actuating source, and that source was the energetic and much esteemed Engineer and Manager of the Yarmouth Gas Company (Mr. W. J. Carpenter), whose efforts were heartily seconded by the Manager of the Water-Works Company (Mr. Joseph Hawksley), and the Manager of the Gorleston Gas Company (Mr. J. Witten). The weather was kind to the visitors, and to those who had made themselves responsible for their entertainment amid the beauties of the popular seaside resort, and of its environment. The visit and the hosts, and the abounding goodwill, will long remain among cherished memories. But these are of the social side of the gathering, the story of which will be found in the report elsewhere.

The time set apart at the meeting for technical work was absorbed by the discussion of two very practical current questions—one referring to purification on most approved and economical lines, the other to that much considered development in commercial activity, free supervision or free maintenance of incandescent gas-burners. Both subjects were introduced to the members in, by request, short papers; and these proved as big a success in provoking discussion as the most seriously exhaustive production might have been. In fact, the members did not feel surfeited with the subjects—as is sometimes the case with laboured disquisitions—before they were invited by the President (Mr. John Young) to discuss them. The paper on purification was by Mr. Frank Prentice, and that on free maintenance by Mr. F. L. Wimhurst. The interest of the paper by Mr. Prentice centred entirely in, and the subscribed testimony attested the effectiveness of, the backward rotation system of dealing with purifiers for the elimination of sulphuretted hydrogen, from the points of view of their duration, the increased absorbing capacity of the material, and cost. When in his comparatively limited circumstances, Mr. R. G. Shadbolt is able to point to the system having reduced his labour costs for purification to 0.08d. per 1000 cubic feet, there is evidence of economy for all in the system, and such economy

as purification in closed vessels by liquids will find it hard to beat. The notes by Mr. Prentice supplied the evidence working under this system, as to longevity, and the large sulphur absorption of the material before being discarded and what he described as the "mystery" of this success received not a positive, but a very feasible, explanation at the hands of Mr. Thomas Glover. It is that in this system the box containing the clean material is placed first, and not last; and as oxide of iron cannot absorb sulphuretted hydrogen and oxygen at the same time, the latter passes through the clean boxes which are absorbing sulphuretted hydrogen, and on to the foul boxes, which are revived by it. In this way, the oxygen is preparing the last boxes for being put first in rotation. Whether or not this is the true explanation, has yet to be confirmed; but Mr. Glover puts it forward as a solution of what has been inexplicable, and for those interested to submit to further proof. The discussion produced several hints from personal experience—among others a simple method adopted by Mr. Glover for rendering his purifier-boxes when being emptied free from nuisance to the neighbourhood, and innocuous to his men.

Mr. Wimhurst is to be congratulated upon his maiden effort on a subject that is of pressing importance in connection with the lighting business. The incandescent gas-light for interior illumination is much cheaper than the electric light in its most modern form. But we have to recognize one disadvantage in comparison with electric lighting; and it is that incandescent burners do entail periodical attention to maintain their high lighting efficiency. The question is how is this disadvantage to be neutralized or minimized. It can only be adequately done by activity on the part of gas suppliers themselves; and this brings us to the point of free maintenance or free supervision. The question was raised in the discussion, Can we afford to do it? We think that the interposition of a negative in the question would have more effect in throwing light upon the situation—Can we afford not to do it? From this standpoint it should be mainly considered. There are many sides from which the subject must be regarded, as was shown by the discussion and an examination of these may be deferred for a week. Meanwhile, it will be seen, from Mr. Shadbolt's remarks in the discussion, that the question of the formation of a Committee by the Commercial Sections of the District Associations for the purpose of considering the matter of co-operative advertising has been taken in hand; and this, too, is a subject which will bear further reference next week.

The Economy of Small Lighting Units.

UNCEASINGLY in the gas industry, we are talking of economies achieved and in prospect from the point of view of the gas supplier, in which economies the consumers participate through the reductions thereby made possible in the price of gas. How is the consumer made to realize that he is deriving benefit from these reductions? It may be that in the very quarter succeeding the lowering of the charge, the consumer may have unconsciously been using small additional quantities of gas that, in the aggregate, wipe out entirely all trace of the benefit the reduction has brought to him. But while there is so much talk of, and attention paid to, manufacturing and capital economies, in which consumers and suppliers share, there does not seem to be a great deal of work going forward with the specific intention of showing consumers how they themselves, within their own houses, may produce considerable economies by applying the developments of more recent times in place of the older form of gas-fittings. In the show-room attached to the gas distribution department, there may be displayed all the most economy-producing appliances of the day, and yet a large proportion of the consumers may be totally ignorant of their existence, or of the value from a pocket-point of view of their adoption. They must be brought before the consumers, and their virtues extolled, in a more direct manner. In the electricity industry, the boast prevails (though there is no foundation for it in fact) that, for domestic use, there is a range of metallic filament electric lamps—unequalled by incandescent gas-burners—suitable for all positions and purposes, and, by a discriminating application of these lighting units to requirement, considerable economy of current can be obtained. There is truth in the statement as to economy being derivable by utilizing lamp sufficient for the (shall we so express it?) maximum requirement of position; but there is no truth in the statement that

the gas industry has not a range of incandescent burners suitable—and, being suitable, economy-producing—for any position. The superstition in this respect is, we fear, due to the apathy in educating gas consumers, by some direct means, in the choice and application of burners appropriate to condition.

The electrical canvasser may go into a gas consumers' house; and the chances are that he will find throughout the house—in ordinary rooms, in the bedrooms, in the hall, on landings, in lavatories, bath-room, &c.—“C” burners, using (say) $3\frac{1}{2}$ cubic feet each per hour, or a large form of inverted burner, representing in their uniformity an unnecessary waste of gas. No wonder that in such a house an electrical canvasser, by cutting down his lighting units to a point that, in his imagination, will be suitable for the purpose, is able to give the householder an estimate (the word should be underlined) as to annual cost of lighting that in some cases, in comparison with the gas bill for lighting only, is not altogether unattractive. That this is so, is due entirely to the insufficient use that is made of the types of gas-burners that, while being small in consumption, are very efficient. In the inverted line, there is the bijou burner—excellent for drawing-rooms, bedrooms, landings, &c., and there are the medium-sized inverted burners that are particularly appropriate for dining-rooms, halls, &c. As a matter of fact, for purely domestic purposes (not for many others that could be named), the large size inverted burner appears to be at a disadvantage in point of size, adjustment to requirement, and in other respects. Then in regard to upright burners, we were only last week noticing a series, including one with a consumption as low as $1\frac{1}{4}$ cubic feet an hour, and a high efficiency, while another may be expected shortly that will only consume between $\frac{1}{2}$ and $\frac{3}{4}$ cubic foot of gas, and give a light of about 17 candles. In the adoption of the lower units of light where applicable, the gas consumer can realize economy, together with other advantages. In their use in rooms (besides the greater decorative effect than can be obtained by employing larger units with their big globes), the division of the heated upward current has, in our experience, a remarkable effect in maintaining ceilings in a cleanly condition; and, in addition, the smaller units enable the illumination to be regulated just as desired—from that afforded by one burner up to the maximum possible illumination of the complete installation in a room. Further a house after dusk always look brighter, and gives the inmates a greater sense of comfort, by having a light in almost every room. With the small incandescent burner units, this condition can be satisfied in an inexpensive way.

From all points of view, the advice may be taken to be sound: Pay more attention to the small lighting units, and explain to the consumer that they offer him economy and convenience that will, in a short time, repay their installation in suitable positions.

Gas Examination Questions.

In last week's “JOURNAL,” there were published the questions set by the Examiners—Mr. Thomas Glover and Mr. J. H. Brearley respectively—in the “Gas Engineering” and “Gas Supply” sections of the Technological Examinations of the City and Guilds of London Institute. When a new examiner comes forward, there is a disposition on the part of those who have been through the mill to put the character of the questions under scrutiny in a somewhat critical fashion, in order to “size up” the examiner compared with his predecessors; and there is also a certain amount of anxiety on the part of prospective candidates to see whether there is the likelihood of a tough job, or of a chance of being let off lightly. We think it will be generally conceded that Mr. Glover has judiciously taken a middle course in inditing the questions for both the honours and the ordinary grades. It is not just to candidates, without the large experience of their professional seniors, to put to them questions that are extraneous to what may fairly be considered daily practice, or do not fall within the scope of ordinary study and reading. Both examiners have had a conscientious regard for this view. In the “Gas Engineering” examinations (honours and ordinary), real engineering questions—that is to say, questions affecting structural work—do not by any means take a prominent place; but, in major part, the questions set may be described as referring to technical management, and otherwise are largely physical and chemical in character.

The questions having relation to technical management are quite up-to-date. In the honours grade, for example,

there are the inquiries as to vertical retorts, the knowledge needed to answer which ought to be the possession of every student who takes an intelligent interest in the course of the industry's technical development. There is also the one as to the details of the design of, with the method of governing, a gas-engine intended to overcome fluctuations in voltage where the engine is used for generating electric current. That is a question which properly points out to gas-engineering students that in these times their education is not complete without technical electrical knowledge. It is also a question which both examiners might claim as coming within their particular spheres; inasmuch as the gas-engine driven electricity generating plant is a common feature of gas-works to-day, and such a generating set will give the large electricity consumer on the district what he requires at a cheaper rate—taking lighting and power together—than that at which the ordinary suppliers of electrical energy can supply him. In the ordinary grade, there is one of those questions on a simple detail of a gas-works plant that might floor many a gas engineer. “Sketch,” says the examiner, “the front and side elevation of a self-sealing retort mouthpiece.” It is quite a proper request; but how many gas engineers to-day pay strict attention to the details of self-sealing retort mouthpieces? There are several excellent self-sealing mouthpieces on the market; and engineers know them to be so, and have probably never had any fault to find with those on which they have bestowed their preference. The consequence is that the usually favoured are specified for new or reconstruction work, or orders are sent direct for them; and there is an end of the matter. Nevertheless, unless an engineer can sketch a front and side elevation of a self-sealing retort-lid, and knows its details thoroughly, he can hardly be said to be a competent judge of what constitute the good points of the article.

In the “Gas Supply” honours and ordinary grades, Mr. Brearley covers a vast amount of ground; and yet how much more on the technical side of the distribution department of a gas undertaking remains to be covered! The questions are very practical ones; and no one aspiring to position in the commercial-technical operations outside the gates of the gas-works can afford nowadays to be ignorant of any of these matters. The questions that have been set on this and previous occasions bring home the extraordinary changes that have been wrought in the gas-supply department not only through competition, but by the extended applications of gas and the new means of more efficiently producing the original purpose of gas combustion—illumination. These examinations should be helpful in raising the status of those engaged in the distribution department, and in producing a better recognition of the truism that the labourer is worthy of his just hire.

Metamorphosis of Coalite Bye-Products.

THE heavy fall in the quotations of the shares of the British Coalite Company which occurred recently is doubtless responsible for the issue to the shareholders of a circular-letter, signed by the Chairman of the Board of the Company, giving some particulars as to the “commercial working of the process.” This letter, which is reproduced on another page of to-day's “JOURNAL,” discloses the fact that the Company have gone to yet another expert for advice as to the utilization of the tar which is an abundant bye-product of the coalite process. In 1908, we learnt from the specious advertisements and articles intended to boom the coalite business that a ton of coal distilled in the coalite “retorts” yielded about 23 gallons of tar, from which were obtained a series of products of extraordinary virtue and value. Among the products named were (per ton of coal) about a gallon of the “finest motor spirit in existence,” a gallon of light oils or “solvent naphthas,” a quantity of tar acids, seven gallons of “fuel oils,” and a quantity (as nearly as we can calculate from the figures given, about 1 cwt.) of pitch or bitumen. The motor spirit was to emancipate the country from the foreign control of its supplies of that commodity; while the fuel oils were to ensure “immunity from any humiliating dependence of this nation in time of war upon the oil-wells of America or elsewhere.” How does this glowing description of the products of coalite tar and their importance to the country tally with the latest information as to what is actually being done with the tar? We learn from the circular, dated the 20th ult., that the coalite tar produced from one ton of coal has, in practice, been proved to contain: 4.75 gallons of naphtha solvents, 4.07

gallons of tar acids, 3.10 gallons of disinfectant oils, and 98 lbs. of pitch or coalite bitumen.

What has become of the motor spirit and the fuel oils, with which coalite was to menace seriously the markets of "the rings and trusts which control the supply to this 'country of motor-spirit and burning oils.'" These rings and trusts were represented as already in 1908 resenting the intrusion of coalite, "with its potentialities of rendering 'us absolutely independent of the Standard or any other 'foreign oil company, as far as the supply of oil for fuel or 'for internal combustion engines is concerned.'" Have the rings and trusts triumphed, that eighteen months later, in a period of phenomenal booming of oil-producing undertakings, motor spirit and fuel oil are no longer named as products of the marvellous coalite tar? We trust that the British Coalite Company have not been persuaded to come to an understanding with the rings and trusts to suppress its production of the spirit which was superior to petrol, and of the fuel oil which was to become the "sinews of war" for the British Navy. Can it be that the Company have received a valuable consideration from the rings and trusts, that it has thus within eighteen months become so unmindful of the best interests of the British people? If so, is it fair that it should continue to style itself the "British" Coalite Company? It cannot, of course, be that the motor spirit and fuel oils which coalite tar was stated to yield in such enormous quantities and of such superlative quality are not actually forthcoming from it! If statements concerning them were indeed flights of the imagination, what credence will the guileless shareholder in the British Coalite Company place in the statements—intended to reassure him—made in the present circular? May he not confidently anticipate that, after a further short lapse of time, a fresh tar-expert will have been called in to advise the Board, and that it will be found that "in practice" the tar no longer contains some of the most valuable products now obtainable from it? If we exclude for the nonce the interference of the machinations of the rings and trusts, another violent metamorphosis of coalite tar may be confidently anticipated at the time when quotations of the Company's shares again exhibit a startling depression in their market value.

Electrical Disaffection.

The electrical people have been trying to move heaven and earth to get set aside the street-lighting contract that the Westminster City Council have thought fit and proper to enter into with the Gaslight and Coke Company, and to have revised prices for electricity submitted. But they are too late. The Gaslight and Coke Company fully understood the explicit contract conditions of the City Council; but it appears that the St. James and Pall Mall Electric Supply Company did not, or rather they insinuate that they did not. Something might well be said here about the variation in the degrees of intelligence of those who interpret the conditions of contracts for respectively the Gas Company and the Electricity Company; but we will forbear. The St. James and Pall Mall Company, however, are very sore over the whole business; and we rather think, having regard to the prices they submitted, that the losing of a piece of street lighting in the very heart of the West-end ranks second in their annoyance to the tormenting criticism to which they have been subjected from all parts of the electrical ranks for allowing the Gaslight and Coke Company to have such a triumphant win, which includes not only the choice area electrically lighted at present and up to November next, but all the streets within the jurisdiction of the Westminster City Council at present lighted by gas, about which further particulars are given elsewhere. The Electric Supply Company, in their distraction, sent a circular to the members of the City Council, which Mr. Jacques Abady, the Chairman of the Works Committee of the Council, described at the meeting of the latter on Thursday, as being full of misstatements, and a contravention of a standing order which prohibits contractors or tradesmen canvassing members or officers of the Council in support of their tenders. The Company plead to be allowed to revise their prices. But it is too late. If they were allowed to do so, the prices of the Gas Company are so considerably below theirs that the revision would have to be on a heavy scale; and, if, again, they were permitted to do so, then in fairness the Gas Company would be entitled to a similar right—their figures having been disclosed. Where, then, would such an abuse of

tendering end? The contract, however, is safely in the hands of the Gas Company; so that the Electricity Company's endeavour to upset a settled condition of things has been as ineffectual as it was foolish. Hinging upon this matter, the "Electrician," in a comment upon the success of the Gas Company in their issue of April 22, referred to Mr. Abady, the Chairman of the Works Committee, as being an out-and-out supporter of gas, and alluded to his views as being "somewhat biased." There was a nasty flavour about the words; and underlying them there seemed to be an insinuation of prejudice having begotten preferential treatment. In the current issue, it is interesting to find our contemporary confessing to having taken a mistaken view of Mr. Abady's attitude in the conduct of his voluntary public duties. What was the actual cause of that change of view?

Illuminating Power at Sheffield.

As will be seen from particulars which appear in another column, the Board of Trade have issued the Provisional Order applied for by the Sheffield United Gaslight Company. The main objects for which the Order was sought were to provide for a reduction in the illuminating power of the gas and the adoption for testing of the "Metropolitan" No. 2 burner. The application was the subject of an inquiry some two months ago at the office of the Board of Trade, when it was explained that the Company's first object was to bring the illuminating power of their gas and the testing of it up to modern conditions—that was to say, they wished to be able to supply 14-candle instead of 16½-candle gas and to use the new burner for testing it. On behalf of the Corporation, it was urged that the Company were asking too much when so many other companies were at present merely applying to Parliament to use the new burner; and it was suggested that the Order should go forward simply providing for the alteration of the burner. Mr. Hanbury Thomas gave evidence for the Company, as did also Mr. Charles Carpenter, Mr. H. E. Jones and Mr. J. F. Bell, of Derby (who stated that their experience of 14-candle power gas in a place similar to Sheffield was a large increase in consumers and no complaints). Mr. Hanbury Thomas pointed out that it was not desired to go down to 14 candles at once. All they proposed to do was to leave off enrichment; and this would probably make only 1-candle power difference, as they used a very good class of coal. For the Corporation, Mr. William Newbigging gave evidence to the effect that the two things asked for would affect the consumers adversely. The Order as issued provides for the supply of 15-candle gas, to be tested by the "Metropolitan" No. 2 burner. Arrangements are to be made for supplying, within a period of two years, suitable flat-flame burners for the gas to consumers who may desire them; and there are also sections dealing with the offering of debentures for sale by public auction or tender, and the holding of the meetings of the Company annually, instead of half yearly, as is necessary at the present time.

Twelve-Candle Power.

Local authorities owning gas-works are now leading in the matter of the reduction of the standard of illuminating power of gas. This fact stands in strange contrast with the violent antagonism shown by local authorities who do not own gas-works when gas companies go to the length of asking for modest reductions of their standards. Only last session, the Bury Corporation had the standard of illuminating power prescribed in their Act at 12 candles, as tested by the "Metropolitan" No. 2 burner and now this session the Local Legislation Committee of the House of Commons have agreed to the Corporation of Middlesbrough reverting to the standard of 12 candles under which they worked up to 1898. In the Corporation Act of that year, it was raised to 15 candles; and now it is going back again—Mr. David Terrace, the Gas Engineer, having advised, and satisfied, the Corporation that with the incandescent burner, and the large use of gas for other purposes in which the illuminating power is of no account, a standard of 15 candles is no longer necessary. These instances of legislative accord with the requests of local authorities to a reduction of standard below 14 candles will supply another point for the already strong case of the gas companies, and perhaps help to induce Parliament to take a still more lenient view of the submission that a standard of illuminating power is about ripe for relegation to the abode of those things the useful existence of which has come to an end.

Metropolitan Borough Councils and the Westminster Street Lighting Contract.

The electrical interests are evidently at work trying, by an indirect method, to make the Gaslight and Coke Company suffer for the bold stroke they successfully made to win the Westminster public lighting contract. A paragraph, under "Electrical Notes" in "The Times" Engineering Supplement last Wednesday, dealing with the question of public lighting, contained the following: "It is clear that an heroic effort is to be made by the gas companies to crush electrical competition in this field. Unless there has been some serious error in the figures, it would appear that the Westminster City Council are to be allowed to renew their contract with the Gas Company at amazingly cheap prices—far lower than those charged by the same Company in other parts of London. Already it is understood that several local authorities are conferring with the intention of enforcing the legal provision against preferential treatment—that is to say, if Westminster is to be lighted at rates which represent a charge of only 5d. or 6d. per 1000 cubic feet of gas, other borough councils will insist on the same terms. If the Gas Company foresaw this development, the only inference is that a determined effort is being made to overwhelm electric competition in street lighting throughout a large part of the London area." It is evident the writer of the foregoing is quite ignorant of the great advance that has been made in the lighting efficiency of high-pressure gas-lamps, and therefore of how the contrast figures work out.

Local Government Board Procedure.

At times, one notices in the popular newspaper Press that profitless discussions take place in the correspondence columns, and apparently excite the greatest interest among readers—particularly if they happen to deal (as, indeed, is usually the case) with what may be termed a "social problem." This being so, it should not be too much to hope for free ventilation of views on a practical question of considerable moment, when attention is drawn to it by a correspondent in the pages of a technical paper. In another part of this issue, an Engineering Firm allude to a matter which it will be agreed is of far-reaching importance to a large number of municipal authorities, as purchasers of engineering materials, on the one hand, and to trading concerns, as manufacturers of such materials, on the other; and it is a hope they express that what they have to say may call forth some interesting and useful comments from readers, which has led to the opening lines of this paragraph being written. As the question broached deals with nothing less than an alteration in the procedure of a Government Department, the necessity for enlisting the aid of as large a body of public opinion as possible (if anything useful is to be accomplished) will be generally admitted. Briefly, the point is the Local Government Board's power of veto over the use of certain materials by municipal engineers. That there should be some measure of control and advisory power, is agreed; but the question raised is whether, in order to secure the maximum of impartiality and efficiency, this important power should be in the hands of a single official, who, it is urged, "may not be in complete touch with all the modern improvements in plant, or who may hold views not in line with those entertained by other engineers of experience or by the profession generally." What is suggested by our correspondents is that such questions as the permissibility of certain materials and the loan periods to be assigned to works should be referred to a committee consisting of gentlemen of knowledge and experience, and including some representatives of the public spending departments who have to do with engineering. Even beyond this, a higher court is proposed for important cases, in the shape of a still larger committee composed of eminent engineers—say, the Presidents (or elected members) of various big societies. Point is certainly given to the criticisms by our correspondents of existing methods by their recital of the fact that some of the materials which are vetoed, or penalized, by the Local Government Board are in extensive use by the other public departments. Such a progressive science as engineering, it goes without saying, needs continual revision of ideas.

The April issue of the "Journal and Transactions" of the Society of Engineers (Incorporated), which is edited by the Secretary (Mr. A. S. E. Ackermann), contains a paper on the Moulmein Water-Works, which was read by Mr. Percy G. Scott at the meeting on the 4th ult. There is also a report of the discussion

THE STATUE OF SIR GEORGE LIVESEY.

In the Exhibition of the Royal Academy at Burlington House, which opened yesterday, will be found the statue of Sir George Livesey, which has been executed by the well-known sculptor, Mr. F. W. Pomeroy, A.R.A., for the South Metropolitan Gas Company. It will be remembered that the Chairman of the Company (Mr. Charles Carpenter) some time since announced that the Directors had consented to the exhibition of the statue at the Academy, in view of the fact that it would enable a large number of the friends of the late Sir George to inspect the work by Mr. Pomeroy. Afterwards the statue will be erected in the garden at the entrance to the Company's offices, in the Old Kent Road.



We are sure that a large number of gentlemen interested in the gas industry will take advantage of this opportunity of seeing the statue, and that, as the result, they will agree that Mr. Pomeroy has faithfully caught Sir George's pose and features. The statue depicts Sir George holding his hat in the right hand with the left hand on hip—evidently (as was his wont) carefully considering some matter of serious import. The face is alert; and, in the opinion of several members of the Royal Academy who knew Sir George, it is a most excellent portrayal. The statue is 8 feet high, and is cast in the best statuary bronze. The pedestal on which it is to stand will be wrought in the best Aberdeen grey granite (6 feet high), with an appropriate inscription. The whole work—bronze casting and pedestal—has been executed by British labour.

We heartily congratulate, as we are sure many others will do, Mr. Pomeroy on the result of his labours, and the general satisfaction that it will give in the gas industry.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 333.)

LAST week was account week on the Stock Exchange; and a feeling of some uneasiness and apprehension in regard to its adjustment in the fashionable speculative markets imparted a degree of dulness which extended to other departments and militated against activity. Throughout the week things swayed this way and that, now better now worse; but they were well above their lowest at the close. The opening day was not cheerful. The leading markets inclined to give way, the American and South African were weak, and even Rubber and Oil were chastened into sobriety. Tuesday was another quiet and rather depressed day for pretty well every department. But gilt-edged lines were strong, and Consols rose $\frac{1}{8}$. Wednesday came out somewhat brighter. Consols advanced another $\frac{1}{8}$, the markets in general were firmer, and even Americans ceased to fall. On Thursday, clouds gathered again, and there was a marked movement to liquidate. Everything was rather weaker, except Home Government issues. Friday seemed agreeably surprised that the settlement had so far revealed no catastrophe, though, of course, it was not all over yet; and things, therefore, assumed a more cheerful tone even if markets could not be called strong. This state of affairs was maintained on Saturday, and the close was certainly less agitated. In the Money Market, there was a good demand for accommodation; but discount rates steadily eased in view of the improved gold position. Business in the Gas Market was much quieter. A comparatively small number of issues were dealt in at all; and they were devoid of any animation. Prices were as nearly as possible stagnant. In fact, setting aside the "*ex div.*" variations, there was only one change of quotation on the London Market and two on the Provincial Exchanges. In Gaslight and Coke issues, the ordinary was quieter, and not disposed to move. Stock changed hands at figures ranging from $103\frac{1}{4}$ to $104\frac{1}{4}$. In the secured issues, the maximum realized 89, the preference from $104\frac{1}{8}$ to $105\frac{3}{8}$, and the debenture from $81\frac{1}{4}$ to $82\frac{3}{8}$. South Metropolitan was little dealt in, at about the old prices; transactions marking from $120\frac{3}{4}$ to 122. The debenture was done at 82 and $81\frac{1}{4}$ free. In Commercials, there was only one bargain in the 4 per cent. at 108. Among the Suburbans and Provincials, Alliance and Dublin was dealt in at $82\frac{1}{2}$ and $83\frac{1}{4}$ (a fall of 1), Brentford old at $251\frac{1}{2}$ and 253, ditto new at 188 to $189\frac{1}{4}$. On the local Exchanges, Newcastle was done at 105 (a rise of $\frac{1}{8}$), and Chester advanced a point. The Continental companies were as quiet as the rest. Imperial had a few dealings at from $181\frac{1}{4}$ to $182\frac{1}{2}$, ditto debenture marked $94\frac{1}{2}$, and European fully-paid $24\frac{3}{8}$ and $24\frac{3}{4}$. Among the undertakings of the remoter world, Bombay changed hands at $6\frac{3}{8}$, Hongkong at $17\frac{3}{8}$ *ex div.*, Monte Video at $13\frac{1}{16}$, Primitiva at $7\frac{1}{16}$, ditto preference at $5\frac{1}{8}$ and $5\frac{1}{4}$, ditto debenture at $99\frac{1}{8}$, River Plate debenture at $99\frac{1}{8}$ and 100, San Paulo at $15\frac{3}{8}$ and $15\frac{5}{8}$, and ditto debenture at $51\frac{1}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Life of Metallic Filaments in Street Lamps—Other Public Lighting Points—Blackening and Fragility—Latest from Newmarket—Worn Quotation.

THE "Electrician" has been gleaned information regarding the use of metallic filament lamps for street illumination, on which subject there seems to be a great deal of anxiety at the present time. The main interest to be extracted from the efforts of our contemporary is in regard to the testimony as to the life of metallic filament lamps in public places, which testimony shows that there is a want of concord in the experiences. It is a little difficult to get at a figure that may be taken as approximately an average life, as, according to charts referring to Wimbledon, the failures commence quite early at 200 hours or under, and go on progressively till a few lamps are still existing at 3000 hours. At Hammersmith of 14 400-candle power Osram lamps fixed only on Nov. 1 last, the average life of half of them was 1360 hours; while the remaining seven were running at 2500 hours. These 400-candle power lamps are not inexpensive things. At Heston and Isleworth the average life of 80 100-candle power "Meta" lamps in the last twelve months was about 1700 hours. At Stepney, half-a-dozen 100-candle power Osram lamps have returned an average life of 1267 hours. From Nuneaton, it is reported that an average life of 2000 hours is being obtained with 50-candle power lamps. At Blackpool, Osram lamps are used, in units of 30, 50, and 100 candle power; and they enter upon their final rest with an average life of about 1000 hours, though in a number of cases the lamps have run as long as 2000 hours. In Horsham streets, free from the great turmoil and bustle of northward towns, the average life of tantalum lamps is about 1600 hours; but singularly the results noted with tungsten lamps are far from uniform. Several other engineers do not commit themselves to figures; among those who adopt a non-committal attitude being the engineer at Canterbury, who says that a few high candle-power Osram lamps have been installed there for street lighting, "and at present he has no fault to find with them." This suggests that the gentleman in question when writing was in an anticipatory mood, and that trouble was peeping over the horizon. But the figures that

are given indicate that, if about 4000 represents the lighting hours in a year, then, generally speaking, round about three lamps will be required for renewals in the course of a year; and metallic filament lamps cost shillings apiece contrasted with two or three pence for mantles.

In several places high-power metallic filaments are replacing arc lamps; and in this connection it is estimated by the engineer at Nuneaton (in the report incidentally referred to above) that the cost of renewals will work out at about two to three times the cost of renewals with arc lamps; but a considerable saving—more than sufficient to compensate for renewals—it is thought, will be obtained in labour. From Pembroke (co. Dublin) is forwarded the intelligence that the cost of metallic lamp renewals is practically equal to the cost of carboning the arc lamps previously installed; but it has been found possible to dispense with the services of a lamp trimmer. The practice of adopting high-power metallic filament lamps in place of arc lamps has a disadvantage in that it tends to increase the risk of a standard being in darkness, for which reason it is thought preferable at Nuneaton to use a number of low candle-power units. Among other points it is seen that at Wimbledon, gas-lamps have been completely discarded, in order to give the electricity generating-station more work; and for 91 flame arc lamps, 44 300-candle power Osram lamps, and 1092 50-candle lamps, the annual cost runs out to something like £6500—capital charges and electricity amounting to £4700, and attendance, repairs, and renewals amounting to about £1800 per annum. From Gillingham, there is an interesting note. Mr. Chalmers reports that he has recently photometered about half-a-dozen of the incandescent gas-lamps in use for street lighting, for which the Gas Company claim 140-candle power; and he obtained an average of only 39·4-candle power—so that about 100-candle power has gone astray. It is added that a Harrison flicker photometer was used in making the tests. The missing candle power speaks badly for the photometer; but perhaps Mr. Haydn Harrison will say that, if photometry is conducted at Gillingham in anything like the fashion that Mr. H. Ross Hooper, of the Local Government Board, thinks that the electricity accounts there are kept (kept in such a manner that an inquiry for a loan has had to be adjourned *sine die*), then the observer not the photometer is unreliable. Of course, this is a matter for Mr. Chalmers and Mr. Harrison to settle between them.

Having before us all the good things—longevity and so forth—that can be said in electrical print in favour of metallic filament lamps, and with all the other things left unsaid, one turns with interest to a letter from the Foster Arc Lamp and Engineering Company touching upon the article, by Mr. G. B. Barham, on the blackening of the bulbs of metallic filament lamps, to which we made reference in the "Memoranda" on April 5. The writers complain that Mr. Barham does not leave us any nearer overcoming the difficulty, which he states, and with good reason, undoubtedly exists. In their opinion, there is not any exception, in all the different makes of lamps, to the liability to "blacken;" and when one takes into consideration the serious loss of efficiency caused by such "blackening," one is bound to come to the conclusion that the high-voltage lamp, as at present made, is by no means a success. As it cannot be thought that the Foster Company desire to do the electrical industry any harm, it may be taken that they are writing honestly when they say: "When the heavy first cost of installing a house with high-voltage lamps is taken into consideration, and also the expense of renewals, owing to their great fragility, it almost passes one's comprehension why contractors (who admittedly suffer severe loss in the stocking of these lamps alone) should recommend their clients to use them. It is now so well known that with the use of a transformer on alternating current, and low-voltage lamps, both the first cost of installations and the running costs afterwards, are so much cheaper than installing high-voltage lamps, that it scarcely needs comment, and low-voltage lamp 'blackening' has been reduced, on a good standard make of lamp, to a minimum." Having had under observation all makes of high-voltage lamps, the writers do not think that any method is at present in use which can safely be said to overcome the trouble in the manufacture of these high-voltage lamps which results in the "blackening" referred to. The Foster Lamp Company are located at Wimbledon. We cannot make their experiences and comments coincide with the report from Wimbledon on the use of metallic filament lamps in the streets. Such lamps installed in the streets are not any more exempt from "heavy first cost," "expense of renewal, owing to their great fragility," and blackening, than lamps used for interior lighting.

Mr. Frank A. Simpson is not only the Electrical Engineer of Newmarket, but he is an enthusiastic diver into ancient manuscripts, and a plagiarist who concocts letters largely composed of stock quotations that have for years done duty with poor success in the advertising literature of the electrical industry. We asked Mr. Simpson a fortnight since to favour us with answers to certain questions touching upon some declarations he had made as to the vitiation of the air of rooms by the combustion of gas (p. 164), as we had, and still have, grave doubts as to that gentleman's personal knowledge giving support to his dogmatism. But Mr. Simpson, for some reason or other which may be left to the selection of our readers, does not come up to the scratch, and give us that proof of his personal competence for which we asked. Looking back over the questions, we have some feeling that his refusal to offer replies is the best display of wisdom that he has yet shown in the controversy in which he has been taking part. Mr. Troughton has had his turn at the last letter penned by Mr. Simpson, to

which we referred on April 19; and now the latter gentleman has occupied the greater part of a column of the "Newmarket Journal" with a further letter largely composed of (electrically) well-thumbed quotations. He reproduces, as if to make a point, a statement by Dr. Rideal that one gas-burner consumes 4.2 cubic feet of air per hour, and a man about 1 cubic foot. What is here to harp upon in this? It is not what a burner or a human being consumes, but the character of their respective deleterious emissions. Pettenkofer has found that pure carbonic acid in the proportion of 100 parts per 10,000 of air is not injurious to human beings; while 10 parts of carbonic acid per 10,000 of air, if derived from the respiration or perspiration of human beings, render the air of a room unfit for a person to remain in for any length of time. On this point Mr. Simpson may be reminded of something we had to say on April 6 last year (p. 19) regarding certain statements of his Chairman, Mr. F. E. Gripper. But if there is any point to be made by Mr. Simpson of Dr. Rideal's figures, he may as well know that, with different burners, the figures would change. For instance, Dr. Bunte has found that with ordinary upright incandescent burners three volumes of air are required to one of gas; and with inverted burners, two volumes of air to one of gas.

Then Mr. Simpson, dipping into the Board of Trade Departmental Report on the Metropolitan Gas Supply, quotes this sentence from the evidence of Mr. Otto Hehner, "I think it would be bad to breathe gas vitiated air, even if it were antiseptic." Mr. Hehner does not say that the use of gas by modern means does vitiate air; but that it would be bad to breathe it if it did. As, however, Mr. Simpson is of opinion that the sentence has peculiar weight, let us quote from the report on the experiments that Mr. Hehner had made and laid before the Committee: "Those who object to the products of gas combustion as regards sulphur can, by using incandescent mantles, reduce the actual amount of gas burnt to a small volume, and the sulphur thrown into the air in proportion, and yet obtain a higher amount of illumination than formerly." Again: "As the net results of these experiments, to which an immense amount of labour was given, I have to report that no measurable amount of sulphurous acid could be detected either in the outside city air, or of a room in which large amounts of coal gas had been burnt." And yet again: "I conclude that it would be utterly immaterial to the consumer of gas if the present regulations as to purification were abolished, and the amount of sulphur allowed to rise to 50 or 60 grains per 100 cubic feet." The results of the experiments show that "in an ordinary papered and whitewashed room, the sulphur oxides thrown into the air by the combustion of a gas-flame were removed so rapidly that the proportion of sulphur in the air of the room was not materially greater, and even sometimes smaller, than the total sulphur-content of the outside air." Proceeding, Professor P. F. Frankland's statement before the Departmental Committee is quoted by Mr. Simpson as to the oppressiveness of the atmosphere in a room where "a large quantity of gas is being burnt." But, of course, Mr. Simpson does not now that Professor Frankland (who recommended incandescent gas-lamps for lighting the Birmingham Art Gallery) has for years now been giving evidence in opposition to most of the progressive movement of the gas industry; and even Professor Frankland, in the Parliamentary Committee rooms this session, has had to admit that gas for lighting is not now burned in "large" quantities, but in small quantities through incandescent gas-burners. The Departmental Committee (upon which Mr. Simpson had not a vote, which was an unfortunate oversight on the part of the Home Secretary) was composed of Lord Rayleigh, Sir W. Abney, Dr. J. Farquharson, Mr. William King, and [then] Mr. J. Fletcher Boulton, K.C. The verdict of this Committee of unchallengeable eminence was this:

It does not appear that any complaints are made by the inhabitants of other districts on the ground that the gas unpurified causes injury to health, or is more destructive to articles such as leather, &c., than it is supposed to be in London. In the face of this striking fact, the Committee are of opinion that those who contend for the maintenance of the clauses relating to sulphur compounds (other than sulphuretted hydrogen) have not sufficiently shown that their abolition in the case of the London Companies would be detrimental to the public.

What has Mr. Simpson to say to this? As to quotations from the writings and sayings of Dr. Haldane (1902-3) and Sir Aston Webb, we may refer Mr. Simpson to a reply in the "Memoranda" of Dec. 14 last (p. 731), a copy of which has been sent to him, and we venture to hope, his edification. Even Dr. Haldane on the Brighton Gas Bill this session has admitted to a House of Commons Committee that the incandescent gas-burner has altered the conditions of lighting, in view of the small quantity of gas consumed to obtain the same degree of illumination. The old experiments by the learned Doctor were made with flat-flame burners, in rooms with doors and windows closed, and without draughts in them! Strange, but true! We still trust that Mr. Simpson will favour us with replies to the questions addressed to him in our issue for April 19; and at the same time he might express his views on the decision of the Departmental Committee, and on the additional information that has been placed by us at his disposal.

On April 19, Alderman and Mrs. Farncombe attained the silver anniversary of their wedding; and among the numerous presents was one from the Directors and officers of the Eastbourne Gas Company, of which Alderman Farncombe is a member of the Board. It took the form of a beautiful filigree rose-bowl, filled with roses.

NOTES FROM WESTMINSTER.

COMMITTEE room proceedings during last week were, within the scope of our interests, of a somewhat "watery" character. It will be of interest, however, to learn that the Standard Burner Bills have been before the Examiners of the House of Commons, and have been sent forward for second reading. In these days of stormy antagonism to gas companies securing any advantages, it will be interesting to readers to learn that the Middlesbrough Corporation have so far successfully carried a claim to a 12-candle power standard, as did the Corporation of Bury last session. Certain important water schemes have been before Committees; and these will be noticed next week.

Twelve-Candle Standard.

The gas section of the Middlesbrough Corporation Bill was reached by the Local Legislation Committee last Wednesday. The section is short, but in one respect highly important, in that the Corporation are asking that the standard of illuminating power shall be reduced from 15 to 12 candles; thus returning to the standard that had existence for thirty years—from 1868 to 1898, in which latter year it ascended to the 15 candles. Mr. Jeeves, one of the Counsel for the promoters, put it to the Committee that "it was in the interests of the consumers" that the reduction of the standard should be made in view of luminosity as a property of gas combustion having lost its value, owing to the use of gas in incandescent burners and its extensive adoption for heating, cooking, and power. Mr. David Terrace, the Corporation Gas Engineer, gave the necessary technical testimony; and the Committee passed the clause. Local authorities who push forward the breaking-down of the effete standard are doing a good work for the gas industry generally.

Sale of Coke.

When we were noticing the Bill of the Middlesbrough Corporation (referred to in the preceding paragraph) on Jan. 22 last, clauses were reproduced relating to the sale of coke. The object of the clauses is the protection of consumers buying in small quantities from retailers, by having the weight or measure certified, and making it a penal offence to contravene the proposed enactment. The Board of Trade were rather opposed (when the clauses were before the Local Legislation Committee last week) to the matter being made the subject of legislation in a Private Act, thinking that it should be, if protection were necessary, incorporated in a General Act, and so have universal application. Still the Board were not altogether unfriendly, believing that Local Authorities should, at any rate, make bye-laws and regulations in regard to coke sales. The Committee, however, were sympathetic with the views of the Corporation; and, subject to revision, the clauses were passed. That is better than waiting for generations for a General Act. The text of the provisions will be found in the report of the proceedings in our "Parliamentary Intelligence."

Why not Electricity?

We have been congratulating the gas industry upon the success of the Heywood and Mountain Ash stand-by clauses of last session; and of the success so far of the clauses incorporated in Bills this session. It is now clear that the Local Government Board will not raise any further objection to such clauses; but according to the proceedings on the Rhondda Bill before the Local Legislation Committee, they seem to have some dislike to the stand-by power for gas being applied to electricity as well as to private suction gas and other producer plants. Why there should be this objection is not at all plain, as it comes hard on gas suppliers if they have to lay, without proper compensation, a long length of service-pipe, and supply and maintain a large meter in a factory, merely for stand-by purposes to electricity. However, in order to please the Local Government Board, the Rhondda promoters agreed to delete from the clause the words "or electricity;" and, abbreviated to this extent, the clause stands. In the Heywood Act last session, protection was given the Gas Department against electricity.

General Law and Commonsense.

Undue respect for the General Law has caused the Unopposed Bills Committee of the House of Commons to remove from the Bristol Gas Company's Bill a clause that had for its purpose, the only sensible way of dealing with consumers who have faulty gas pipes and fittings, and from which there are neglected escapes. The Company proposed, on such escapes coming to their knowledge, to give the consumer notice that if, after thirty-six hours, the escape continued, they should cut off the gas, and have power to recover any costs incurred. Gas undertakings could do with authority of this kind to assist them in protecting negligent consumers against their own folly. But the apotheosis of the General Law brought the balance of feeling of the Unopposed Bills Committee down against the commonsense proposal of the Company; and so the clause went. But the Company have succeeded with another provision that gives them the right to recover the cost of reconnection when a troublesome consumer necessitates the cutting off of the supply. Provision has also been made in the Bill to restrict the right of entry to premises for cutting-off purposes to certain hours of the day.

Electricity Powers.

It will be remembered that the Unopposed Bills Committee passed the Bishops Stortford, Harlow, and Epping Bill just recently, but reserved decision on the electricity section. This, too, has now been passed; and so the measure will likely proceed without further molestation.

RETIREMENT OF MR. R. FORBES CARPENTER.

READERS will regret to learn, as we do to have to record, that, in consequence of persistent ill-health, Mr. Russell Forbes Carpenter, F.I.C., retired on the 17th ult. from the position of Chief Inspector under the Alkali Works Regulation Act. It is not necessary to refer here in any detail to Mr. Carpenter's work, as the copious extracts from his annual reports which have periodically appeared in the "JOURNAL" have afforded ample proof of the excellent manner in which his duties have been performed. Suffice it to say that, in the long period during which he has held the office, he has won the esteem of everyone with whom he has been brought into contact.

Mr. Carpenter was appointed a Sub-Inspector in January, 1882, becoming an Inspector in July, 1884, and Chief Inspector in June, 1895; so that he has held for about fifteen years the last-named position, in which he succeeded Mr. Alfred E. Fletcher. It may be remarked that Mr. Carpenter, who possessed noteworthy organizing powers, had a great deal to do with the re-drafting and consolidating of the Acts of 1881 and 1892, which resulted in the passing of the Act of 1906—one of the first measures that Mr. John Burns got through when he was put at the head of the Local Government Board. This new Act is recognized as an admirable one; and it brought within its scope a class of works whose inclusion had long been required—namely, smelting works. Great opposition was in the first place offered by manufacturers to this step; but Mr. Carpenter's tact was equal to the occasion, and everything is now going on exceedingly smoothly. Mr. Carpenter has served on the Council of the Institute of Chemistry and the National Physical Laboratory, and been Chairman of the Manchester Section of the Society of Chemical Industry.

The new Chief Inspector is Mr. William S. Curphey, who was appointed an Inspector in 1892, and has since had entire charge of the work in Scotland.

In connection with the retirement of Mr. R. Forbes Carpenter, as noted above, we learn that the Secretary for Scotland has appointed Mr. J. W. Young, B.A., B.Sc., hitherto a Sub-Inspector under the Alkali Works Regulation Acts, to the post of Inspector for Scotland.

PERSONAL.

Mr. J. T. BROUGHTON has been appointed by the Congleton Town Council Manager of the Corporation gas-works at a commencing salary of £165 per annum.

Mr. EDWARD ALLEN, M.Inst.C.E., has been elected President of the Liverpool Engineering Society—an honour not merely personal but also a recognition of the Liverpool United Gas Company as a very important factor in the life of the city.

No less than 62 applications were received for the position of Gas Engineer to the Corporation of Nelson, which has become vacant through the resignation of Mr. A. J. HOPE. The Gas Committee met last week, and reduced the number to five; and it was arranged for the final selection to be made yesterday.

Mr. JOHN FURNESS, the Manager and Secretary of the Slaithwaite Gas Company, has a long record of service as a member of the Urban District Council, having served continuously since its formation in 1894. About ten years ago, he was honoured with the position of Chairman; and the members have again shown their confidence in him by making him Chairman for the ensuing twelve months. By virtue of his office, he will take his seat on the County Bench at Huddersfield as a Justice of the Peace.

Mr. WILLIAM WALCH, Office Superintendent of the Gas Department of the Bolton Corporation, has resigned after a 52 years' connection with the undertaking, made up of 14 years with the Bolton Gas Company, and 38 years with the Corporation. In accepting the resignation, the Gas Committee, at their meeting last Friday, passed a resolution expressing regret at Mr. Walch's decision, and also placing on record grateful recognition of the valuable services rendered by him to the Gas Department. The Gas Committee have referred to a Sub-Committee the question of appointing a successor to Mr. Walch.

Mr. F. W. VANSTONE, who has had the supervision of the new water-works at Paignton during their construction, has been elected a member of the Paignton Urban District Council. At the last meeting of the Water Committee, a letter was received from Mr. Vanstone asking to be released from his engagement as Engineer of the unfinished portion of the distribution scheme, and stating that his son (Mr. F. W. E. Vanstone) was willing to take over the responsibility and carry out the scheme. The Committee decided to release Mr. Vanstone from his agreement, provided that all plans, drawings, records, bills of quantities, and other documents in his possession relating to the water undertaking were handed over to the Council. As a Water Engineer has recently been appointed, the Committee did not see their way to offer Mr. F. W. E. Vanstone his father's position. The Council confirmed the action of the Committee.

OBITUARY.

The death, after a short illness, is announced of Herr HAN RICHTER, who was 42 years of age. The deceased, who died at Kiel, was, it is said, the originator of the four-cycle double-acting gas-engine.

Mr. JOHN IRELAND, late Manager and Secretary of the Ferry Port-on-Craig Gaslight Company, Limited, died at his residence in Tayport, Fifeshire, on the 23rd ult., in his 79th year. Mr. Ireland was for fifty years in the employ of the Gas Company. In September last, the Corporation acquired the undertaking of the Company; and Mr. Ireland retired from office at the beginning of this year.

It is with regret that we have to record the death, which took place last Sunday week, of Mr. THOMAS MAY, senior, who had reached the ripe age of 81. He was connected with the gas industry for about fifty-five years; having occupied the position of Manager of the Ramsgate Gas-Works from 1855 to 1870, when he left (being succeeded by the late Mr. W. A. Valon) to take up a similar position with the Canterbury Gas and Water Company. There he remained for some thirty years, at the end of which time he retired from active service, though his assistance was retained by the Company in a consultative capacity. In past years, Mr. May was largely consulted by many of the Kentish gas companies; and at the time of his death he was a Director of the Broadstairs Gas Company, a position which he had occupied for over fifty years. The funeral took place at St. Martin's, Canterbury, on Thursday. Sympathy will be felt by a large circle of friends with Mr. Thomas May, jun., the Engineer and Secretary of the Richmond Gas Company, in his bereavement.

THE PATENT OFFICE IN 1909.

THE Twenty-Seventh Annual Report of the Comptroller-General of Patents, Designs, and Trade Marks, for the year 1909 (which on this occasion bears a different signature from that to which we have become accustomed—Sir C. M. Dalton having been succeeded by Mr. W. Temple Franks), opens with a brief survey of the history of legislation in regard to patents and designs, with special reference to the existing duties and work of the Patent Office and the jurisdiction of the Comptroller.

In this review, we are informed that the earliest important Statute in regard to patents was the Statute of Monopolies, in the time of James I., which abolished all monopolies except "letters patent and grants of privilege for the term of fourteen years or under, hereafter to be made, of the sole working or making of any manner of new manufactures within the realm, to the true and first inventor." After this enactment, no material alteration was made in patent law or practice until the year 1833, when Lord Brougham's Act enabled a patentee for the first time to amend his specification by way of disclaimer or alteration, and gave the Privy Council the power of prolonging the term of a patent in certain cases from fourteen to twenty-one years. In those days the securing of a patent was not a step to be lightly undertaken; for it involved a serious call upon the purse of the applicant. In 1852, the procedure was greatly simplified, and the fees were reduced—though they still remained heavy enough to constitute a serious tax on inventors. By an Act passed in the year named, a patent was made to extend for the first time to the whole of the United Kingdom; and the total fees payable amounted to £175. Previously, three separate patents had to be taken out for England, Scotland, and Ireland respectively, and the total fees usually exceeded £400. The Act also contained other important provisions. One of these prohibited the old practice of including more than a single invention in one patent. Under the Patents, Designs, and Trade Marks Act of 1883, the present Patent Office was established and placed under the immediate supervision of a Comptroller-General, acting under the superintendence and direction of the Board of Trade; and in 1902 power was given to the Examiners to make an investigation "for the purpose of ascertaining whether an invention claimed had been wholly or partly claimed or described in any complete specification published before the date of the application, and left pursuant to any application for a patent in the United Kingdom within the preceding fifty years." The Comptroller was further authorized, on an Examiner's report, and after hearing the applicant, to insert in the specification a reference to prior specifications which appeared to claim or describe the invention. Another Act was passed in 1907, which besides consolidating the law, contained various provisions, the most important of which gave the Comptroller power at any time after four years from the date of a patent to revoke it on the grounds that the patented article or process was manufacture or carried on exclusively or mainly outside the United Kingdom. This was in reality merely an extension of a principle which had been adopted in previous Acts. For instance, by the Act of 1901 power was expressly given to the Judicial Committee of the Privy Council to revoke a patent worked mainly or exclusively abroad "if the reasonable requirements of the public in the invention were not satisfied in this country." The new section has, however, created widespread interest; and considerable prominence to proceedings under it has been given in the columns of the newspaper Press. There have already been 73 applications

to revoke; and 17 of the patents have been actually revoked. A special point is made of the fact that an application to revoke the same patent may be repeated on any number of occasions, if new facts emerge or fresh grounds for revocation arise.

On turning to the particulars of last year's work of the Patent Office itself, it is noticed that the number of applications for patents in 1909 (30,603) was larger than that in any other of the last ten years; though the number of complete specifications filed has been exceeded on two occasions. The figures for the last four years have been: 1906—applications, 30,030; complete specifications filed, 18,243. 1907—28,915 and 18,829. 1908—8,598 and 17,746. 1909—30,603 and 18,705. The number of applications received from women inventors was 648, which is an improvement on the 572 of the previous year; though even now the figure shows that there is one direction at least in which the nonfranchised portion of the population still play a comparatively unimportant part. Of the total number of applications for patents, 19,878 were received from persons resident in England and Wales, 1308 from Scotland, and 314 from Ireland. The applications from most of the British Colonies were about equal in number to those made in 1908; but those from Canada show a large increase. There is a decrease in the number of applications received from Austria, Belgium, Denmark, France, Germany, Holland, Italy, and Spain; and an increase in those from Russia and the United States. The applications from Germany numbered 3038, compared with 3059 in 1908; from the United States, 2787, against 2644; and from France, 997, against 1056. The number of patents sealed in 1907 was 16,190, or 55.9 per cent. of the applications; and out of 14,170 patents sealed upon the applications made in the year 1895, 470, or 3.3 per cent., were maintained for the full period of fourteen years. The number of patents which expired in 1909 was 15,276; and the total number of new patents sealed, 15,065. Thus the number of patents in force was decreased during the year by 211.

As to the examination of the complete specifications under the provisions of the Act already referred to, it is remarked in the report that the number of cases where the complete specification is reported as wholly anticipated or not anticipated at all is decreasing year by year; while those where it is reported as partially anticipated are increasing. It also appears that there is a growing tendency to meet the reported anticipation by an amendment of the specification; and there is a consequent decline in the number of cases in which a reference to a previous specification is inserted. The number of such references inserted in the specifications of 1908 was only 310, as against 426 and 523 in those of 1907 and 1906 respectively. The number of applications made for the revocation of patents worked exclusively or mainly outside the United Kingdom was 55; but 27 of these were subsequently abandoned. In eleven of the remaining cases the patent was revoked, in five the application was dismissed, in one the patent expired after proceedings had been begun, and eleven cases are still pending. Nine petitions for the extension of the term of patents were lodged in 1909. Of these, five were abandoned, and two dismissed; the remaining two cases being still undecided. There are now four patents in force which have been prolonged beyond the usual period of fourteen years.

Referring to the subject-matter of the patents, the report says that one of the outstanding features of the year is the enormous development in aeronautics. The subject of locomotion in general, though continuing the slight falling-off noticeable during the past few years, still occupies the most prominent position in the field of inventive activity; while the interest shown by patentees in the development of the internal combustion engine has been more than maintained. Inventions dealing with the mechanical handling of materials by conveyors and transporters are much in evidence; while "problems relating to lighting have been a prolific source of invention—especially with regard to vapour or self-generating gas lamps, and to means for automatically lighting and extinguishing street-lamps." The classification of published complete specifications (at one time a feature of the report) is again absent on this occasion; so it is impossible to go further into the details of the subject-matter of the various patents.

Last year the receipts from patents fees were £267,985, compared with £262,890 in 1908; from designs fees, £5578, against £5189; and from trade marks fees, £17,247, compared with £17,358. The receipts from sales of publications were £12,029—making the total receipts £302,839, against £297,335 for the preceding year, an increase of £5504. The expenditure, £208,536, also exhibits an increase of £29,005.

"The Sale of Gas Apparatus."—This is the title of a booklet which the author, Mr. J. Pater Wiatt, has written in the hope that it will be found useful to the many officials employed in the gas industry whose duties lie either in the sales or the distribution department. Due acknowledgment is made by him of the sources of some of the information, as well as of assistance received from various friends in the compilation of the work. The contents are divided into twelve chapters; and the subjects selected for treatment are ones which the author believes will be helpful to those who are engaged in show-rooms or similar positions. The information given is not, of course, intended to be of an advanced character. If it were so, the very object of the work could be defeated. Rather is it sought to offer "wrinkles" to those who may require them. The price of the booklet is 1s.; and it is published at the offices of the "JOURNAL."

PRODUCER GAS-FIRED FURNACES.*

INDUSTRIAL progress demands that it should be realized as widely as possible that a ton of coal, and in fact any other fuel, can be made to do far more work after its conversion into gas than it could used as a solid fuel with direct firing. In this book it is the author's purpose to give detailed descriptions and practical illustrations of the various types of gas-fired furnaces used in the chemical and engineering industries. The author rightly points out that, by using a producer, it is possible to replace high-grade coals by low-grade fuels, which could not otherwise be used owing to a high percentage of ash rendering combustion in a direct-fired furnace entirely impossible.

In the first chapter, on "The Generation of Producer Gas," the author states that "the height of the fuel-bed in producers necessary for complete reduction varies with the quality of the fuels used. Dusty fuels require less height than coarse, loose fuels. The proper height for 1-inch coke is 30 inches; for 1½-inch coke, 45 inches; for 2½-inch coke, 72 inches. This is undoubtedly a fact; but the size of fuel to be used is a detail which is often overlooked in the design of a producer.

In a chapter on the "Construction of Gas Producers," the author shows, by means of some excellent illustrations, a variety of designs; and he briefly describes their characteristics. It is noticed that producers are almost invariably fitted with bell-hoppers, so that continuous working without the necessity of waiting during charging operations is rendered possible. This arrangement might with advantage be fitted to water-gas plants. Various devices are also described and illustrated, by means of which the removal of ashes is mechanically effected. A further arrangement which increases the efficiency of the producer is the mechanical poker. Many other ingenious methods of ensuring the maximum of efficiency from the producer are shown in this chapter. The combustion of producer gas and one or two methods of mixing gas and air for combustion are briefly discussed. The author next deals with some types of furnaces used in the various chemical industries—including the Schilling-Bunte furnace for heating retort-settings. An interesting illustration is given of a producer-gas-fired boiler plant; and to those who are aware of the economies of gaseous firing as compared with direct firing, it seems incredible that so-called up-to-date boiler plant still provides for direct instead of gaseous firing. In the subsequent five chapters are described typical producer furnaces used in the metal, iron and steel, lime and cement, glass, and brick and ceramic industries. Much information of a concise and comprehensive nature is given in these chapters; and a thorough grasp of the subject is rendered infinitely more easy by the inclusion of a large number of self-explanatory illustrations.

An excellent chapter is that on the "Selection of Refractories," some of which is, in a general way, of interest to gas engineers; and the same may be said of the rest of the work. The author concludes the book with an appendix on the "Purification and Recovery of Gases" and "Gas Power." The whole subject is adequately treated in a clear style; and the work may be commended to those who wish to make a special study of producers. A perusal, however, gives one the impression that the readers of the book will be somewhat limited in number.

M. GREBEL ON NEW CARBONIZING METHODS.

A RECENT number of "Le Génie Civil" contains the first portion of an article by M. Grebel—whose name is known to many of our readers in connection with his communications to the Société Technique du Gaz, of which he is a member, as well as to some of our French contemporaries—in which he offers some observations on modern methods of carbonization. The subject-matter has, for the most part, appeared from time to time in our columns; but it will be of interest to indicate briefly the scope of the author's work, as, in a measure, it is supplemental to that of M. Marquisan, whose paper read before the French Society of Civil Engineers about two years ago was noticed at the time.

M. Grebel opens with a few historical particulars, in the course of which he points out that during the past three years a number of new systems of carbonizing coal have made their appearance, the principal object of which is the reduction of manual labour. While many of them recall the first conceptions of Murdoch, who tried, in the early days of the gas industry, horizontal, inclined, and vertical retorts, their principal characteristics are the lengthening of the duration of the charge, and, as a consequence, the increase of its weight. The feature of the old retort-setting was the distillation of the coal in from 4 hrs. 48 mins. to six hours, and that of the original coke-oven, the coking of the coal in several days; whereas now the tendency is to work off the charge in 24 hours, both in chamber settings and modern coke-ovens.

After this introduction, the author proceeds to classify, in tabular form, the different methods in use for the distillation of coal, on the basis of the normal minimum duration of the charge. The

* "Producer Gas-Fired Furnaces." By Oskar Nagel, Ph.D., Consulting Chemical Engineer; Author of "Mechanical Appliances." Published by the Author: New York; 1909.

first group, in which the charge is worked off in 4 hrs. 48 mins., comprises ordinary horizontal, inclined (Coze), and vertical retorts; the second, in which the time occupied is from 10 to 12 hours, includes the Bolz, Bueb, Young-Glover Love, and Klönne systems; the third, in which 24 hours are required, consists of the Klönne (Rotterdam), Koppers, and Ries (Munich) systems. All the methods of carbonization named, including the Woodall-Duckham, are shown on a plate forming a supplement to the above-named publication.

The author then passes on to offer some general remarks on the several systems of settings he has mentioned. He acknowledges that he has been captivated by the principle of continuity, which it would seem should be the object of all processes employed in industrial chemistry. Nevertheless, as the result of practical experience, he cannot but regard as utopian the continuous vertical retort, furnished with mechanism for the admission of the coal and the removal of the coke at certain longer or shorter intervals. If the idea is simple, its realization, in M. Grebel's opinion, is extremely difficult, inasmuch as it involves practical problems of a very complex and delicate nature. As long ago as 1897, he showed by experiment that the "pasty" condition into which nearly all coals pass in the course of coking interferes with their progressive descent. This he considers sufficient to condemn the continuous vertical retort, except when certain special English coals which are suitable for it can be procured. With regard to the Settle-Padfield and Young-Glover systems, he says that if they have not, like that of MM. Verdier and Teulon, been actually abandoned, they have not "entered the domain of practice." As to the inclined retort, it appears to have had its day; while the vertical retorts of Bolz and Klönne and the "45's" of Love and Genotte, though working very well, represent, according to M. Grebel, only a transitory solution of the problem. He acknowledges, however, that the Bueb system leaves nothing to be desired. The Dessau settings have captivated a good many gas engineers because they have behind them a past which is wanting in more recent systems of distillation in 24 hours. On the other hand, they dispense with only a portion of the manual labour, they produce a gas which is only of just the standard quality, and they yield a coke of 50 kilos. per hectolitre (2.75 bushels) which is neither the 40-kilo. coke from ordinary retorts nor the 60-kilo. metallurgic coke coming from carbonizing chambers. All things considered, M. Grebel is of opinion that the lower cost and the certainty in operation of ordinary horizontal retorts 10 feet long will always ensure for them the supremacy in small works, where only one or two units of five to nine retorts are needed to produce the quantity of gas required. In connection with these retorts, only hand charging-machines may be employed. M. Grebel thinks the 20-feet through retort, designed to allow of entirely mechanical charging and discharging, will be superseded by newer appliances which better fulfil this condition.

Turning to the future of coal carbonization, M. Grebel considers that what has taken place during the past three years has shown that the modern coke-oven is the right system of dealing with a large bulk of coal; and that all that is required to render it an excellent producer of both gas and coke is to ensure its soundness, and heat it by generator gas. He expresses his gratification at finding his former predictions in this respect, which were combated at the time—especially in regard to the use of horizontal chambers—are now being verified. Especially is this shown by the action of Herr Aug. Klönne, of Dortmund, who, as the outcome of experiments extending back to 1892, rarely advises the employment of vertical chambers in small works, but recommends horizontal ones. In support of this statement, the author mentions that during the past two years Herr Klönne has put up eight installations of horizontals, which are at work, and capable of carbonizing 400 metric tons of coal per day, compared with two on the inclined and one on the vertical system. Seeing that the firm named construct vertical, inclined, and horizontal chamber settings, M. Grebel submits that their preference for the last-named type is worthy of consideration.

The author concludes his article by describing the horizontal chamber setting at Rotterdam, and explaining its operation by the aid of the section of the setting shown on the supplemental plate already referred to. He also gives some views of the first inclined chamber settings at Königsberg and of the vertical chambers at Dortmund, which were illustrated in the "JOURNAL" for June 22 last year (p. 837). He promises to give in the second portion of the article a description of the first setting of horizontal chambers put up in France—viz., at Versailles—which will be at work in the course of the current year; and he will then deal in detail with the advantages of this system, from the point of view of its convenience and economy.

Wales and Monmouthshire District Institution of Gas Engineers and Managers.—The May meeting of the Association, we are informed by the Hon. Secretary (Mr. Octavius Thomas), will be held on Wednesday of next week (the 11th inst.) at Cardiff, under the presidency of Mr. A. H. Brookman, of Tenby. The business will consist of the election of officers for the ensuing year; a paper by Mr. T. Acland, of Llanelly; and a discussion on the "Formation of Classes for Gas Engineering and Supply," to be opened by Mr. H. D. Madden, of Cardiff. After the meeting, the members will be the guests at luncheon of the Chairman and Directors of the Cardiff Gas Company; and subsequently the Grangetown works will be visited.

BRUSSELS INTERNATIONAL EXHIBITION.

The British Display.

THE receipt from the Board of Trade (Exhibitions Branch) of a copy of the official catalogue of the goods that are being shown by British firms at the Brussels International Exhibition—which was opened by the King and Queen of the Belgians on April 2—enables us to refer to some of the displays in the branches of industry with which our readers are more particularly concerned. The British Industrial Hall occupies an area of 150,640 square feet, and forms part of the building which contains also the Belgian exhibits; while the space allotted to Great Britain in the Machinery Hall has an area of 64,000 square feet, and is situated in the middle of the hall. It may be mentioned that the British catalogue contains the names of nearly four hundred firms; and their exhibits are classified into 22 groups, and sub-divided into 128 classes.

First of all, taking the names in alphabetical order, we notice that Messrs. William Asquith, Limited, show drilling and tapping machines. From the British Cyanides Company there are cyanides of soda and ferrocyanides of soda and potash. The Cambridge Scientific Instrument Company exhibit the pyrometers, calorimeters, and other testing and recording appliances with which their name has become so closely associated; and Messrs. Crossley Bros. and the Campbell Gas-Engine Company, their particular makes of engines and suction-gas plants. Coalite, Limited, are taking the opportunity to make the Belgian people acquainted with "the new smokeless fuel obtained by the low-temperature distillation of coal." To gas heating and cooking appliances, fire places, gas and oil laboratory appliances and furnaces, water heaters, &c., attention is drawn by Messrs. Fletcher, Russell, and Co. The Gaslight and Coke Company exhibit bye-products of gas manufacture; and the Glenboig Union Fire-Clay Company fire-bricks, blocks, and gas-retorts. The Boys and the Mahler Cook bomb calorimeters are to be seen at the stand of Messrs. J. J. Griffin and Sons; and Messrs. William Kenyon and Sons show specialities in gas and water tools, &c.

The National Gas-Engine Company have one of their engines and suction producer gas plants; and the Power Gas Corporation, suction-pressure gas producer plant, and a model of Mond gas plant, with sulphate of ammonia recovery apparatus, and samples of combustibles and products. The Humphrey internal combustion pump, which has lately been fully described in the "JOURNAL," is exhibited by the Pump and Power Company. The pump which is shown in operation is designed to lift 250,000 gallons of water per hour to a height of 35 feet. The pump has none of the usual moving parts—no piston, crankshaft, or flywheel, no non-return valve in the delivery pipe, and no glands. The only working parts are the water valves and the admission and exhaust valves. There is a suction-gas engine and generator by Messrs. Ruston, Proctor, and Co.

Under the name of the South Metropolitan Gas Company, there are sulphate of ammonia and coal-tar pitch for making briquettes; while the Sturtevant Engineering Company demonstrate applications of blowing and exhausting fans. Messrs. Townson and Mercer show some gas analysis apparatus.

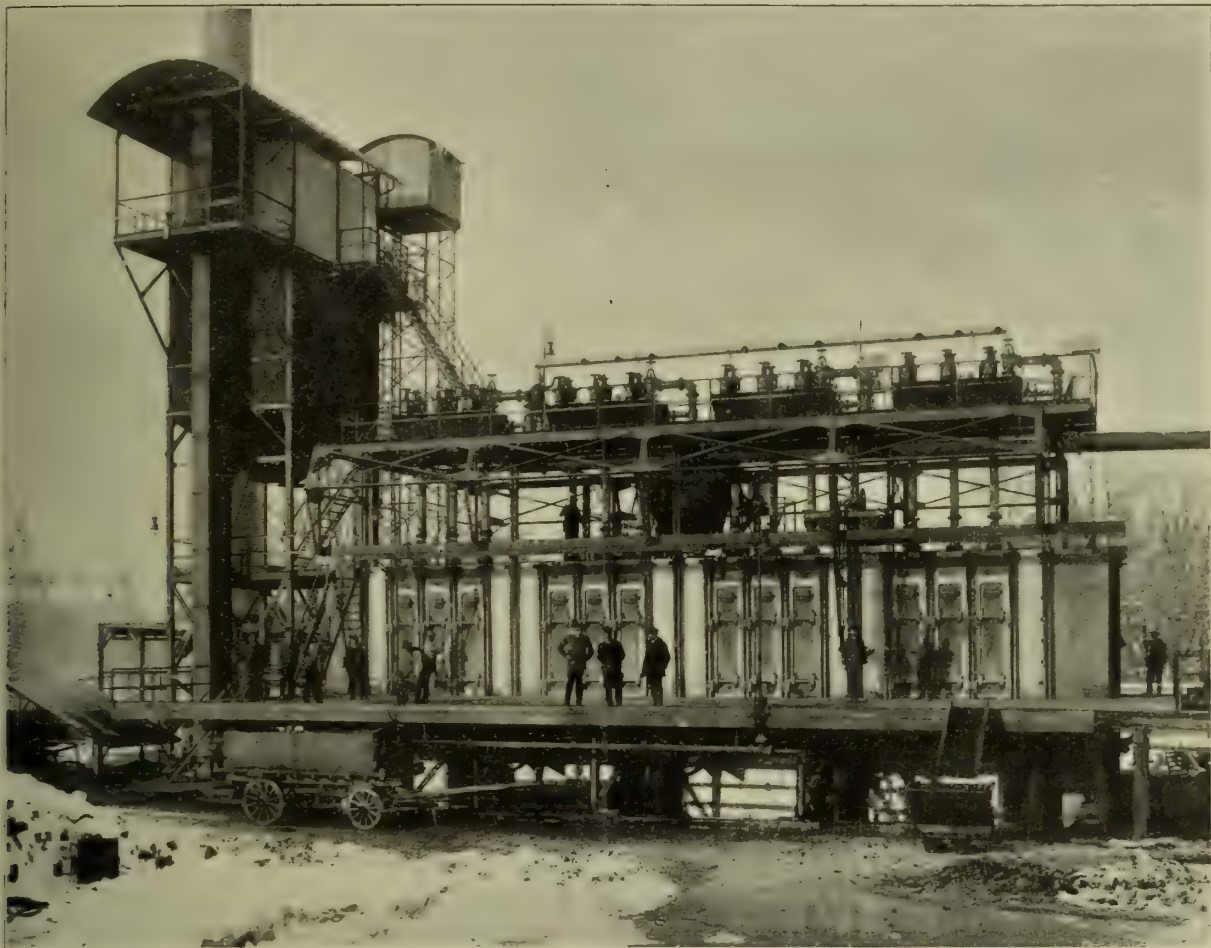
In the Mining and Metallurgy group, gas coal finds mention in connection with numerous exhibits—those, for instance, of Messrs. T. W. Dance, Son, and Hunter; the Hamsterley Colliery; the Horden Collieries; Messrs. James Joicey and Co.; the Lambton Collieries; the North Walbottle Coal Company; the Priestman Collieries; Messrs. U. A. Ritson and Sons; the Seaton Burn Coal Company; and the Stella Coal Company.

Heathfield Once More.

Renewed efforts are being made to get the public into the shares of the South of England Natural Gas and Petroleum Company, Limited—which has been formed to revive the Heathfield natural gas fiasco of some few years ago. Possibly it is hoped that the wide interest now being taken in the exploitation of new oil fields may make the task of securing applications easier than it has hitherto proved. In yesterday's "Daily Mail" a whole page was occupied by an illustrated description of the "discovery," written from information supplied by the Company; and in another part of the issue was the Abridged Prospectus. We saw this document—or one very much like it—in February, and commented upon it in our issue of March 1 (p. 563). The capital was then fixed at £20,000; and it seems that £16,000 of shares are still available. The "ordinary" portion is offered at a premium! In addition, £5000 of first mortgage debentures are offered. Clearly, the response to the flood of prospectuses issued earlier in the year was unsatisfactory; and if investors have any memory at all, the same fate will wait upon the present appeal.

Compulsory Working of Patents.—Under the title of "Compulsory Working and Revocation of Patents" (Stevens and Sons; 3s. 6d.), Mr. Ernest Lunge has written a work dealing with two vexed questions arising out of the Patent Act, 1907. His pages contain a historical sketch and a practical guide covering every matter connected with the law and practice under section 27, so far as the words of the Statute, the patents rules of the Board of Trade, the rules of the Supreme Court, and the decisions of the Courts which have dealt with the section, afford any authentic materials.

HORIZONTAL CARBONIZING CHAMBERS FOR THE WHOLE GAS SUPPLY OF A TOWN.



Installation of Twelve Horizontal Koppers Chambers at Innsbruck.

ERE appeared in our last issue a translation of a report by
rr O. Peischer, the Manager of the Innsbruck Corporation
s-Works, as to the results of three months' experience with
town supply of gas exclusively by manufacture in large hori-
tal carbonizing chambers or ovens. The former carbonizing
at is being replaced by new plant of a productive capacity
5,000 cubic metres (529,724 cubic feet) per diem. Ultimately

there will be six beds of horizontal carbonizing chambers on the
Koppers system. But up to the present time four beds, each
containing three chambers, have been erected. Of these, we are
now in a position to give an excellent illustration; and for the
dimensions and full particulars of the results obtained, readers
are referred to the article which appeared on p. 231 of last Tues-
day's "JOURNAL."

A NEW WATER-HEATER.

EN noticing the gas apparatus on view at the recent "Ideal
me Exhibition" at Olympia, reference was made to a new
tern circulator which was then for the first time exhibi-
by the Parkinson Stove Company, Limited. The "Hydro-
rm" water-heater—for so the appliance has been named—
ugh specially designed for general house supply, is also suitable
other purposes, and is
ed to be remarkably effi-
nt in action. In fact, in
igning water-heaters effi-
cy is no more than one
uld expect, in view of the
e experience in this direc-
of the firm, with whom,
is well known, are incor-
ated Maughan's Patent
yser Company.

o the first place, the
ydrotherm" is entirely
omatic in action. In
water part of a building
may be placed, the turn-
on of a tap connected
h it in any portion of
premises automatically
uses the gas-valve to open.
e gas is lit by a pilot,
hot water is delivered in
ew seconds, after which it
continues to flow as long as
ap remains open. On the
being closed, the valve again shuts off the gas, and leaves
y the pilot. This light is, of course, quite a small affair; the



The "Hydrotherm" Water-Heater.

quantity of gas consumed by it being only about 1 cubic foot per
hour. In designing the automatic gas and water valve, care has
been taken to make it perfectly free in operation, with a minimum
of friction, in order to obviate any possibility of the movement
getting fixed. The working parts are accessible for repair when
necessary, without interfering with the various connections—the
valve being protected by a removable cover.

That the "Hydrotherm" is made throughout in a very sub-
stantial manner, will be understood when it is remarked that it
is tested to a pressure of 150 lbs. per square inch—which means
that, if desired (and if allowed), the apparatus could safely be
connected direct with the water-main. The heating section is of
solid-drawn copper tube, of stout gauge, the efficiency of which
is much enhanced by a system of heat conductors. The coil of
tube is enclosed in a chimney of strong galvanized iron, which is
covered by a copper exterior case, polished and lacquered. These
cases can be removed without disturbing any of the gas and
water connections, thus enabling the coil to be cleaned, if need-
ful, without the attention of a skilled workman. The base is of
cast iron (except in the smallest size), to which all the fittings
are attached; and the burner is also of cast iron, and fitted with
special luminous jets. A door in the base affords facility for
lighting the pilot jet and cleaning the burner, which may be en-
tirely removed without disconnecting any of the gas and water
fittings. The heater can be connected up to any existing house
services.

The advantages of being able to obtain a supply of hot water
in any quantity, with a consumption of fuel proportionate to the
amount of water used, are now too well recognized to need em-
phasis here. Appliances which offer these advantages are assured
of due consideration; and therefore the claims of the "Hydro-
therm" are not likely to be overlooked. Surely, a hot bath of
30 gallons, with a consumption of about 25 cubic feet of gas
(which would cost less than 1d. with gas at anything under 3s. 4d.
per 1000 cubic feet), should meet the views of the most exacting
customer of a gas undertaking; and this is the efficiency which
the makers state is attained by the "Hydrotherm."

PROPOSED MUNICIPALIZATION OF THE GAS-WORKS AT GENOA.

THE April number of our Italian contemporary, "Il Gaz" gives prominent place to a full report of the speech of Assessore Comm. Avv. Alessandro Caveri, in which he placed before the Town Council of Genoa the considered proposals for the municipalization of the local gas-works, which belong to the Union des Gaz Company, and are controlled by the Continental Union Gas Company. It may be remembered that the "JOURNAL" recently gave an illustrated article relating to the new Gavette Gas-Works at Genoa, besides which there are the two older works at Sampierdarena and Bisagno, from which gas is sent into the town. Our contemporary reports that, after a very short and superficial discussion on March 6, the Council of the Commune unanimously approved of the advised purchase and municipalization of the Genoa gas undertaking.

The original proposal dates back to Feb. 10, 1908, when the Genoese Council unanimously determined to go into the question, and decided to have the expert technical advice of Sigg. Ing. Broccardi and Ing. Tondi. "Our citizens," said Sig. Caveri, "are the supreme judges, and, being called upon to decide this question as the ultimate court of appeal, have the right to be fully informed upon it." The speaker then proceeded to deal with the general aspects and propositions of municipalization, which now, fortunately, had passed from the field of theory into the field of fact. The first half of last century had been the period of individual enterprise and of the competitive spirit of commerce. To-day other ideas and principles had come into view. Out of the memories of ancient cities now arose the driving needs of modern towns, among which was the question of the municipalization of public services, and more especially those of a monopolistic character—for example, public lighting, which, to be carried on by private hands, required a concession from the Commune for the right to occupy the subsoil of the public roads. From the terrain of fact, Italy was, perhaps, the first to pass to the terrain of legal right, by reason of the laws and regulations authorizing the municipalization of public services. This was the law which to-day had to be applied; and it was a great step in the path of progress and of civilization.

After further like general observations, results of the municipalization of gas undertakings were cited, commencing with England, the country "the most convinced of the benefits of the practice." The profits of Birmingham, Leicester, Manchester, and Salford were given. In Germany, the municipal lighting service of Berlin provided a net return of over 4 million marks. In Switzerland, the Company having the lighting concession of Geneva paid 30,000 lire annually to the city. Parenthetically, the Union des Gaz Company, during its 53 years, had not contributed one centime to Genoa from its exploitation of this valuable industry; while at Geneva, in 1908, when the gas-works were municipalized, the net profits amounted to 575,000 lire. Basle, Berne, and Zürich were also mentioned. In Belgium, Brussels, in 1903, besides getting its public lighting for nothing, received 44,030,000 lire into the coffers of its gas undertaking. So, too, Amsterdam, with 1,462,000 lire; Cologne, with 1,538,000 lire; Copenhagen, with 1,478,000 lire; Leipzig, with 966,000 lire; Prague, with 614,000 lire; Stockholm, with 1,063,000 lire; and Vienna, with 3,596,000 lire.

In Italy, the figures were less. At Padua, the Società Lionese charged 38 centimes per cubic metre for its gas. In 1897, the Commune took over the service, and reduced the price to 20 centimes, and the following year saved 35,000 lire out of the 85,000 lire it paid to the Società for the public lighting. In 1909, the price of gas was reduced to 11 centimes for public lighting, and 18 centimes for private use. At Spezzia, the Communal profits were 20,312 lire; at Como, 118,298 lire; at Bologna, in 1909, 106,000 lire; at Pisa, in 1907, 37,747 lire, with an increase of gas consumption after municipalization of 8.64 per cent.; at Leghorn, 132,000 lire; at Trieste, 419,000 lire. Such figures supported the proposal made. The experience of Genoa, also, in regard to the public services which had been municipalized, was as favourable—public markets, posting, and street cleaning.

After setting out the legal requirements preparatory to municipalization, and showing that they had been complied with, the financial question was considered, in order to ascertain what was the indemnity to be given to the Gas Company for the acquisition of their undertaking. The enactment of 1903 required "a just indemnity" (*indennità equa*) to be paid, taking into account the industrial value of the plant, the duration of the concession, and other considerations duly set out, and, in addition, the profit which will be taken from those giving up the concession, or, in other words, "the surrendered profits" (*lucro cessante*). The legal interpretation to be given to these words was next considered; but this need not detain us here. Suffice it to say that, in fact, the concession of the Union des Gaz Company commenced from March, 1857; that it was for 67 years, of which 53 have run their course. The industrial value of the plant, say the experts, should be equal to what it would cost to put up a convenient installation, taking into account the depreciation of the plant. Also, in the municipal contract with the Union des Gaz Company, it is provided that, at the end of the concession, the mains become the property of the Commune without the payment of any indemnity for them. In short, the figure of 8,288,885 lire (say

£331,555) is arrived at as representing the industrial value of the plant. Adding to this sum what is alleged to be requisite for the surrendered profits, the total becomes 10,473,000 lire or about £418,920. With some further additions, for working capital, &c., the total amount required to be found amounts to 11,972,310 lire, or, roughly, £478,892. This sum it is proposed to obtain by a loan at not more than 5 per cent., redeemable in twenty years. It was, therefore, ultimately and unanimously decided by the Council to proceed with the exercise of their right to municipalize the gas undertaking; and, failing an agreement with the Union des Gaz Company as to the sum mentioned as the indemnity (namely, 10,473,000 lire), to nominate Sig. Ing. Eugenio Broccardi as the Council's Arbitrator, leaving the Gas Company to nominate theirs—a third to be chosen by the President of the Tribunal before whom the arbitration will be heard.

COMPETITION IN PUBLIC LIGHTING SERVICE.

By NORTON H. HUMPHREYS, Assoc.M.Inst.C.E., F.C.S.

THERE has been a noticeable change in public opinion on this subject, compared with the ideas that prevailed when gas was first introduced to the public. Where is the cry round which so many a fierce combat raged in the past—the interest of the consumer? Where is the loud-voiced, many-adjec-tived agitator, who talked about vampires fattening on the public vitals, robbers who were wary enough to evade the meshes of the law, and so forth, who achieved notoriety by violence and extravagance of metaphor rather than by accurate facts? Where are those who insisted on the right of the poor man to be supplied at the same price as the rich one? It may be said that the public are now better educated, and have seen that a public monopoly can be so controlled by regulations as to do as much for the advantage of the consumer as for the profit of the owner. But the pendulum now tends to swing the other way; and instances could be quoted of arrangements being allowed to pass into law that are decidedly not in the interest of the consumer—and this with the complacent approval of those who claim to represent and to protect the interests of the public.

In some towns, the representation of the consumers' interest was crystallized by the formation of a "Consumers" gas company, formed expressly for the purpose of competing with, and forcing the hand of, the existing gas suppliers. The title is still retained as a matter of form; but there is no distinctive line of action that is indicated thereby. The "Consumers" company is run on exactly the same lines as any other. The last twenty years have witnessed the establishment of many electricity supply companies; but not one of these has claimed to be established in the interest of the consumer, or to be a consumers' company. In many small towns, indeed, they have been forced on the public by outside speculators, rather than promoted locally in obedience to an evident demand. Only a few days ago, before a Parliamentary Committee, there was considerable doubt as to whether any decided demand for electricity existed in a small provincial town.

Among the numerous inducements that have been dangled before the public, like the proverbial bunch of carrots, the interest of the consumer has had no place. The tendency has been in the other direction. One occasionally hears a confident anticipation that the influence of the new-comer will have such a marked effect on the consumption of gas as to necessitate an increase in the selling price. After all that can be done in the way of cutting working costs, it is actually supposed and hoped that the gas company will find themselves between the Scylla of no profits available for interest on capital investment, and the Charybdis of a higher selling price with the risk of further loss of trade. I have never been able to understand why there should be any cause for jubilation, either in an advanced price of gas or in a lessened dividend for the shareholders. At the time when "the poor man's interest" was a fierce party cry, such interest barely existed in fact, because the poor man could not afford gas appliances, and was not inclined to fit up his weekly tenement with them. It was not till the door of the prepayment meter was opened that the poor man figured to any extent on the ledgers of a gas company. There never was a time when the need of cheap gas was more pressing, from the poor man's point of view, than to-day. A substantial increase in the price of gas would be a national calamity, entailing widespread hardship and distress.

As much may be said with regard to a sweeping reduction in gas dividends. No doubt some of the owners of the 150 millions sterling, or thereabouts, that is invested in gas securities in the United Kingdom, are wealthy persons to whom a reduction of dividend is not a vital matter. But the poor man or woman figures to quite as large an extent in the list of shareholders as in the gas-rental ledger. The small trader has put his trifling surpluses—the only provision he is able to make against old age or bad trade—and the widow or elderly spinster has invested her small means of support, in the local gas-works, regarding this as a safe investment that comes to some extent under her own personal knowledge. This class of investors have no great faith in the Stock Exchange, or in home or foreign securities. They do not understand such things, and therefore they prefer the local ventures. Half cottage property, half gas shares, is a favourite custom. It would be difficult to exaggerate the suffering

and privation that would be caused to these small investors by a reduction of (say) one-half the dividend. There is room for congratulation in the fact that nothing of this kind has obtained in practice, and that no competitor strong enough to prejudice the value of gas property to any important extent has yet loomed in sight. But it is strange the descendants of those who attached so much importance to the interests of the consumer should now allow competitive schemes to come into existence without any opposition or exposure of the fallacy involved.

The point is especially evident in connection with the operations that come under the category of Municipal Trading, which in theory is supposed to be conducted primarily, if not entirely, in the interest of the consumer. The municipal body, in theory, possesses a soul that does not stoop to the vulgar instincts of personal profit which are the chief consideration to the private trader. There is a certain amount of sympathy between the objects of the municipal gas undertaking and the consumers' gas company in that both claim to be actuated by philanthropic motives, and to desire to advance the welfare of the consumer by furnishing him with a good article at cost price. The resemblance goes farther, because it rarely happens that either the municipality or the consumers' company live up to their pretensions. The shareholders in the latter have quite as strong a faith in the full standard dividend as those in any other company, and take care to elect directors who will faithfully look after their interests; while the finance committee of the municipal body can always find means for disposing of large sums, as the phrase goes, for the "relief of the rates"—an expression that rarely represents fact. The assessment in the so-called rate-aided district is not substantially lower than in any other; and the so-called "relief" may go to pay for extravagances that would not be indulged in if they had to be submitted to the public vote, or to cover deficits in other ventures.

So far as the consumer is concerned, his interests are as well, if not better, served by a progressive, soundly managed company, who know that their own interests and the security of their business can be best assured by a cheap and efficient service, as when his requirements are served by the local authority or the consumers' company, who claim to make his interests the first consideration. A joint-stock company has a much thinner skin, and in many ways can be brought to book in a manner that does not apply to the municipal authority. Who ever heard of a town council or a local board being fined for supplying bad gas? If the consumer is ever inclined to look closely into the selling price of gas, he has in the balance-sheet of the company a plain statement of the income and expenditure; whereas the borough accounts are usually of a more complicated nature, and are apt to be directly or indirectly mixed up with other matters. The gas undertaking may be a success; but other ventures are not so fortunate. It is very difficult to earn a profit on the supply of electricity, on tramways, and other things that might be mentioned, in the smaller-sized towns. But whatever the results of the venture may be, the City Fathers do not care to admit that they have made a mistake, and are increasing the rates through the medium of enterprises undertaken for the ostensible purpose of reducing them. There is no way in which the ratepayer can be assured that proper provision for the renewal and depreciation of working plant has been made. The company may be trusted to look after this point in their own interests; but if they neglect it, the loss does not fall upon the consumer. Some of the contracts for public departments—such as street lighting or the supply of power to tramways—can be placed at non-competitive rates, and made the medium for showing a fictitious profit by the simple process of taking money out of one pocket to put into another.

The complaints of unfair action on the part of municipalities that have been made lately, are not without foundation; and it cannot possibly be urged that a policy of this sort tends to the advantage of the consumer. One can understand a reasonable scale of discounts for large, or for special, classes of consumption that offer advantages such as the employment of plant at a period when it would otherwise be lying idle. But the weak ones should not be bolstered up at the expense of the strong; and each class should stand on its own bottom and pay its own way. One should not bear the whole burden of interest on capital, to say nothing of the actual loss incurred in pushing another. Something may be urged on behalf of furnishing day consumption, for example, at a lower rate of profit, on the principle that it is better to earn half a loaf by running the plant at a time when it is not required for other purposes, and consequently would not be earning anything at all. But there is no half-loaf, common sense, or fairness to the consumers in cutting the special rate down to the bare working cost, or even lower. Gas companies who have more than one price have always followed something like a consistent course; and it is very unusual to find the difference between the highest and the lowest rate exceeding 15 per cent. of the former. But in regard to electricity, the price per unit may range from 7d. down to $\frac{1}{2}$ d. Regarded in the light of ordinary commercial fairness and equity—in other words, in the interest of the consumer—it is impossible to justify so wide a variation. Are we to assume that the lowest rate represents the bare working cost, and that the customer who pays 7d. per unit pays fourteen times the actual cost? Evidently the maximum price is too much or the minimum price too little.

The disadvantages of free competition in the supply of gas are so well known that a cursory glance at them will be sufficient.

Under their incentive, it is assumed not only that the working expenses would be energetically kept down to the lowest possible point, but that the profits will be cut to the lowest rate at which capital can be obtained. With these points in view, there were some towns, already well served by one gas company, where it was thought to be a wise policy to start a second or opposition venture. If for no other reason, the first must not be allowed to have its own way. It rarely happened that the requirements of the district—such as the actual necessity for two concerns, or whether there was really room for both to make a living—were considered. Very often one of the reasons for promoting the second was an exaggerated idea as to the profit, or the possibilities of profit, enjoyed by the first; and while the probability is that, as a matter of fact, only a small dividend is earned, rumours as to bonuses and other snug little arrangements easily get into circulation, and the popular idea of the profits made by a public company is an altogether erroneous one. There are many people to-day who base their views on the practices in other trades that have some advantage in the way of monopoly, and who firmly believe that the actual profit received by the shareholders on their investments is anything from 20 to 50 per cent., and that statements as to 5 or 6 per cent. dividend are simply a blind.

Some support was given to the supposed advantages of free competition, if the new-comer based its charges on an estimate in which the items of renewal or depreciation were absent or very inadequately represented, or if the two parties concerned could be dragged into a war of prices, with the view of starving each other out. For a time the consumer obtained his supply at cost price, or substantially less; but it inevitably happened that he or his descendants had to pay heavily for the accommodation. The contestants, finding it an unprofitable business to maul each other for the advantage of the public, came to friendly terms, such as an amalgamation or else a districting arrangement. Whatever the details of the bargain, the result was the same—competition was replaced by a regulated monopoly, and the district, while in no way better off than when it was supplied by one undertaking, was saddled with the expense of supporting two. The arrangement was in no way to the interest of the consumer, who was made to bear a permanent debt incurred to meet the expenses of competition. The incubus may be reduced to unnoticeable proportions by the extension and the growth of the business; but it is still there, and hinders a reduction in price.

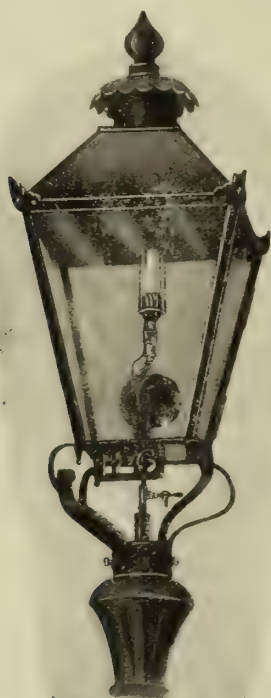
Examples might be quoted of neighbouring undertakings, one saddled with the results of long periods of competition, while the other has enjoyed an unclouded existence. Comparisons as to the capital per 1000 cubic feet of gas sold or the selling price will substantiate this argument; and it is not so evident in large districts that can well afford to support two or more separate undertakings as in small districts that cannot do so. But the fact is not to be ignored that two separate and distinct works, each with a full staff and establishment expenses, cannot be run so cheaply or so conveniently as in a single undertaking large enough to deal with the whole. Competition also carried other troubles, such as friction in connection with the opening of the roads, and inconvenience to the public by unnecessary frequency of such operations. Without following the whole story, the end may be stated. About fifty years ago, the idea of free competition in gas had already become a thing of the past, and displaced by regulated monopoly. This was the first step towards the cheap and efficient service enjoyed by the public to-day. Investors who would not risk their capital, even at 10 per cent. interest, in a business exposed to free competition, are willing to do so at 5 per cent. under the security afforded by statutory powers.

The competition to which allusion has been made represented competition not only in the supply of gas, but of light. The second gas company, at that time, was the only available weapon. But whether the new-comer is gas, electricity, or anything else, the result is the same so far as the disadvantages of competition are concerned. There is the same duplication of costs in running independent sets of plant, two sets of establishment expenses, two separate staffs, and an increase in the proportion of idle plant, to say nothing of special expenses in the way of advertising, canvassing, and so forth. There is the same public inconvenience following the frequent breaking-up of the roads and foot-paths. Neither party expects to lose money as a permanent thing, but to recoup any temporary loss with interest. Therefore all extra charges eventually find their way to the consumer, in the form of an extra loading on the selling price. In the case of competition between gas and electricity, nothing in the way of a districting arrangement is practicable; but amalgamation on terms that are advantageous to both, but not to the consumer, is quite within the bounds of feasibility. Perhaps there is some advantage in the consumer being able to pay his money and take his choice; but it is one that must be paid for. If a regulated monopoly, with its advantages of cheap capital and limitations as to quality and selling price, was necessary and desirable when one agent only was available, it is equally so when two or more distinct systems are at command.

Visit of Juniors to Burnley.—The sixth annual joint meeting of the Manchester and District Junior Gas Association and the Yorkshire Junior Gas Association will take place next Saturday afternoon, when the members will visit the Burnley Gas-Works, and inspect the installation of vertical retorts recently erected by the Engineer, Mr. J. P. Leather.

THE "AUTOMATON" LAMP-LIGHTER.

IN selecting a system of automatic street lamp lighting and extinguishing, several questions must be considered besides the mere operation of lighting and extinguishing at stated intervals. There is, for example, the temporary lighting and extinguishing necessitated by abnormal meteorological conditions; and where pressure operated devices are applied, there must be considered the transient extreme rises of pressure necessitated by large draughts upon the mains—such as during the cooking for the Sunday dinner. It is because some of the automatic systems of lighting and extinguishing street-lamps are unable to negotiate emergencies and casual requirements, that there has been failure. A system which contains novel features, and which, in the improved form, is able to readily meet fortuitous circumstances, is that known as the "Automaton" lamp-lighter, which is being exploited by a recently formed Company under the title of the Auto-Lighter, Ltd., of 17, Victoria Street, S.W. The first notice of this new device was published in the "JOURNAL" for Nov. 3, 1908; but since then there have been developments by Mr. George Robson, the inventor, which extend, in a notable degree, the applicability of the arrangement, and, indeed, render it serviceable under all conceivable conditions, merely by the adjustment of the mechanism by the aid of weights and the incorporation of a suitable cam.



But the principle of the invention remains unchanged; the improvements are in directions that enlarge its range and adaptability, as will be shown in the course of the present article. The "Automaton" lighter and extinguisher is a mechanical appliance, with its cycle of actions ingeniously produced by a wave of gas pressure, without any constant running of the mechanism, but simply a few seconds' operation at the time of lighting-up and extinguishing the burner; so that a long life, with little in the way of wear and tear, may be anticipated. The device took our fancy at the outset; and now that it has been brought to a condition in which it can meet the pressure variations of a gas-works supply without occasioning any trouble in lighting-up and extinguishing at times inconsistent with the natural order of things, it invites, and obtains, our good opinion still more. The mechanism is partly in the form of clockwork, with several additions embodied specially for the designed purpose. The whole, as it were, forms a sort of motor, which is energized by a spring, and works only when turning on or off the specially devised gas-cock. Simple as the mechanism really is, it would be impossible to give an intelligible description of it without sketches, or without the actual mechanism before the reader. The mechanism, in its drum-shaped casing, is affixed to the gas-supply pipe and the gas-cock in any convenient position, and without the operating parts being exposed in any way to the current of gas. On the inner side of the flat plate of the casing to which attachment is made, there is a weight-controlled diaphragm, which is inflated when the necessary wave of pressure is sent along the mains. When inflated, it presses against a trigger plate, which sets in operation the mechanism, consisting of a train of wheels, a pawl to start the mechanism, levers, weighted arms, locking lever, and so forth—the weighted arms playing an important part in the adjustment of the arrangement to meet the varying conditions of pressure. No useful purpose will be served by describing the minutiae of the operations; suffice it that in an hour's experimental work (at Mr. Robson's office, at 59-61, New Oxford Street) with various samples of the device, using a small pressure raising and lowering plant, there was not

a single hitch in any of the motions and in the fulfilment of objects. The pilot alight, the gas-cock was turned on when the desired pressure was given, the gas was ignited, the pilot light shut off (when the plug of the cock was turned through 90°); and when the pressure was reduced to the requisite and fixed degree, the reverse results ensued—the main supply being gradually shut off, the pilot light re-ignited, and the mechanism was once more safely locked, but always in readiness for the operations to be repeated at any time. To describe the operations would be to give an idea of complication; while, as a matter of fact, they are demonstrably extremely simple.

In the operation of some forms of pressure apparatus, there are a bell, the mechanism, weights, and valves; and to lift the bell and operate the mechanism for lighting-up purposes, of course a certain amount of pressure (*plus* something for friction) is required. Then the pressure has to be reduced to a certain point to allow of the bell to fall and the mechanism to again become engaged. The pressure required between the lift and the drop is what is called the range; and, within this range, it is stated, there is the seat of trouble. The pressure required in the operation of the mechanism includes a part, as already intimated, to overcome friction; but, owing to vibration, part of the allowance for friction is neutralized, with the result that, supposing the pressure at which the apparatus is set for lighting-up is 40-10ths, it is possible (with vibration happening) there may be lighting-up at 35-10ths. Another disadvantage is said to have been found through local disturbances of pressure due to abnormal draughts which has allowed the pressure to drop to such an extent that some of the street lights are extinguished while others are kept going. In the perfecting of the "Automaton" apparatus defects and inconveniences of the kind have been kept in view, and protection against them provided. In the present form, friction is reduced to a negligible quantity—in fact, Mr. Robson asserts that there is no friction whatever in the apparatus, so that it cannot be affected by vibration; and consequently lighting-up takes place at a definite point and at no other, owing to the means of adjustment provided by the two sets of weights forming part of the mechanism. And no accidental variation of the pressure will affect it. This is highly important. We will not go through the experiments and the results witnessed to prove the point. There was abundant satisfaction that they confirmed the claim; as they also did that the mechanism, simply by the application of additional weights or their removal, enables the range of pressure at which the apparatus works to be varied at will.

Then there is the condition of temporary high pressures—such as during the cooking period on Sunday—to provide for. A gas manager does not want to have his street lamps alight while people are returning from church on the Sunday morning. The "Automaton" lighter obviates any such contingency—in fact, any ordinary movements of pressure up or down will not affect it. Assuming, too, that before the proper time for lighting up, a big demand for gas arises privately through some fortuitous circumstance, and the pressure has to be raised, the lamps will not be lighted before the proper time. Variations of level in a district cause differences of gas pressure. These, too, have been provided for in the apparatus. And the ability to meet any likely variations of pressure in this way without affecting the apparatus is largely due to the ingenious series of beautifully designed cams that Mr. Robson has worked out. We know, in fact, of no ordinary variation in pressure conditions that this device cannot be made proof against, so far as affecting its positive working is concerned.

We have purposely avoided giving details here, because, having stated observed facts, it is believed that those who are interested in an apparatus that has been designed to present such a pressure range in the matter of control will be anxious to put it to trial, and on their own behalf investigate causes and merits.

The lighter we understand is being well received by gas undertakings in England and several Continental countries. Among other places, the apparatus has been experimentally fitted to the lamps in the Kenley district of Croydon, and has been in use for the past six or seven months, giving, it is believed, entire satisfaction.

Koppers Bye-Product Coke-Ovens at Birmingham, Alabama.

We learn that 280 Koppers bye-product coke-ovens have been contracted for by the Tennessee Coal, Iron, and Railroad Company for their Birmingham, Alabama, plant. These ovens will be 37 feet long (between doors) and 9 ft. 10½ in. high, and will have an average width of 19½ inches. Each oven will produce 11·25 tons of coke every 24 hours. With coal containing 30 per cent. of volatile matter, the daily output of the plant will be 3145 tons of coke, besides 22 million cubic feet of 500 B.Th.U. gas, 35,000 gallons of tar, and 44 tons of sulphate of ammonia. The ammonia will be recovered from the gas by the Koppers direct process. With this plant of 280 ovens, the United States Steel Corporation will have a total of 1120 Koppers bye-product coke-ovens. The first ovens of this type erected in America were built in 1907 by the Illinois Steel Company at Joliet, Illinois. They have been in operation for nineteen months to date; and they are stated to be giving results superior to any previously obtained anywhere in the world in the bye-product coke-oven industry. This is the same type of bye-product coke-oven that is being erected by H. Koppers for the Lake Superior Iron and Steel Company, at Sault Ste. Marie, Ontario.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

Meeting at Great Yarmouth.

The Forty-Third General Meeting of the Association was held at Great Yarmouth last Friday. Naturally such a popular seaside resort has attractions apart from the ordinary inducements of a technical meeting; and the combination of the town and the meeting attractions brought together a large number of members and visitors. The Chairmen and Directors of the Great Yarmouth and the Gorleston and Southtown Gas Companies united in giving the visitors a cordial welcome, which they did by entertaining them at luncheon at Goode's Rooms. At the head of the table was the Chairman of the Yarmouth Gas Company, Sir R. H. Inglis Palgrave, F.R.S.; and he was supported by the Deputy-Chairman of the Company (Mr. T. A. Rising) and another Director (Mr. William Barnard). Unfortunately the Chairman of the Gorleston and Southtown Gas Company (Mr. C. N. Brown) was prevented by an accident from being present; but the directorate was represented by Mr. Z. Rayson, Mr. P. Martin, and Mr. J. Rant. The Mayor (Mr. T. W. Swindell) and the Vicar of Great Yarmouth (the Rev. Canon Willink) were also present. The President of the Association (Mr. John Young) and one of the Vice-Presidents of the Institution of Gas Engineers (Mr. R. G. Shadbolt) were at the upper table. Among the local representatives of the gas industry were Mr. W. J. Carpenter, the Engineer and Manager of the Yarmouth Gas Company, the Superintendent of the Distribution Department (Mr. Charles Ellis), and the Assistant-Secretary (Mr. H. Salter).

After luncheon and the loyal toast,

The CHAIRMAN proposed the toast of "The Eastern Counties Gas Managers' Association," and congratulated the members on having reached their forty-third general meeting. The transactions of the Association showed that it had been a most useful body. It was an old saying that gas dividends were made or lost in the retort-house; and if that were so, then they had much to thank gas engineers for, inasmuch as, in his time, retort-house working had been improved to such an extent that, whereas only 10,000 cubic feet of gas were once made per ton of coal, they now approached 12,000 cubic feet. He was hoping that in time they would be able to excel even this high figure. From the point of view of coal economy, it was interesting to know that so much larger a quantity of gas was being extracted from the coal. In his concluding remarks, he spoke of the value of co-operation in all business matters.

The PRESIDENT, in thanking Sir Inglis and his co-Directors for their welcome, said Mr. Carpenter was evidently blessed with a very fine Board of Directors who took a keen interest in all he was doing, and recognized (as did his professional brethren) the ability with which he managed the concern. It was clear the Chairman of the Company followed intently the trend of events in the gas industry. He thanked him sincerely for his kind remarks regarding the work of the Association. It was quite true that this was the forty-third meeting; but the Association was only 21 years old. Nevertheless, he thought the meeting that day would show those who were not members that it was a lusty band of intelligent and zealous men, who had at heart the true interests of those they served, and possessed the ambition to help forward the good of the community by introducing new processes for improving the products they sold. The Chairman had mentioned the subject of coal, and the application of processes that enabled them to obtain greater results from it. This was of great value; but the price at which coal was supplied was also of immense importance. And they had to face the fact that much was done, and was being done to increase the price. He might instance the Mines (Eight Hours) Bill, which had not met with the smooth working that the late Home Secretary thought it would; and it had caused a great deal of friction and discontent throughout the coalfields. He was afraid it would tend to keep coal permanently at a higher level than it would otherwise have been at. The necessity of cheap gas impressed itself upon every earnest gas engineer at the present time; and it was their intention to hold their own. He was glad to learn of the honour that was about to be conferred on Sir Inglis Palgrave by the presentation to him of the freedom of the town for the services he had rendered to it. He might heartily congratulate the Mayor upon securing such a freeman. [Applause.]

Mr. T. A. RISING (Deputy-Chairman of the Yarmouth Gas Company) proposed "The Visitors." He remarked that there were two Gas Companies visiting the town, though it was not a large one. The Yarmouth Gas Company supplied the east side of the town, and the Gorleston Company the west side. The Chairman of the latter Company unfortunately could not be present, through an accident. The Companies had to meet the competition of the municipal electric light undertaking; but that it was friendly competition was evidenced by the presence of the Mayor and Corporation officials at the luncheon. The competitors were doing their best to outshine each other; and he thought that gas might at present claim the best of it.

The MAYOR, in responding, said it was a great pleasure to him to be present that day. It was indeed very kind of the Gas Companies to invite the head of a municipal body who were running the electric light in competition. It showed that there was a kindly feeling between the Corporation and the Gas Companies. He was especially glad to be present with their distinguished townsman, Sir Inglis Palgrave, in the chair. It was said by some that a man was too old at forty. Sir Inglis had gone far beyond the ordinary span allotted to man; and was hale, hearty, and well, and could make a magnificent speech. He hoped that their Chairman would live long to shed lustre on the town he loved, and which admired him so well. He (the Mayor) regretted the Chairman of the Southtown Company could not be present.

Mr. R. G. SHADBOLT then submitted "The Great Yarmouth and

Gorleston and Southtown Gas Companies." He remarked that it had been the privilege of the members to be the guests of many gas authorities during the existence of the Association; but they had never been honoured before by being entertained by two hosts at one time, as they were being that day. As to the Gas Company, the members were intimately acquainted with their methods of working, and with the success attending their operations, through the excellent paper that was read at their meeting a year ago, by their friend Mr. Carpenter; and through that gentleman unbosoming himself as he did on that occasion, the members felt they knew every inch and every bit of plant that formed the works. Having these facts before them, they could not do less than express their admiration and appreciation of the work that was being done in the town by the Company, in the interests not only of the shareholders, but of the consumers. No gas company could expect to be very long successful unless it was an inseparable part of the town in which it existed, and which it served. He thought he might venture to congratulate Sir Inglis Palgrave upon the honour that was about to be conferred upon him by his fellow townsmen in making him a freeman of the borough; and he (Mr. Shadbolt) thought he could say that they, as representing the gas industry, shared, through Sir Inglis, in the honour. [Applause.]

The toast having been heartily honoured,

The CHAIRMAN briefly replied. In the course of his remarks, he said he had noticed that Mr. Young in his presidential address had said that he took £30,000 a year from his slot meters in Hull. He (the Chairman) hoped that in Yarmouth, they too would reach if not something as grand, at least something as respectable.

The Business Meeting.

The Business Meeting was held at the Royal Assembly Rooms—the PRESIDENT (Mr. John Young) in the chair.

The HON. SECRETARY (Mr. Thos. A. Guyatt, of Ely) read the minutes of the last meeting, held at Hull on Sept. 23; and on the motion of Mr. E. W. SMITH (Chelmsford), seconded by Mr. F. L. WIMHURST (Cambridge), they were confirmed.

NEW MEMBERS.

On the proposition of Mr. W. D. CHILD (Romford), seconded by Mr. H. N. CLARK (London), the following gentlemen were elected members of the Association: Mr. George Crick, of Southwold; Mr. Joshua Parker, of Huntingdon; Mr. Charles W. Offord, of Enfield; and Mr. W. H. Thrale, of Hessele. Mr. Albert Cliff, of Stamford, was elected an associate member.

PAPERS AND DISCUSSIONS.

Short introductory papers for discussion were then read by Mr. F. PRENTICE, of Ipswich, and Mr. F. L. WIMHURST, of Cambridge. They were respectively on the subjects of "Purification" and "Free Maintenance." With reports of the discussions, they appear on pp. 310 and 312.

Messrs. Prentice and Wimhurst were subsequently thanked for their contributions, on the motion of Mr. W. B. FARQUHAR (Ilford), seconded by Mr. F. PATERNOSTER (Felixstowe).

Acknowledgment of the vote having been made, the members proceeded to the

ELECTION OF OFFICE-BEARERS.

The PRESIDENT proposed that Mr. J. W. Auchterlonie should be elected President for the ensuing year. The abilities of their friend, he said, were well known to all the members, as was also the admirable way in which he had managed the Gas Company that he served at Cambridge. Mr. Auchterlonie took a keen interest in every subject that was for the good of the gas industry generally, as well as for the benefit of the members of the Association particularly. His geniality and social qualities were likewise valued by each one.

Mr. J. H. TROUGHTON (Newmarket) seconded the motion, which was heartily carried.

Mr. AUCHTERLONIE, in his reply, said he was sure it would require considerable effort on his part to maintain the high standard that had been set by the Past-Presidents of the Association, and not least by the out-going President, Mr. Young. He could promise the members that, if they visited Cambridge in the autumn, they would be received in the best possible way.

Mr. R. G. SHADBOLT (Grantham) proposed that Mr. Paternoster be elected Vice-President of the Association. He thought that young members such as Mr. Paternoster, who were showing keen interest in the Association and in the work of the industry generally, ought to be encouraged. This was the view of the Committee; and he thought that in this case the proposition was a mark of merit.

Mr. JOHN BARTON (Peterborough), in seconding, remarked that Mr. Paternoster would make a useful Vice-President, just as he had proved himself a useful member of the Association.

The motion was cordially agreed to.

Mr. PATERNOSTER, in his acknowledgment, said as it was the wish of the members that he should occupy the position, it would be his hope that the interests of the Association would not suffer during his term of office.

Mr. H. WIMHURST (Sleaford) moved the re-election of Mr. Guyatt as Hon. Secretary and Treasurer. As a former occupant of the position, he (Mr. Wimhurst) knew the vast amount of work

Mr. Guyatt put into the duties of the office; and they were much indebted to him for agreeing to accept the position for another year.

Mr. F. PRENTICE (Ipswich), in seconding, said as a member of the Committee he had had a larger insight than he had had before as to the amount of work Mr. Guyatt had to do; and, having had this, he thought their best thanks were due to him for his acceptance of the office.

The motion was heartily adopted.

Moved by Mr. THOMAS GLOVER (Norwich), and seconded by Mr. W. ORME (Woodbridge), Messrs. H. Wimburst and T. Dann were re-appointed Auditors.

Mr. W. J. CARPENTER proposed, and Mr. H. N. CLARK seconded, the appointment of Mr. J. T. Jolliffe (Ipswich) and Mr. J. H. Brearley (Longwood) as members of the Committee.

PLACE OF NEXT MEETING.

Mr. AUCHTERLONIE moved that the next meeting be held at Cambridge. He was sure his Directors would offer the members a very hearty welcome.

Mr. C. F. RUGGLES (Leighton Buzzard) seconded the motion, which was heartily carried.

A VOTE OF THANKS—THE INSTITUTION BENEVOLENT FUND.

Mr. GEORGE HELPS (Nuneaton) proposed a hearty vote of thanks to the President and the officers for their services during the past year.

Mr. JAMES TERRACE (Grimsby) seconded the motion, which was unanimously carried.

The PRESIDENT expressed the gratitude of himself and the officers of the Association for this acknowledgment of their services. Proceeding, he said he had a letter from Mr. J. W. Helps the other day with reference to the Benevolent Fund of the Institution of Gas Engineers, which was in an unsatisfactory condition—that was to say, the Committee who administered the fund had not sufficient at their command to meet the demands that were made upon them. Out of nearly 900 members of the Institution of Gas Engineers, there were less than 200 subscribers to the fund. This ought not to be; and it should be regarded as a great privilege by members to assist a little in this excellent cause. What was wanted was regularity of subscription of such amount as members could spare for the purpose, so that the Committee might have an income upon which they could rely. Surely it was the duty of gas engineers to see that those who administered the fund had enough money to meet the demands. He should be glad to receive the names of members who would assist by becoming annual contributors.

THE DINNER.

At the dinner in the evening, the President (Mr. John Young) presided. Unfortunately the venerable Chairman of the Great Yarmouth Gas Company could not be present; but the local gas and water interests were well represented, as was also the civic government, by notably his Worship the Mayor. Among the guests was Mr. Charles Hawksley. After the loyal toast, that of "The Gas Industry" was proposed by the Deputy-Mayor (Mr. C. A. Campling); and, in a brilliant speech, Mr. R. A. Shadbolt responded. "The Town and Trade of Great Yarmouth" was submitted by Mr. John Carter, in a speech that called forth encomiums from the Mayor in the course of his reply, in which he also said that, though the Corporation owned the electric undertaking, it was their wish to see the Gas Company continue at a high level of prosperity. "Kindred Associations" was proposed in appropriate terms by Mr. J. T. Jolliffe; and response was made by Mr. George Helps. To Mr. Carter was also entrusted the toast of "The President." One of his remarks that was cordially approved was that Mr. Young exemplified all the best qualities of the men who had made the gas industry the great power that it is. The President, on rising to respond, was received with almost overwhelming enthusiasm. Before concluding his remarks in response, he proposed "The Health of Mr. W. J. Carpenter," to whom he said the great success of the meeting was almost entirely due. Mr. Carpenter, acknowledging the toast, distributed the honour for the success of the meeting among all those who had assisted him, especially naming Mr. Joseph Hawksley. The Mayor asked permission to interpose to say how much Mr. Carpenter was esteemed and valued in the town. "The Honorary Secretary" was the next toast; and it was in the care of Mr. C. F. Ruggles. Mr. Guyatt made suitable reply. Between the speeches were some excellently rendered songs.

VISIT TO THE GREAT YARMOUTH WATER COMPANY'S ORMESBY PUMPING-STATION.

Saturday morning opened brightly; but before the members were timed to fulfil a kindly extended invitation on the part of the Chairman (Sir Inglis Palgrave) and Directors of the Great Yarmouth Water-Works Company, the atmospheric conditions became grey and somewhat cold. The spirits of the members were proof against depressing influences; and it was a most enjoyable seven-mile drive that was made from the Hotel Victoria on Yarmouth front to the Ormesby pumping-station. Here the members were most heartily received by (in the absence of Sir Inglis) the Deputy-Chairman of the Company (Mr. C. S. Orde), other of the Directors, the Consulting Engineer (Mr. C. Hawksley), and the Manager (Mr. Joseph Hawksley). The pumping-station

itself is beautiful, and so are all its surroundings. The filter-beds, each with its cascade aerating the water, were inspected. Then the pumping-house had its machinery examined; and the top floor of the building was invaded to view from the windows four picturesque scenes such as give gratification to any eye that is impressed by Nature's noblest work. After roaming among the interest and beauties, a call was made to a large marquee, where, under the genial chairmanship of Mr. Orde, the visitors were entertained at lunch. Among the guests at the top table was the President of the Institution of Gas Engineers (Mr. J. W. Helps), who had unfortunately been prevented by a Board meeting from reaching Great Yarmouth in time for the previous day's meeting and functions. Following the loyal toast, the Chairman proposed "The Visitors," giving one and all a hearty welcome in the name of the Chairman and Directors of the Company. The Mayor, the President of the Eastern Counties Association, and Mr. Helps responded.

Mr. HELPS said it gave him great pleasure to assist in responding to this toast. They had all enjoyed themselves immensely, and had learnt a good deal. If nothing else, they had, or he hoped they had, learnt the one virtue of cleanliness. From what they had seen that day in the beautiful engine-room of the works, they could carry something home which would enable them to do more than they had done in the past in the way of making their works things of greater beauty than they were at present. The Chairman had remarked upon there being something strange in the way in which gas and water were frequently united. Mr. Orde was right there. He (Mr. Helps) did not understand the reason for it any more than their Chairman did. But there was one very characteristic point in this, that often, when they went into such an engine-room as they had been in that day, they saw the names of gentlemen who had spent a great portion of their lives not only in connection with water but in connection with gas. The name of Hawksley was one that was not only revered in connection with water, but with gas. On the engines he also saw the name of Boulton and Watt (this having been retained by the firm's successors); and every gas man knew their association with the birth of gas lighting. He thanked the Yarmouth Water Company most heartily for giving them this opportunity for seeing their beautiful works.

Mr. Charles Hawksley added a few words, in which he referred to the association of his father with the works before his own appointment as Consulting Engineer. Then came the final toast—Mr. Young submitting "The Great Yarmouth Water-Works Company." The acknowledgment that he made of the bounteous entertainment and pleasure given to the members was most cordially endorsed. Mr. Orde made a genial reply. Shortly afterwards, by the side of one of the filter-beds, a photograph of the visitors was taken; and after further roaming round the station, they remounted the conveyances, and enjoyed the drive back to Yarmouth, where several remained over Sunday.

The following is a description of the Yarmouth Water-Works taken from a booklet distributed among the visitors:

In the year 1850 an inquiry into the sanitary state of Great Yarmouth was conducted by the General Board of Health; and the Superintending Inspector reported upon the utter want of pure water in the borough, and on its paramount necessity and easy acquisition at the Ormesby Broad.

In 1853, the Great Yarmouth Water-Works Company was formed under an Act of Parliament, and authorized to obtain water from Ormesby Broad, situate in the parish of Ormesby St. Michael, about $7\frac{1}{2}$ miles north-west from Great Yarmouth. This broad is one of a chain of shallow lakes, covering an area of about 450 acres, fed from a gathering ground of 10,000 acres, and from springs within their own basins, having an overflow into the River Bure controlled by sluices. The limits of supply comprised the parishes of Ormesby and Caister, with the Borough of Great Yarmouth, including Gorleston and Southtown, containing, according to the then census returns, a population of 28,315. The capital authorized under this first Act was £50,000.

The original works at Ormesby were constructed under the supervision and to the designs of Mr. James G. Lynde. They consisted of a pumping-station, containing two horizontal steam-engines of 30 H.P. each, constructed by Messrs. Cochrane and Co., of Dudley, and two Lancashire boilers. Each engine was capable of pumping 450,000 gallons of water in 24 hours. These engines have been well preserved, and are now used as occasion requires. Two filter-beds were provided, each having a sand area of 20,000 square feet. A 12-inch main was laid to an open reservoir at Caister, and thence to Yarmouth. A stand-pipe was erected at the reservoir to increase the pressure in the town mains. This original Caister Reservoir is now empty. Its use has been discontinued in favour of a newer and larger covered reservoir, containing 1,250,000 gallons, constructed on higher ground, from which a much better service is afforded; the top water line being 80 feet above Ordnance datum.

Shortly after the passing of the Company's Act in 1857, Mr. Lynde resigned his position as Engineer to the Company. Mr. Thomas Hawksley was called in by the Directors to advise; and to his designs and those of Mr. Charles Hawksley, all subsequent works have been constructed.

So far water was only being supplied to the inhabitants on the east side of the River Yare. But great need of water was felt by those living in Southtown and Gorleston; and in 1859 a 10-inch main was laid under the bed of the river to furnish the desired supply. At a later date, 1875, another main, 15 inches diameter, was laid in a similar manner to increase the supply to the western side of the river, and to furnish water for a covered reservoir,

which was built on the highest available ground at Gorleston in 1873. The capacity of this reservoir is 800,000 gallons.

In 1864, Mr. John Ayris was appointed Manager, and held the appointment until his resignation in 1900—a period of 36 years, during which he maintained the works in a high state of efficiency.

In 1878, the Directors of the Company decided to filter the water twice before delivering it to the district. This change involved a large capital outlay in the purchase of additional lands and the construction of another primary filter, of the same design and size as the existing ones, and of two secondary filters, each 150 feet by 100 feet, having a combined area of 30,000 square feet. The work was completed in 1881; and from that date all water delivered to the town has passed through two series of filters.

To meet the increasing demand for water, additional filters have from time to time been made; and the total area of sand used for filtration is now 165,000 square feet.

Before passing on to the sand, the water is pumped over fountains erected in the centre of each filter; and, falling over a series of circular steps, it is, by being broken up in this way, thoroughly aerated.

The Company, in its anxiety to preserve the character of the water, have within recent years made extensive purchases of land and property in the immediate neighbourhood of the works, in order that they may have control over the sanitation, and have done all in their power to render the Broad water beyond suspicion. Careful monthly examinations of the filtered water, both chemical and bacteriological, are made, and they are always found to be satisfactory.

In 1884-5, it became necessary to provide additional pumping power; and with this object another and larger engine-house was erected and furnished with two beam-engines, and a boiler-house with three Lancashire boilers. The engines, built by James Watt and Co., of Birmingham, are each of 60 H.P., and to each are attached the three pumps necessary for carrying out the system of double filtration—a lake pump to raise water on to the first filters; a transfer pump to lift the once filtered water on to the second series of filters; and a town pump to supply the reservoirs and town. These engines are together able to pump nearly 2½ million gallons to the district in 24 hours. A 24-inch cast-iron conduit, through which the water gravitates, connects the lake pump with the centre of the Broad.

About this period, a second pumping main 15 inches diameter was laid from Ormesby through Caister to Yarmouth; and in 1903-6 a 24-inch main was laid. The Company now possess three pumping mains—viz., 24-inch, 15-inch, and 12-inch—which enable them to maintain a constant and abundant supply, which has never been interrupted.

In order that the Company might maintain a constant and satisfactory pressure of water in the mains supplying the higher parts of Gorleston, where a rapid development of building was taking place, the Company, in 1904, established a high-level supply station in the Gorleston reservoir ground, where pumps driven by gas-engines maintain a column of water in a stand-pipe. This ensures the highest parts of this district being served with ample pressure.

The latest, and perhaps the most interesting, piece of work undertaken by the Directors of the Company has been the construction of a cast-iron tunnel at a considerable depth under the bed of the River Yare, 7 feet in diameter and over 400 feet long, through which two steel pipes have been laid, 21 inches diameter, which are in future to convey the water from the eastern to the western side of the river, and will take the place of the existing 15-inch and 10-inch mains laid in the river bed, which, in the interests of navigation, are to be removed. The time occupied in this work has extended over eighteen months, and a most satisfactory watertight subway has been the result.

In the summer of 1903, at the end of a drought extending over many years, the water in Ormesby Broad fell so low (13 inches below sea level) that it became evident to the Company's advisers that, as an average yearly increase of 10 million gallons was required by the district, an additional source of supply must be found to augment the existing one.

The neighbouring town of Lowestoft was also growing and within measurable distance of requiring more water, and arrangements were suggested by which both water undertakings could share the large cost of procuring and utilizing the same source for supplemental purposes.

This was effected by the passing of an Act of Parliament in 1907, giving power to take water from the River Bure, in the parish of Horning, about nine miles from the Ormesby pumping-station. The commencement of the new works is in early contemplation. Water will be pumped from the River Bure to Ormesby, there stored in sedimentation reservoirs, filtered and pumped, and forwarded to Yarmouth and Gorleston—the Lowestoft Water and Gas Company taking their portion in bulk beyond the Gorleston reservoir at the boundary of the Lowestoft Company's district.

The growth of the Company has been continuous, and has increased largely of late years, as may best be shown by the following statistics:—

Total Quantity of Water Pumped.

| | |
|-------------------------------------|---------------------|
| Year ended March 25, 1871 | 109,599,146 gallons |
| " " 1881 | 200,974,482 " |
| " " 1891 | 260,386,560 " |
| " " 1901 | 406,457,360 " |
| " " 1910 | 487,045,904 " |

The highest week's pumping during the year ended March 25, 1910, was in the week ended Aug. 14—viz., 11,520,600 gallons; the lowest week's record in the same year, the week ended April 3—viz., 7,718,920 gallons. The large influx of visitors to Yarmouth during the summer accounts for the unusual variation in the quantity of water required, as shown in the above comparison. The present average daily quantity of water consumed for all purposes is 1,334,372 gallons. The population supplied, estimated on the census of 1901, is 55,101. This number is very largely increased during the summer months, and again during the fishing season. The total number of consumers on the books at March 25 last was 14,975.

| | Total Amount of Capital Issued. | Total Revenue from Water-Rents. |
|----------------|---------------------------------|---------------------------------|
| 1871 | £84,560 | £5,000 |
| 1881 | 133,300 | 10,040 |
| 1891 | 197,415 | 12,604 |
| 1901 | 248,300 | 16,957 |
| 1909 | 315,950 | 22,569 |

A dividend at the rate of 4 per cent. per annum has been regularly paid for the last thirteen years.

MANCHESTER JUNIOR GAS ASSOCIATION.

Another Lecture by Professor Dixon.

There was a fair muster of members of the Manchester and District Junior Gas Association to hear an address delivered at the Victoria University of Manchester, on Saturday afternoon, by Professor Harold B. Dixon, M.A., F.R.S., who took for his subject "The Explosion Wave in Gases." Mr. F. THORP, President of the Association, was in the chair.

Professor DIXON's lecture was of a discursive character, and really an elaboration of the different points raised in his two previous addresses to members of the Association—namely, the "Chemistry of Flame" and "Some Theories of Combustion in Gases." First of all, he demonstrated the effect of the mixture of air and different gas when fired; pointing out that in each case a certain pressure had to be reached in the combustion to make the mixture detonate, and showing by slides thrown on the screen that, once detonation was set up, it continued at an absolutely uniform velocity, which could be predicted from the known constituents of the mixture. He also gave pourtrayals of the beginning of the explosion wave, its development, and how measured. The Professor having dealt with the rate of explosions in gases, the velocity of a sound wave in the flame of exploded gases, the initiation of the detonation wave and of the wave retonation, the initial phases of the explosion, and given a comparison of the rate of the explosion with that of the sound wave, and the instantaneous pressure produced in the explosion wave, proceeded to illustrate the chief points by lantern slides.

Mr. CARTER, in moving a vote of thanks to the Professor for his address, said he was looking forward hopefully to the proposed closer union between the Association and the University—being entirely satisfied that it would materially assist students in gas engineering.

Mr. M'NICHOL seconded; observing that the lecture made more clear to him the previous two.

The resolution, having been supported by Mr. KAY, was carried with applause.

Professor DIXON, in responding, hinted that, with a closer association between the University and gas engineers, many of the problems that now confronted them might be solved, and advantage taken of new ideas. Could any one of them tell him, he asked, what was going on in the condenser, or what was going on in the gasholder, which was simpler? Then, again, could any of them say what amount of ether was given off the coal in the first hour of the charge? He only mentioned these to show what might be done in the way of research work.

A visit has been made to the Sheffield United Gaslight Company's experimental furnace room by Professor W. A. Carlyle, Mr. W. H. Merrett, and several other gentlemen of the Royal School of Mines, South Kensington. Mr. Arthur Mead, the Superintendent, explained the uses of the several types of furnaces manufactured by the Richmond Gas Stove and Meter Company, and supplied by the Sheffield Gas Company for industrial and trade purposes. A Richmond high-temperature melting furnace, worked by gas and air blast, and capable of developing heat up to 1600° C., specially interested the visitors.

In connection with the Engineering and Machinery Exhibition organized by the proprietors of the "Engineering Review," which is to be held next autumn in the Manchester City Hall, the announcement is made that, as the large space at disposal has proved unequal to meet the demand made for a complete section devoted to colliery and general mining machinery, it has been decided to deal with the position by holding a special Mining and Colliery Exhibition in the same hall from Oct. 16 to 30, 1911. It is intended to make mining by machinery the predominant feature; and special attention will also be paid to the part now played by electricity in mining operations. Educational matters will be given due prominence.

EASTERN COUNTIES ASSOCIATION PAPERS.

[See p. 307.]

PURIFICATION.

By Mr. F. PRENTICE, of Ipswich.

The purification of gas from impurities is a very extensive subject, yet one of interest to every gas man, and one that we can with profit spend a short time considering.

What is an impurity? Anything in the gas that we do not want, and have no use for. At one time, tar and ammonia were so called; and these valuable bye-products were wasted. At the present time, the only real impurities worth much consideration are naphthalene, carbonic acid, and sulphuretted hydrogen. By some, sulphur compounds are placed in this category; but the overwhelming scientific evidence adduced in recent years forbid me to do so, though I propose saying a word or two on the usual methods adopted for its extraction. I will take this first.

Foul gas contains anything from 20 to 60 or 70 grains per 100 cubic feet. Some of this variation is due to coal, and much to retort temperature. It is an elusive compound, hard to be defined, and difficult to arrest. Sulphide of calcium, produced by sulphiding fresh lime, is the usual means employed for its extraction. Carbonic acid has to be rigidly excluded, or carbonate of lime is formed, and the sulphur compounds are either liberated or unarrested.

This sulphide of calcium is an unstable compound, and has peculiar idiosyncrasies—sometimes mopping-up the sulphur compounds with avidity, and at others as freely liberating them. I have known as much as 90 grains per 100 cubic feet to be given off from one of these purifiers.

Fortunately, the sulphur compound bogey has been exposed of late. The wisest scientists of the time have taken it in hand. It is shorn of its terrors; and most of us, as a consequence, rest in peace.

Naphthalene may be called an impurity, but in a different sense to the others referred to. There is no objection to it, *per se*; but we desire its absence because of its choking effect on all pipes, from a 24-inch holder inlet to a $\frac{3}{8}$ -inch gas-cock. This thin crystal flake, so fragile as to dissolve in the hand, somehow contrives to build its delicate structure into masses that will resist powerful pressures. At one time naphthalene was a curiosity; and I well remember, 25 years ago, collecting some from an old syphon cover, and showing it round as a beautiful rarity.

The temperature of the retorts has largely to do with its formation; and as we must have our retorts hot, in order to produce the makes required at the present day, we also produce naphthalene. And it brings its troubles with it.

After thousands of experiments, and the designing of many elaborate and costly pieces of apparatus for its extraction, it has been found that the simple process of washing the gas with hot water-gas tar will reduce this impurity to a degree that makes it practically harmless.

I suggest, as the result of many experiments, that a rotary washer, working at a temperature of about 100°, will reduce a gas containing 17 to 20 grains of naphthalene per 100 cubic feet to 4 grains, and this by the use of 0.1 gallon of water-gas tar per 1000 cubic feet of gas.

In dealing with this question, it is well to remember that purification begins directly the gas leaves the retort, and continues more or less through the washers and scrubbers, till those boxes are arrived at that we call purifiers proper. Now the more impurities that can be extracted in the earlier stages the better, as the boxes last longer, and purification becomes less costly.

Just a word about carbonic acid. The foul gas usually contains 800 to 1000 grains per 100 cubic feet. Condensers, washers, and scrubbers take out 160 grains—leaving the remainder to be dealt with. Lime is the material usually used in the boxes; and when in Ipswich we were purifying for carbonic acid, we found that, as an average, a ton of Suffolk lime would extract the carbonic acid from the gas made from 438 tons of coal. This impurity if left in the gas reduces the illuminating power half-a-candle per 1 per cent. of carbonic acid; and the question each one has to settle is, Is the cost of its removal compensated for by the additional quality produced? Or, to put it another way, Is the increased illuminating power worth the cost of its extraction?

Sulphuretted hydrogen lies in a different category to the foregoing, and is a very real impurity. Fortunately, it is one easy to grapple with. Some engineers use lime for its extraction; and this method has its advantages where lime is cheap, because carbonic acid is of necessity also eliminated, and a higher illuminating power results. The only thing to be careful of is to see that the carbonic acid does not get too far forward in the boxes, because lime being more in love with the gas than with sulphuretted hydrogen, it readily embraces it, allowing the sulphuretted hydrogen to go forward and cause trouble.

The more usual method for the extraction of this impurity is by means of oxide of iron. The action is simple; sulphide of iron being formed. On exposure of the material to air, re-oxidation takes place; and free sulphur is deposited in the mass. Now it is obvious that taking out, laying down, revivifying, and replacing the material in the boxes, means money; and many schemes have been propounded for revivifying *in situ*.

Twenty-five years ago, I worked a steam-blast injector for forcing

air through the boxes after shutting them off. This was a good idea in theory; but, in practice, when the oxide contained a large percentage of sulphur, fires readily occurred, and sieves were burnt up, even though every care was taken. So this plan was abandoned. Then it was found that the admission of 1½ to 3 per cent. of air at the exhauster considerably lengthened the life of a box; and this was, and is now, almost universally done.

The late Mr. W. A. Valon, of Ramsgate, arguing that only a fifth part of the air so admitted did any good—the nitrogen only diluting the gas—tried pure oxygen in quantities of ½ per cent. I inspected at Ramsgate his apparatus—especially the process for producing the oxygen—and found it very interesting. The cost of the latter was, I believe, the cause of its ultimate abandonment.

Comparatively recently, a plan has been evolved which in our case has been very successful, though the exact cause of its success is somewhat of a mystery. I refer to changing the purifiers in backward rotation. Suppose the order to be 1, 2, 3, 4. When No. 3 shows distinctly, No. 4 is put first—the order then being 4, 1, 2, 3. When No. 2 shows, No. 3 is put first—3, 4, 1, 2. And so on. The last purifier always has a good rest from foul gas, and partially revivifies during this period. When its turn comes to go on first again, it will work vigorously once more.

Take an actual example: A purifier was charged with 100 tons of new oxide on Nov. 21, 1907. Sixteen months later it was taken out for the first time, broken up, turned, and replaced. It contained 48.9 per cent. of sulphur. It then worked again in the same box till Dec. 31, 1909, and then contained 54.9 per cent. of sulphur, and was discarded and sold. During this period it was reversed twelve times, and passed 991,827,000 cubic feet of gas. As three other boxes were being worked all the time, we may divide this quantity of gas by four, which gives 247,956,000 cubic feet as the work done by this box. The tests for sulphuretted hydrogen at the outlet of the boxes at the end of twelve months' work were: No. 1, 278 grains; No. 2, 150; No. 3, 100; No. 4, 50.

Catch boxes are a necessity with this method, as traces of sulphuretted hydrogen at the outlets are always obtainable with the paper test, though the quantity is often too small to be estimated by the ordinary Harcourt's colour test. The presence of water gas makes the "catches" all the more necessary. With pure coal gas, the catch boxes would probably last almost the whole of this period. To reduce the pressure which this method tends to produce, we work these purifiers downwards, instead of upwards.

Discussion.

Mr. R. G. SHADBOLT (Grantham) said the notes Mr. Prentice had compiled, so concisely and nicely, really made it a simple matter to follow and understand the drift of his arguments. Boiling the paper down—making all allowances, and taking into consideration the different factors that had been raised by him—it all came to the point as to the cheapest way of removing sulphur from gas. Undoubtedly, the backward rotation system was about the best in regard to the ordinary purifiers in use at present. Mr. Prentice said it was essential to have catch-boxes. For the last three years, he (Mr. Shadbolt) had been working with three purifiers on and one off, with no catch-box, and most successfully so. There it was seen how circumstances altered cases. The conclusion he had come to was this, that they could not get above a certain life out of their purifiers. He had two 25-feet purifiers and two 15 ft. by 12 ft., with an annual make of 100 millions. Supposing they had three boxes—two on and one off—it was a little difficult to get them changed quickly enough. They had to take into consideration the area of the purifiers; and there was the time element also to be taken into account. If they had only three boxes, they could only wait until No. 1 was foul to a certain extent; and then it must be turned off. He had found that, when he increased the proportion of air, no greater efficiency was obtained beyond a certain point. He stopped measuring his air years ago. It was found that, as they increased the quantity of air, the added quantity of oxygen was passing the foul box, and was simply added to the total volume of gas; and they got as high as 1.8 per cent. of oxygen on one occasion. Just at that time some one read a paper on this backward rotation method; and they immediately grasped the idea. It came to this, that they had to change much more frequently than he understood Mr. Prentice did—they had to change the small boxes much more quickly than the large ones; and by so doing, they could maintain the gas perfectly free from sulphuretted hydrogen. With regard to costs, for the five years preceding the last three, the labour costs on oxide purification alone was 0.22d. per 1000 cubic feet, as compared with 0.08d. for the backward rotation system. The sulphur content, or non-content, under this system, and under their conditions, was much more constant, because prior to every change, under the old set of conditions, they were approaching a show of sulphur, and it actually ran until they got a real show, before they changed. So that reducing purification to a certain set of conditions, they could practically obtain freedom from sulphuretted hydrogen in the maximum, as well as the minimum, period.

Mr. T. GLOVER (Norwich) said he was glad purification was the subject on this occasion, and that carbonization was having a rest for the time. Purification after carbonization must be the matter of greatest importance to them as manufacturers. During recent years they had made considerable strides towards the very desirable state of things of purification in closed vessels. He meant to say they had not got to purification by caustic ammonia dreamed of by scientists a few years ago; but they had

to improved purification in ordinary vessels, and with oxide of iron, that there was little chance, he was afraid, for either Feld's or the Claus process. It appeared they would be able to do their purification, and make it pay, at such a slight cost that purification could not bulk in their balance-sheets at all. And it was to be one by the method to which Mr. Prentice had drawn attention—that was to say, when a box was filled with fresh material, by putting it first, instead of last, as they were taught to do. Mr. Prentice had not given them the reason; and it was important for them that they should understand it. Why was it the reverse method of working would give so much longer life to the material in the boxes? He believed the explanation was that oxide of iron could not absorb sulphuretted hydrogen and oxygen at the same time; and, by putting the foul boxes last, the oxygen came through the clean boxes which were absorbing sulphuretted hydrogen, and on to the foul boxes, which were revived by it. If fresh material were put in, and the box was placed first, it was rapidly absorbing sulphuretted hydrogen for some time, but it was not absorbing oxygen; the oxygen passed clean through it, and revived the boxes last in rotation. In working with four boxes, the first box was absorbing sulphuretted hydrogen very rapidly, and No. 4 was absorbing oxygen, and was being prepared for being put first. This was how many engineers were now working, and with very great advantage. Regarding downward purification, he (Mr. Glover) did not claim to be the originator of this, because he thought, if he remembered rightly, that he took the idea from Mr. Hislop, of Paisley. A paper that Mr. Hislop read a few years ago, reminded him (Mr. Glover) of a previous experience; and he then tried it again with great advantage. They got much less back-pressure with downward, than with upward, purification; and there were other important reasons why they should have downward purification. All had doubtless noticed that moisture from fresh boxes of oxide was carried forward by the chemical action—by the heat generated; and it condensed in the lower part of the succeeding box and was drained off. It was a corrosive liquid, which was a great nuisance. By downward purification, the condensation took place on the cover of the boxes, and dropped down into the material, and so kept it in condition. There was another matter that was important. If they got oxide too hot, it lost its power of absorption; and the way, he supposed, to revive the inert oxide (which was sometimes giving them trouble) was to send forward traces of caustic ammonia from the scrubbers, and it became dehydrated. It was probably known by those present that spent oxide was so treated, by the action of caustic soda or caustic ammonia, after being burnt in the kilns; and they could do this quite well for themselves. If they had an inert oxide, it might be brought back to useful life by passing some traces of caustic ammonia through it, by bye-passing the scrubbers to some extent. It had to be done carefully; and it would then bring the oxide back to life. There were various ways in which reversing could be done; but he was disposed to think with Mr. Shadbolt there was less need of catch-boxes with this process, and by this system of working, than with the old system. They did not require catch-boxes in these days. His coal-gas plant was put down for purification by oxide and lime. They obtained release from the sulphur compounds nuisance; and the purification was now done entirely by oxide of iron. The results were exceedingly good. As to the question of nuisance, to some gas engineers, this was one of great importance. In this matter as in others, they ought to have an ideal, and to make their works as little a public nuisance as possible. They wanted their works to be as smokeless and as smell-less as they could be made. When a box was opened, if no care were taken with regard to the foul gas that it contained, it was liable to be a nuisance. When the cover was lifted, the material was full of foul gas, and that went into the air; and if the works were in the midst of residential property, it was a nuisance. It was a simple matter to connect up the boxes with the inlet of the exhausters, and draw air through the boxes downwards, and thus secure the foul gas; and then when the covers were lifted, there was no nuisance. At Norwich this had been practised for a couple of years. He practically lived over the top of the purifiers; and he knew that when they used to change them they had a distinct nuisance. One could not have a strong smell of this kind without having all the neighbours know what they were doing. They had now, however, made the changing of the purifiers almost an odourless operation. When a box was shut off, all they did was to connect up with the inlet of the exhauster, and draw air through for an hour. Then the plugs on the purifiers were shut down again; and before the men entered next morning, the air was turned on once more for about a quarter of an hour. So that, when the men entered the boxes, they were not working in an atmosphere of foul gas. He would be pleased to show anyone the arrangement. There was nothing very special about it; but it was effective in that way. Working downward also helped to reduce the nuisance, because they had none of the corrosive and strongly smelling liquor running on to the floor and into the drains. It was absorbed by the material. Purification had become quite a pleasure compared with what it used to be; and he was sure they were all glad it was so.

Mr. W. B. FARQUHAR (Ilford) remarked that Mr. Prentice had referred to an example of new oxide that was put in on Nov. 21, 1907. The first time it was taken out it contained 48.9 per cent. of sulphur. It then worked again to Dec. 31, 1909, and then contained 54.9 per cent. of sulphur. Was that on the dry or wet basis?

Mr. PRENTICE: Wet basis.

Mr. SHADBOLT: You can work up your spent oxide with a far greater percentage of sulphur when using the backward rotation system.

Mr. W. J. CARPENTER (Yarmouth) observed that Mr. Prentice asked, "What is an impurity?" And his answer was: "Anything in the gas we do not want, and have no use for." That was right in one sense. But in another sense they had a use even for sulphuretted hydrogen. They used it in a way, because they could collect it; and, having collected it, their oxide was rendered more valuable. He was not quite so sure that they were as safe as formerly when the sulphur compounds were reduced within measurable distance. With regard to smell, they ought to make people's homes as smell-less as possible. In their own practice, they endeavoured to reduce the sulphur compounds within what might be called decent limits. At the time when radiators and stoves were being used largely underneath people's noses, it was very necessary to have the gas as clean as possible. He did not think he could say quite as much as Mr. Prentice regarding the overwhelming scientific evidence on this point. They had noses, and could smell for themselves whether the gas was bad; and they did not want any scientist to tell them that. When he went into a place, he could tell whether his own gas was bad; and he did not want any overwhelming scientific evidence to prove the contrary. [Laughter.] He did not think the paper went far enough. They ought not to consider that the whole of the purification was done in the purifying-house. There were interesting purifying processes previous to sending the gas into the purifier-house. There was a good deal to be said about an efficient means of washing and scrubbing; and there were more efficient means nowadays than there used to be. Mr. Prentice also said that it was an easy matter to get rid of naphthalene, if only the gas was washed with hot water-gas tar. He (Mr. Carpenter) had not hot water-gas tar; and so had to employ other methods of getting rid of the trouble. They had introduced a system for its extraction; and they had also adopted means for sending paraffin gas forward, so that it dropped down at the same temperature. He should like Mr. Prentice to say something more about that, because so many of their members had not the particular means at hand that he mentioned. The paper started elementarily, and ended very scientifically, and that was as it ought to be.

Mr. W. D. CHILD (Romford) said that, when he designed the works for the Romford Gas Company, he went away from what was the very common practice of a long length of foul main between the retorts and the condensers, and made the connection between them as short as possible—bringing the gas into a vertical tube with a number of discs with fine perforations, so that the hot gas was subjected to a straining effect. Thus the tar was removed by friction before the gas went into the condensers. Some few years ago, the Southern Association were making inquiry into the causes of naphthalene, and its possible prevention; and from the description he gave of what he was doing at the Romford works, they were selected as one of those at which Dr. Colman should make special investigation. As the result, Dr. Colman was convinced that the removal of the tar by friction in this way also removed the naphthalene from the gas. At all events in the twenty years or more that the arrangement had been running, they had had no trouble in the works or the district with naphthalene in any proportion whatever. He was in agreement with Mr. Carpenter in so far that they did not want scientific assistance in degrading the gas sent out to the consumers; but they were glad indeed to have any scientific information which would prevent impurities being in the gas.

The PRESIDENT endorsed Mr. Prentice's observation in regard to washing gas with water-gas tar. For eight years they had been doing this at Hull; and naphthalene in the district was practically unknown. As to the backward rotation system, he agreed with Mr. Shadbolt that the greater the rapidity with which the changes were made, the greater the efficiency of the purification; and Mr. Glover's explanation would appeal to each one as to the reason why purification *in situ* took place more effectually by placing the clean boxes in front. This method had been at work in Hull for some years; and they had arranged the connections so that they could work the stream of gas downwards for part of the time, and upwards for the other part. In this way, they could reverse the flow; and this was a great assistance in purification. He also thought the oxidation of the oxide of iron took place with much greater rapidity in the presence of a little moisture, especially if the moisture was warm. For this reason, they added a little steam to the ingoing gas. The oxide never caked; and they could work it for a long time. He had had purifiers that had been at work for twelve months, and gave no excessive back-pressure. He would earnestly recommend each one of the members to pay particular attention to Mr. Glover's idea of getting the purifiers clean before the men went into them. He had seen Mr. Glover's arrangement for doing this; and it was admirable. The results obtained were excellent, though the method was simple. Nuisance was prevented; and the safety of the men was assured, which was the first consideration they all, he was certain, had at heart.

Mr. C. BANHAM (Wymondham) remarked that he was in charge of small works; and he was afraid Mr. Prentice's paper did not appeal much to gas managers in his category. He (Mr. Banham) represented a Company that had been using oxide exclusively for twenty years; and the problem he had had to face was the trouble of tar and water in the bottom of the boxes, which caused a great waste of oxide. They put up a greater length of foul main,

thinking this would cure it; but it did not. He then replaced the boards in the scrubber with coke; and this he found a great benefit. Instead of getting the bottom of the boxes wet, they now had them dry. He also found that, if they kept the retorts screwed up after the charges were burnt off, sulphur compounds were formed which went forward with the gas, and were not taken out by the oxide. Then, as Mr. Carpenter had said, they could smell the gas.

Mr. PRENTICE, in reply, said he had been much interested in what Mr. Shadbolt had said. He did not know whether Mr. Shadbolt used water gas. There was undoubtedly a difference on the outlet of their purifiers when using water gas, even though a small percentage—say, 17 per cent. He had known the last purifier to show the effect of the reduction of the water gas distinctly; and the sulphuretted hydrogen would sometimes afterwards go back to the first box. The presence of water gas made a catch-box a necessity. He would like to thank Mr. Glover for his explanation as to how the oxide was revived *in situ*. Though he should be the last man to suggest that Mr. Glover was not hitting the nail on the head, at the same time he must confess to a slight doubt about it; and certainly, as soon as he returned to Ipswich, he should make a series of tests to prove the matter. Because the fact he had mentioned, that the impurity would sometimes recede to the first box on the reduction of the water gas and perhaps increasing the air up to 3 per cent., rather suggested there was some other factor at work in addition to the one mentioned. Now with regard to Mr. Carpenter, he (Mr. Prentice) imagined that, in spite of the value of the production of sulphuretted hydrogen, they would all be glad to be without it. If this was so, it came under his category of an impurity. Then as to water-gas tar, if Mr. Carpenter had none, he believed he distilled his own tar; and crude naphtha and light oils would answer the purpose equally well, if not better. They had at Ipswich for this purpose used benzol dropped into the mains in small quantities. The use of water-gas tar was first suggested to them by Mr. Glover.

Mr. CARPENTER: Where do you put it in?

Mr. PRENTICE: We drop it into the main after a syphon.

Mr. CARPENTER: You said "hot" water-gas tar.

Mr. PRENTICE said it was kept hot because the gas was passing at 100° Fahr. The water-gas tar was, as a matter of fact, put in cold; but the temperature of the washer-scrubber was kept up as hot as possible. In a short paper like the one he had read, he could not say anything about the means of purification preceding the ordinary processes, nor deal with all the impurities. He did, however, mention that the washers and scrubbers had an important part in reducing these impurities, and making the work lighter for the purifiers proper. As to the use of steam, they had tried steaming the purifiers at Ipswich; but so far as they had gone at present, they had not found any advantage. They were not troubled with pressure. He had only known one purifier to give more than (say) 2 inches of pressure; and, as a rule, the pressure was about $\frac{1}{2}$ inch. The effect of steaming for four consecutive days for half an hour each day was that they got oxide out containing 14 per cent. of water; and it had to be laid down and turned two or three times before the percentage of water was reduced sufficiently to make it fit for sale.

The PRESIDENT: The quantity of steam is almost continuous; and when we empty a purifier that has become spent, the usual percentage of moisture is about 4 per cent.

Mr. J. T. JOLLIFFE (Ipswich): Have you any sensible rise in the temperature?

The PRESIDENT: Yes; that is beneficial. The purification takes place at a moderately high temperature.

Mr. JOLLIFFE: What rise in temperature do you get with the steaming?

The PRESIDENT: About 20°.

FREE MAINTENANCE.

By Mr. F. L. WIMHURST, of Cambridge.

It is somewhat difficult to find a suitable title for the few remarks I have to make; and though it appears on the programme as "Free Maintenance," I wish the members to fully understand that I am not here to-day prepared to advise or recommend free maintenance, but more to recommend free supervision of any and all gas appliances. Also I do not wish to restrict your discussion to supervision and maintenance, but to bring forward any ideas or suggestions you may have to make on present-day and up-to-date business methods of conducting the selling department of a gas undertaking.

All are, I think, agreed that the old methods of "Take it or Leave it" must go, and in its stead must rule the complete satisfaction of the consumer coupled with the best interests of the gas undertaking. This state of affairs has no doubt been brought about by competition, the healthy stimulus of which has been good for all concerned. Our gas managers have met the situation in a bold manner; and the makers of gas-consuming apparatus have not been slow to back them up, with the result that various and improved appliances have been placed on the market for the utilization of gas to the comfort of the consumer.

The different appliances now in vogue are all designed on scientific lines; and the gas manager is able to inform his consumer fairly accurately what results he will, or should, obtain with a given consumption of gas. But, unfortunately, these

results are frequently not obtained through various causes—that most frequently met with being lack of knowledge and carelessness on the part of those using the gas; and this is more especially so in incandescent lighting.

With a view to giving the consumer more satisfaction from his incandescent lighting, the Cambridge Gas Company some five years ago inaugurated a system of supervision and maintenance at nominal charges of 3d. per burner per quarter, which included one visit per month. This charge is equal to 1d. per burner per visit. All materials are charged for extra.

We have on our books 283 consumers who have taken advantage of the facility; and for the year ending March last, an average of 3850 burners per quarter have been attended to. We have found that an average of about 43 burners can be attended to per day. When the system was started, this average was as high as 50; but the advent of the inverted burner reduced the number. Our charge of 1d. per burner per visit just pays for the supervision. There is, of course, a profit on all material used in the maintenance.

Our total number of consumers is 10,700, and of these 6460 have the ordinary service—showing that a small percentage only are prepared to avail themselves of our present system of maintenance. A good light and a satisfied consumer are two of the best advertisements it is possible to obtain. If we are to acquire these valuable assets, it appears necessary to either reduce our supervision charges or remove them altogether.

To remove the charge for supervision would, in our case, add 1d. to the price of gas—that is, calculating on 6000 consumers being suitable for supervision, with an average of five burners each. As a set-off against this expenditure, there would be a considerable profit on the goods sold for maintenance.

Referring to the men employed on supervision work, it is necessary that these should be suitably trained, smart, obliging, and of good appearance. But as the occupation does not present prospects for advancement, some difficulty might be experienced in obtaining a sufficient number of youths for the work.

The difficulty of maintaining the efficiency of lighting is shared by cooks and gas-fires—both to a less degree, I admit; and the cooker the least of the three.

When spring-cleaning is over and the summer season of shorter lighting hours is upon us, occupation should be found for the maintenance men supervising cooks, as these are more used in summer than winter. Dirty burners, with their attendant objectionable smell and stiff taps, should be rectified; when required, old and rusty trays should be replaced; and the cooks generally should be put into an efficient state. They will then prove to be an even greater boon to the hard-worked housewife than they are in many cases at present.

On two occasions when cookery demonstrations were taking place in Cambridge, a lady instructor has visited the district for the purpose of instructing the housewife in her own home on the use of the cooker. These visits proved very satisfactory, as numerous minor defects were discovered, reported to the head office and rectified, and many frivolous complaints attributable to lack of knowledge were explained away. A few minutes' conversation and demonstration on the part of the lady instructor did far more good than volumes of literature.

Gas-fires have of late been much improved, and their efficiency increased, so that they may now be recommended to the middle classes as well as the more wealthy. To obtain the best results from them, it is necessary that adjustments should be made in the proportions of air and gas; and the disposition of the fuel over the burner should be carefully done at the periodical cleaning. It is difficult to induce consumers to realize this. They continue to use the fire until it becomes inefficient, and then condemn it because it is a nuisance and emits a smell, or it may develop some other defect which, if attended by a skilled person, might be rectified in a few minutes. If these fires were periodically inspected during the winter months—cleaned out and readjusted—how much more satisfaction would they afford the consumer. Where half-hearted satisfaction exists, there would be found a client who would never tire of eulogizing his bedroom or other gas-fire, with its warmth unaccompanied by dirt and dust.

To supervise the three gas appliances mentioned would require a large staff of suitably trained men or youths; and as they do not at present exist, where are we to turn to obtain them? Technical classes are held to teach men and youths various trades—such as plumbing, engineering, chemistry, &c.; and if the county authorities are able to do this, why then should they not have classes for gas combustion, which would include some elementary light and heat and chemistry of combustion.

I do not know that it is yet realized by all gas managers that a gas undertaking is a business concern. Most have now arrived at this decision, and are endeavouring to run the concern on business principles. But the public, I fear, are not aware of this; and if they do not say so, they certainly think the position held by a statutory monopoly is an envious one. It should be our best endeavour to dispel any and all such thoughts as this from the minds of the public; and this may to a great extent be done by civility and courteousness on the part of the servants of the undertaking, and a desire by all connected with it to give satisfaction to their customers—to do more business with them, and induce them to take more gas.

Meter inspectors, who, by reason of their frequent visits, are well known to the consumer, should be trained to give advice to consumers on general gas matters and make recommendations for

additional apparatus. If the inspector is not trained to do this, then he should certainly be instructed to ask if everything is satisfactory, or can the company do anything to improve the lighting, or shall he request the superintending inspector to call?

Great care should be exercised in selecting a man to fill the post of inspector or foreman of the gas-fitters. He should be capable both practically and theoretically; and be able to give advice in fitting all kinds of apparatus, and estimates for both fixing and the cost of running afterwards.

As the inspector is, in a sense, the salesman of a gas undertaking, he should possess tact, and always be on the look-out for fresh business, and be by no means at all short-tempered. A good all-round inspector is worth his money, and may make all the difference between amity and enmity between the consumer and the undertaking.

Advertisements and gas undertakings have not long known one another; and I think there is still space for developments in this direction. A short and seasonable advertisement in a local paper is I am certain good for all undertakings. It is also a solatium for the Press; and it is quite right that the Press should see the actions of the gas company in a proper light. I believe the lack of advertising on the part of gas companies is in no small measure due to the conservatism of boards of directors. Care is required in wording an advertisement. No attempt should be made to say too much; and what is said should be truthful and about our own goods—not concerning the quality or otherwise of our competitors' article.

Much has been said lately in the Daily Press concerning electric metallic filament lamps and other electric appliances. This should be met with some counter article on either gas lighting or some other form of gas consumption. The cost of this should be met in some co-operative manner. A *pro rata* basis appears to be the only equitable method. If co-operative action on the part of a sufficient number of gas undertakings cannot be obtained, then the Commercial Sections might see their way to undertake the work. The articles should be carefully drawn up in a literary style by a man who realizes who he is writing for. Technicalities should be avoided, as the man in the street cannot be expected to bother his mind with candle-hours and calories. The recent successes of the London Companies in obtaining the lighting of important thoroughfares in competition with other forms of lighting should not be allowed to rest where it is, but should be mentioned in all the daily papers, because we all know that what is done in the Metropolis to-day is done in the Provinces to-morrow.

Show-rooms are now a *sine qua non* of almost every gas undertaking. They are a great convenience to consumers for handing in complaints, orders, and payments. The attendant, either male or female, should be fully alive to business. To keep him up to his work, a bonus might be paid on his sales; and if this is paid monthly or quarterly, it is kept more in notice than if it were taken out yearly. An overstocked show-room window is not at all attractive. In addition, nothing in particular is seen by the public. A few articles well distributed, and frequently changed, are more likely to arrest the attention of those who are probable buyers. The public should be invited to enter the show-room without being expected to buy; and if the attendant is at hand to give information (but his presence not rendered obtrusive), it will go a long way towards inducing prospective customers to walk round and inspect the stock.

Public lighting is generally a lean investment; but it is difficult to estimate its value as an advertisement. A street with a row of bright and clean lights along each side, gives one the impression of cleanliness and safety.

Discussion.

Mr. W. J. CARPENTER (Great Yarmouth) desired to say how much he appreciated the excellent way their young member had put the subject of his paper before them. He (Mr. Carpenter) came prepared to deal with what was usually called maintenance; but Mr. Wimhurst had dealt with the maintenance of the whole gas industry. The maintenance of consumers' burners, however, was the most interesting thing he could talk about. They charged 9d. per burner per quarter, providing material; and they had already a good many ledger accounts. He did not know how it was proposed to collect the money by charging so much per burner as they were being maintained. It was very difficult to collect 4d. or 5d. at a time as the case might be; it was, in fact, more difficult to collect such sums than £4 or £5. The collection had to be done very carefully; and he found it a most difficult thing to get in small sums, though they had perhaps 25 people collecting. This was the sort of thing they had to consider. It might no doubt be easily arranged in some places. Where one man saw difficulty in a system, another got through it very well indeed. There was also the risk of pilfering. In regard to maintenance, they did as much as they could under the system of so much per burner per quarter. It was a graduated matter, and sometimes came down, and almost disappeared. They were doing maintenance in a great number of cases at 3d. per burner per quarter; but they were, he believed, charging themselves something for doing it. It was one of the most difficult matters with which they as gas managers had to be deal. A consumer might come along and say: "We will take away this business if you do not do this or that for nothing." They did not tell him they would do it; but they did it all the same.

Mr. J. W. AUCHTERLONIE (Cambridge) remarked that the

position of the gas industry was very much like that of the trade of the country generally. Rivals obsessed them in almost every section of their business—especially in gas lighting. There they had a rival which was governed by scientifically trained, keen, and vigorous men. These men cut into the gas business; and it was only by cutting into it, that they could hope to extend their own business. Most gas men had been trying to put their houses in order by remodelling their carbonizing plant, and getting down costs, and so reducing the price of gas to the lowest possible point. They had also been endeavouring to get consumers to part with their flat-flame burners, and to put in the incandescent ones. They had at Cambridge adopted free maintenance, or rather the free supervision scheme which Mr. Wimhurst had touched upon. It was disheartening to find that, when one had put in a good installation, it was, in a short time, neglected; and what was once a fine advertisement, had become quite the contrary. They could not perhaps get the consumer to come on to the maintenance system; and yet possibly he could not clean his burners himself, or he would not. The necessity of supervising incandescent burners had been forcibly brought before him of late. He thought that what had been done as a matter of expediency ought to be done universally and gratuitously. He did not advocate free maintenance; he referred to free supervision. One manager had been bold enough to advocate free maintenance at a cost of something like 2½d. to 7d. per 1000 cubic feet—that was, total maintenance. He (Mr. Auchterlonie) thought that very few of them would be prepared to advocate such a scheme, because such a concession could only be given at the cost of the users of gas for power, cooking, and heating purposes. He did not think such a scheme would be equitable even between lighting consumers, because a careless consumer would necessarily cost more in maintenance than a careful one. The question of sliding-scale companies also came in. Though he did not think they could advocate a free maintenance system for such companies, from figures he had taken out, he calculated that 1d. per 1000 cubic feet would cover the cost of free supervision—that was for labour alone. Where there was a profit charged on the materials, the figure might then be as low as ¾d. Such a concession would be one step towards satisfying their consumers. As to co-operation among gas companies for advertising purposes, this ought to be extended to the supply of lady teachers, canvassers, and demonstrators, whom the co-operating companies might have on application to a central authority. In 1907, Mr. Goodenough, the Chief Inspector of the Gaslight and Coke Company, read a paper at the Dublin meeting of the Institution of Gas Engineers; and it would be remembered that he invited the co-operation of the Institution in the matter of advertising. But he (Mr. Auchterlonie) was not aware that anything had been done in this direction as the result. Only recently he had cut out of a daily paper an advertisement regarding a metallic filament lamp. Reading it, one would think it was simply an article stating that electricity was cheaper than gas, until one got to the end of it, and found it was an advertisement for a metallic filament lamp. They all remembered, too, the articles in the "Daily Mail," "Daily Chronicle," and other papers some time ago. Co-operation among gas companies would combat this kind of thing. Personally he felt the distinct disadvantage of these articles being allowed to go unchallenged; and many other managers did the same. He was in a position to say that his Board, at all events, would be very pleased to join some form of combination for the purpose, either through the Institution of Gas Engineers or through the Commercial Sections. Whatever was done ought to be done in a constitutional manner; and each gas manager ought to bring the matter in a direct form before his board. There was a distinct necessity for co-operation in the work of keeping the gas industry in the front.

Mr. GEORGE HELPS (Nuneaton) observed that all matters, however complex they might appear to be, generally resolved themselves in simple issues. This question of maintenance, or supervision and maintenance, resolved itself into a very simple matter. Were they to supply gas, or were they to supply light, heat, and power? He did not think there could be any question at all about it. If they looked at it from the commonsense point of view, they would not be questioning the advisability of dealing with the matter in such a way that their process covered all that the consumers required. He supposed that those present knew that there were many houses that were fitted up at the expense of their companies, in which the consumers used gas when the mantle was on, but did not use gas when the mantle happened to be off. As gas suppliers, they wanted them to use the gas. If they gave the consumers free mantles, the cost would be charged in the gas. What did it matter whether they charged for the mantle when it was put on, or whether it was charged for in the gas? Mr. Carpenter had put forward the difficulty of collecting small sums of money where they charged for putting on a mantle, or doing something or other. How much longer they, as members of a big industry, would continue to attempt to get money from the consumers in dribbles he did not know. It ought to end quickly. Electricians were setting out to charge for electricity by the house, and not by the burner. They were simply doing it on the rating of the house, and surely gas authorities could set about dealing with their consumers so that they knew what their light or heat was going to cost, without having to keep a secretary or some other person to "tot-up" all the sundries for which they were now called upon to pay. Some of their consumers were pestered by all sorts of traders, who called with mantles

and burners, for which they charged heavily, and which money might just as well be paid in the account for gas.

Mr. R. G. SHADBOLT (Grantham) said with respect to co-operation among gas companies with regard to advertising, he did not think he was giving anything away, or anticipating anything in a way he ought not to do, by saying that, at a recent general meeting of various Commercial Sections, a Committee was specially appointed to go into the question of systematic advertising methods among gas undertakings. In the short space of a week, the Committee would be holding its first meeting; and by the time the Institution met in June, when the joint meeting of the Commercial Sections would be held, it was hoped a step in advance would have been taken. A move was therefore being made; and the expressions of opinion that day would help to show there was general dissatisfaction with their advertising methods, or (as the Americans called it) with their Publicity Department. As to the maintenance question, it was rather a big one; and it resolved itself into how far they were justified in going in for saddling the price of gas with the cost of maintenance of this, that, or the other. Because whatever they might include in the price of gas, they were only credited in the eyes of the public with the selling price of the gas. In one undertaking the selling price of gas included nothing else; meter-rents, stoves, connections, &c., were charged for, and paid for, separately. Another undertaking supplied everything free. Between them a difference of 6d. per 1000 feet might be found. With this difference in the cost of gas, the public did not give any credit to the undertaking for supplying all these things free, although the trend of events was in this direction. It was a question they had to very closely watch, so as not to overload their companies to such an extent as to overstrain them. This was the point as it presented itself to him. Cookers and fires, as well as incandescent burners, were being maintained at the present time. What were they costing now; and what was the additional cost going to be if they went in for free maintenance. Free supervision was not free maintenance, particularly if they were going to charge such a price for materials as to recoup themselves for the labour. Take Grantham, which was a good instance with reference to the maintenance of cookers, because they had absolutely saturated the district with them. They had only eighty consumers who had not a cooker, grill, or boiling-ring. This was about saturation point; so the figures there ought to be reliable. The Company had out 2300 or so cookers; and these cost them, on an average of years, 2s. 0½d. per cooker, or a tax upon the gas, excluding that consumed in the public lamps, of 0·66d. per 1000 cubic feet. Then taking fires (which did not strike the public as they ought to do), they could not exactly run the cost out at per 1000 cubic feet; but it worked out to about 1s. per fire per annum. Cookers required more attention. Coming to incandescent burners, they had been on the maintenance system for some time. A present inventory showed they had 10,000 incandescent lights, and there were still existing some 8000 flat-flame burners. He did not say these burners were used, except occasionally, and not for important purposes. Out of the 10,000 incandescent burners, they had 2200 on the maintenance system—from 6d. to 4½d., and possibly some of them were of a *minus* quantity. [Laughter.] But taking the actual maintenance, it cost them about £235. If they maintained these all free, it would cost them £1068; and even now, under the present system, they were losing £50 a year in net cost. This was what it came to. They had to make up their minds to the expenditure on the top of the other items; and it came to a shade over 3d. per 1000 cubic feet of gas on the total sales, excluding public lamps. Taking the cost of the maintenance of cookers, fires, and their depreciation, they were putting a tax on gas to the extent of 3·64d.; and if they now added the 3d. already mentioned, it would make 6·64d. So that the plain point was this: Was it policy to double the existing tax on the price of gas? This was an actual, concrete case. Could they afford it? Could they render this service to the public in such a way as to be acceptable, and continue to maintain their reputation for low-priced gas upon which they flattered themselves—in some instances, at any rate.

Mr. W. B. FARQUHAR (Ilford) said that some of the remarks made—particularly those of the last speaker—were on the lines he had been thinking out. They had a certain amount of money to find to run their concerns; and it was a question whether they applied the surplus money to reducing the price of gas or to giving more facilities to the consumers in maintenance. His own Company maintained burners at 7d. each; and this 7d. just covered the cost of materials—the time being actually paid for by the Company. So it would be seen that the Company were in a sense losing considerably by the system. But there was this about the scheme of free maintenance, and charging the consumer only for the material, that though the Company gave the consumer good attention, and only requested him to pay for the mantle or globe, the consumer afterwards would wait to the very last minute before he asked for a burner to be attended to. That was why he thought free inspection with a charge for material would fail, and nothing but full free maintenance would answer. He did not advocate free maintenance by any means; he was only pointing out that where a charge was made including labour and everything, the consumer came more readily, and the company obtained a better advertisement because the consumer obtained a better light. In Ilford they had a very keen municipal electric light department fighting the Gas Company; and, on every hand, they found the advertisement "Electricity is Cheaper than Gas."

The Electricity Department sent out circulars advocating that houses should be wired, because gas was unwholesome, and there were bad fumes from its combustion. These things had to be tackled, and in no half-hearted way. It had to be stated that gas was good for its ventilating properties; and that certainly it was cheaper than the electric light. In Ilford, they had not a single public gas-lamp through the electricity concern being in the hands of the local authority. He thought in connection with gas-cookers that a good deal could be done by getting builders to make recesses in the sculleries of houses to take them. Another thing they were trying to do was to get coal kitcheners taken out altogether, and to put gas cookers in their place, so as to ensure their use all the year round. Constant use of the cooker kept it in better condition than intermittent use. He should like the writer of the paper to confirm the figure given as to the number of burners he stated could be maintained per day.

Mr. W. D. CHILD (Romford) observed that Mr. Helps had very rightly suggested that they should sell not gas, but light and heat; and Mr. Shadbolt afterwards supplemented this by showing very clearly what it would cost to do so. At the time, however, that most sliding-scale companies were put under parliamentary control, the price was fixed for them under which they could pay a certain rate of dividend; and they were told that further reductions should give them the right to a certain increase of the standard dividend. If they gave away only a penny per 1000 cubic feet in maintenance, they would be robbing the proprietors of part of their dividend. In his opinion, they should endeavour to sell gas as cheaply as possible, and give the shareholders their dividend, and let maintenance be collected separately from the supply of gas.

Mr. J. H. TROUGHTON (Newmarket) said the paper was a useful one, and brought before them a subject, in a forcible way, to which they could not too often give attention. With regard to advertising, Mr. Shadbolt had mentioned that the matter of co-operation between gas authorities who were members of the Commercial Sections would be dealt with at an early date. The electricians had at the present time a system of co-operative advertising; and it recently came into operation. Edmundson's Electricity Corporation (who had undertakings in several towns) had become members of this co-operative movement, and were using the literature that was produced, and sent all over the kingdom to advocate their light. It was said in this literature that electricity was cheaper than gas; and that the electricity suppliers were prepared to back it up—so far as they could.

Mr. WIMHURST, in reply, agreed with Mr. Carpenter that it was necessary to deal with every individual case on its merits. If it became necessary to maintain certain burners free of charge, there was nothing for it but to do it to retain the custom. The charge of 9d. per burner per quarter appeared rather high; but Mr. Carpenter should know best what he was doing. Probably "what he lost on the swings, he gained on the roundabouts."

Mr. CARPENTER: I said we charged it, Sir. [Laughter.]

Mr. WIMHURST (proceeding) said that as to the training of attendants, perhaps Cambridge was somewhat different to other towns. They had a class of people who must be dealt with very carefully; and they had found that certain youths were not satisfactory; while others gave entire satisfaction. They had to deal with ladies, and the youths had to be trained to somewhat pander to the ladies, and let them have their own way. With regard to collecting the money, the attendants carried the mantles and other things with them; and it was known from the stock that was taken out what money should be brought in. And their books showed what was credit, and what was paid for. Mention had been made of the point of saddling the price of gas with these charges. He called attention in the paper to the fact that free supervision did add 1d. to the price of gas. But the consumer had to pay for it; so that, in the end, it came to the same thing. With regard to electric suppliers charging so much per house, many gas companies would be pleased to take houses on at the same rate that the electricity people were charging in this way. As to men walking from house to house selling mantles, surely if householders would buy from hawkers, they would buy from gas companies. It was very gratifying to hear from Mr. Shadbolt that a Committee had been formed to deal with the question of advertising. Mr. Shadbolt had also referred to the question of saddling the price of gas with a sum of money for maintenance; but it resolved itself into a question as to which way the consumer preferred it—a less price for per 1000 feet of gas with a shabby service, or a higher price for gas with a satisfactory service. With the consumers satisfied, then the gas undertaking would continue to go forward in the lighting business. Mr. Farquhar also spoke of gas being charged at the lowest possible price, and other matters. With the monthly visit which he (Mr. Wimhurst) proposed, it would not be necessary for the consumer to call at the gas office to ask for a mantle or a globe. With a monthly visit, the mantles and burners would, he thought, be maintained in a fairly efficient state. As to electrical competition, when he said "Do not say too much about your competitor's article," he meant do not throw too much mud on the competitor. Their line of action should be to impress people with the idea as to what they themselves were prepared to do. The co-operative system of advertising would look after any caustic articles published in the press, and which asserted that electricity was cheaper than gas. As to recesses in kitchens for cookers, it would be a difficult matter to get the builders of cottage property to make such provision. The number of burners that he (Mr. Wimhurst)

mentioned as being supervised per day was 43. The average was 50 when the system started; but it had fallen since the advent of the inverted burner. Mr. Child had remarked upon the position of proprietors in sliding-scale companies. It was quite true that saddling the price of gas with as much as 6d. per 1000 cubic feet would be robbing the proprietors. The question again was whether they were to saddle the price of gas, give satisfaction with the light, and do more business in the lighting branch, or sell gas at a less price, give less satisfaction with the light, and probably in consequence do less business.

GASHOLDER INLET AND OUTLET PIPES.

The Company carrying on business at Lyons, as constructors of gas-works plant, under the title of MM. Bonnet, Spazin, et Cie., have lately taken out a patent for France for an improved arrangement of gasholder inlet and outlet pipes.

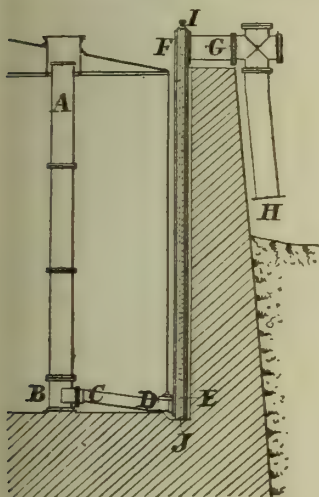


Fig. 1.



Fig. 3.

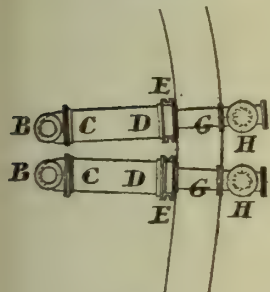


Fig. 2.

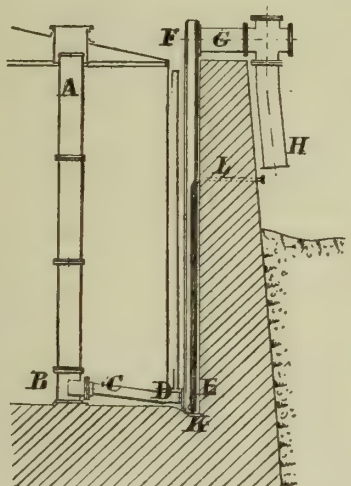


Fig. 4.

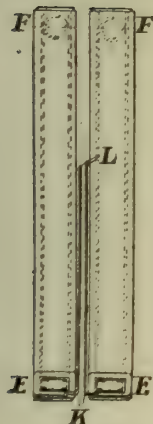


Fig. 6.

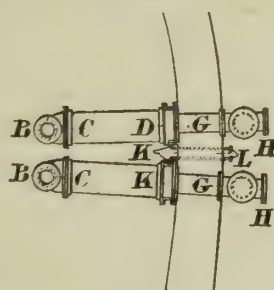


Fig. 5.

to sink a vertical shaft outside the tank, construct a passage under the masonry, and make an opening in the shaft to allow the pipes to pass through. This is always a difficult piece of work, especially if the tank stands on water-logged or rocky soil; for in both cases there is risk of disturbing the masonry and jeopardizing the soundness of the tank. The object of the invention is the removal of these difficulties by an arrangement of fixed inlet and outlet pipes which may be adopted for new holders, but which is specially applicable for those which are to be telescoped, as it does not necessitate the sinking of a shaft.

In order to render their explanation of the arrangement as clear as possible, the accompanying illustrations, showing the application of the invention, are given by the patentees. Fig. 1 is a part section of a single-lift holder in a brick tank, the bell descending to the bottom, and resting upon supports; fig. 2 is a plan, in which the bell has been raised; fig. 3 shows the pipes in elevation; and figs. 4, 5, and 6 are variants.

The pipe A B (figs. 1 and 2), fitted inside the tank, and resting upon the bottom, has to be connected to the pipe G H. In order that this may be done, the lower end is prolonged by a right-angled tubulure of the same size as the pipe, and this is attached to the slightly inclined pipe (also right-angled) C D, which is joined to the vertical pipe E F, the lower end of which forms a clearing pocket. The suction-pipe of this pocket I J is placed inside the gas-pipe, if the height of the latter does not exceed 20 to 23 feet. This is the arrangement shown in figs. 1, 2, and 3. If the height is greater than that just mentioned, the suction pipe is placed outside the gas-pipe up to from 20 to 23 feet from the bottom of the tank, as shown at K L in figs. 4 and 6.

The rectangular form of the pipes lends itself perfectly to the placing of them, whether below the bell at rest, or between the bell and the tank. They can be easily strengthened on the inside. In telescopic holders having two or more lifts, the arrangement described is the same. The inlet and outlet pipes pass below the different lifts, and afterwards between the outer lift and the tank, as shown in figs. 4, 5, and 6.

Another French patent relating to the inlet and outlet pipes of gasholders has been taken out by the Ofenbau-Gesellschaft; and their arrangement has for its object to obtain a better admixture of gases than is now possible.

Fig. 1 is a section of a single-lift holder; fig. 2 a section on the line X X of fig. 1; fig. 3 a section of a double-lift holder; and fig. 4 shows a method of passing the gas over a central partition.

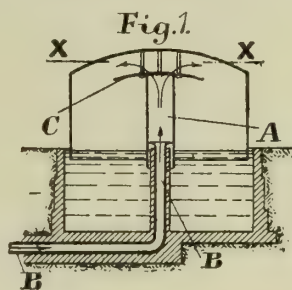


Fig. 1.

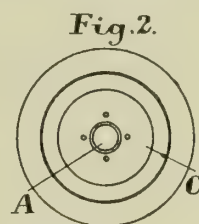


Fig. 2.

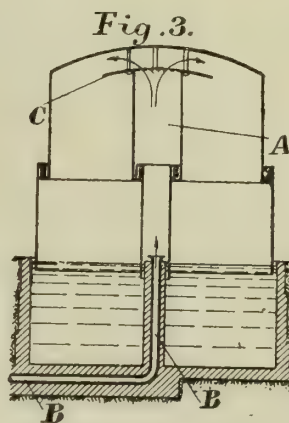


Fig. 3.

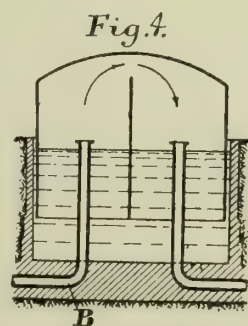


Fig. 4.

In figs. 1 and 2, a pipe A, perforated in its upper part, is attached to, and descends from, the crown of the holder; its lower end reaching just below the mouth of the inlet-pipe B, as shown. The pipe A moves up and down with the lift, and consequently the gas is forced always to rise into the crown. With the view of preventing only a partial admixture of the gases, the incoming gas is made to flow over the plate C. For telescopic holders, it is necessary to form the inlet-pipe as in fig. 3.

In the arrangement shown in fig. 4, which is specially suitable for small holders, it will be noticed that the partition does not reach the crown, and that its lower edge is always in the water. It divides the lift into two compartments. The gas conveyed into the holder by the left-hand pipe passes, as indicated by the arrow, into the adjoining compartment, and mixes with the gas contained therein; or the same result may be produced by perforations in the upper portion of the partition. Below the opening there may be placed a plate similar to C in figs. 1 and 3.

The patentees point out at the commencement that the pipes serving to convey the gas into and out of gasholders are placed either inside or outside these vessels. In the latter case, they are so jointed as to ensure, in all positions of the bell, the connection of the pipes rising from the ground in the vicinity of the tank with those fixed in the holder crown. In the former, the pipes run under the foundation of the tank, and end above the level of the water. The outer knee-jointed pipes frequently interfere seriously with the movements of the bell, and wear out the crown sheets; while those laid beneath the masonry of the tank can be neither examined nor repaired. Moreover, when a holder is enlarged by the addition of a second or a third lift, the employment of exterior pipes is out of the question; consequently the diameter of those inside has to be increased. It then becomes necessary

COAL TAR FOR ROAD MAKING.

At a Meeting of the Society of Engineers (Incorporated), held at Caxton Hall, Westminster, last night, Mr. R. O. WYNNE-ROBERTS, M.Inst.C.E., read a paper on "Up-to-Date Roads;" and, in the course of it, he dealt as follows with the subject of binders.

There are many bituminous compounds on the market for the purpose of binding together the road-metal, and thus largely reducing the inter-attrition caused by traffic on macadam. The author does not propose to deal with the different commercial binders individually; but as they consist mainly of coal tar, either with or without other ingredients, it will suffice if this commodity alone is dealt with.

Coal tar is one of the most complex mixtures which chemists have had to investigate; and though it has been under examination for upwards of fifty years, new discoveries are continually being made. From the road engineer's point of view, however, this liquid has probably been sufficiently investigated to indicate under what conditions it is best suited for road works. As by far the largest quantity of tar used on roads is obtained directly or indirectly from different gas-works, it is necessary to point out that as the coals, methods of carbonization, and other important factors, differ, so does the quality of the tar vary. Even when the same coal is consumed, it is remarkable how the variation in the quantity of coal charged into each retort, different temperatures, &c., will produce tar of a different character. It is therefore of the utmost importance that road engineers should understand how this product is manufactured before they can apply the same with any reasonable assurance of success.

After giving a succinct description of the process of gas manufacture and the production of the bye-product tar, Mr. Wynne-Roberts proceeded: There are a large number of coking-ovens in operation where the bye-product tar is recovered; and the rapidly increased number of such coking-ovens erected in this country will result in the production of a large quantity of tar. Although there are many points of interest to road engineers in this connection, the author must confine his observations to gas-works tar.

As the temperature of the furnaces and flues is not maintained at the same pyrometric level at all gas-works, the tar must differ. The high heats maintained at the larger gas-works under certain conditions produce tars of great density; while at country gas-works, as the temperature is somewhat lower, this product is less viscous. The practice, which was almost universal until recently, of partially filling the retorts with coal, is now changing into fuller charges; and this has a great influence on the composition of the tar. Furthermore, vertical, "slopers," and chamber retorts are being extensively adopted at the larger gas-works, with the result that the molecular arrangements of the constituents of the tar are altered. In fact, there is every prospect that the tar produced at most of the larger gas-works will soon be altered in composition, by increasing the charges of coal, and by installing other forms of retorts.

Thick, crude tar is not a positive proof of its quality as a binder; for, on the one hand, it is more retentive of moisture, and, on the other, it has in all probability a high percentage of free carbon, neither of which is beneficial to the binding properties of the tar. The separation of the water from tar is not an easy matter. Some of the tars produced in the Metropolis, for instance, are sponge-like in their retentive powers. The question of effective dehydration is an important one to road engineers, because water acts as a deterrent against the efficient adhesion of the tar to macadam, since there is a greater affinity between stone and water than between stone and tar.

It is often found, when boiling crude tar in ordinary kettles, that it is liable to boil over and ignite. As this is almost entirely due to the presence of water, it is important that moisture should be eliminated as far as possible. At some gas-works, the tar is heated by steam-coils, which reduces its viscosity, and causes the water to rise more quickly to the surface to be drained away. All tars should be heated before being applied on the roads. Care must be taken, however, not to raise the temperature of crude tar above 150° Fahr., or it will be liable to froth over. If the above temperature is maintained for about two hours, most of the moisture will be driven off.

As free carbon has no binding value, and is liable to be converted into black dust or mud, it follows that tars containing the smallest percentage will be superior for road work. The selection of tar can only be made by separating the products from different points; that condensed in the hydraulic main being usually the most heavily charged with free carbon. At present, the tars from all parts are drained to one point; and consequently selection is impossible. This, however, will doubtless be changed as road engineers become more acquainted with the virtues and defects of this product.

Tar also contains a considerable quantity of light oil and naphtha, which act like diluents; and unless they are extracted, they volatilize on the road surface, leaving a skin which is not as durable as it might otherwise be. If it happens to rain immediately after the road surface is tarred, the oils are apt to emulsify and be washed into the gutters, and ultimately into the water-courses. Boiling tar in ordinary cauldrons will not drive out the light oil, &c., as it is not possible to raise the temperature sufficiently high without causing it to overflow. These constituents

can be extracted only by distillation; and this means the provision of suitable stills, &c. Distillation of tar is a comparatively simple process. The author nearly 25 years ago erected a 3-ton plant, which has been worked by ordinary workmen without any serious mishap.

Having shortly described the process of distilling tar, the author said: Owing to the variability of the quality of crude tar, its use, without prolonged boiling, cannot be recommended; and even then it is not equal in durability and uniformity of results to that obtained by the use of refined or distilled tars. Proprietary tars consist mainly of refined or distilled tars, with the addition of other ingredients. Inasmuch as refined or distilled tar is not obtainable at most gas-works, there is good reason for road engineers to erect either stationary or portable distilling plants, the cost of which will necessarily vary according to their capacities. As the use of tar on roads is of recent development, the number of distilling apparatus installed by local authorities is at present limited; but, with more intimate knowledge, gained by experience, engineers will be able to stipulate the more essential requirements as to the quality of tar. The adoption of such distilling plants will doubtless become more general in the immediate future.

It is possible to design a portable distilling apparatus which can be operated by an intelligent workman, on any convenient point of the roadside, to produce refined or distilled tar of a uniform quality to conform with any workable standard or specification. Such an apparatus would be useful, as effective boiling could be carried on with economy and the minimum of risk, and the tar would be ready for use in the manufacture of tar macadam, tar-sand grout, tar-chip grout, or for tarring road surfaces. The author has designed such a plant.

The most satisfactory methods of testing tar must necessarily be those employed by analytical chemists in their well-equipped laboratories, together with more or less prolonged observations of the effects of climate and traffic. The more essential tests as to the quality of tar are: (1) Specific gravity; (2) viscosity; (3) percentage of free carbon; (4) adhesion; (5) percentage of moisture; (6) loss by evaporation; (7) loss by fractional distillation; (8) percentage of fixed carbon. The usual tests are much too elaborate and tedious for use by road engineers. There are, however, some simple ones which can be employed by them to obtain sufficiently reliable working comparisons; and these are applicable for the first five of the list.

Specific Gravity can be ascertained by means of a Twaddell hydrometer, which, for convenience, should have the degrees and specific gravity figures clearly marked. This instrument, when immersed in the tar, sinks to a depth according to the density of the liquid. Refined tar should have a density of about 50° Tw., or 1.250 sp. gr. To convert Twaddell degrees into specific gravity—let Tw. be the number of degrees Twaddell, then specific gravity = $\text{Tw.} \times 0.005 + 1$. For example, 50° Tw. = $50 \times 0.005 + 1 = 1.250$ specific gravity.

Viscosity.—The hydrometer can be used to ascertain the viscosity of tar. This instrument should be first immersed as far as 50 Tw., or 1.250 sp. gr., and taken out to drain for two or three minutes. Then, with a seconds watch in view, the hydrometer should be allowed to sink into the tar, and the time it takes to subside to the above-mentioned point noted. This should be done two or three times and mean results taken.

Free Carbon.—The same hydrometer can also be used to ascertain with approximate accuracy the percentage of free carbon contained in a tar. Mr. Warnes, an eminent authority on tar distillation in this country, has prepared a formula which is applicable for Midland and probably other tars.

For Twaddell degrees, free carbon = $0.8N - 10$.

N = number of degrees.

If specific gravity only is shown on the hydrometer, then

Sp. gr. — $1.000 \times 160 - 10$ = percentage of free carbon.

The percentage of free carbon in crude tar should not exceed 25.

Adhesion.—No instrument has yet been devised to ascertain satisfactorily the adhesive quality of tar compounds. Tests for ductility are easy and simple; but as the action of the traffic on macadam is that of impact, tending to separate the stones from each other, ductility does not constitute a factor of prime importance. It must, however, be regarded as of some value. The author is investigating the question of a satisfactory test for adhesion, and hopes shortly to bring out an instrument for ascertaining the comparative adhesive qualities of various tars.

Moisture.—There should not be any moisture either in refined or distilled tar; but when crude tar is employed, a simple test for ascertaining if the moisture has been driven out by boiling is that suggested by Dr. Rideal—namely, by placing a cold glass plate over the cauldron. If any steam is being evolved, it will condense on the plate.

There are three methods in which tar is used on road works: (1) Tarring the surface, (2) mixing with macadam, (3) grouting the macadam *in situ*. Each of these has its advocates.

Tarring.—To ensure good results, the road should be dry, not only on the surface, but also for a depth of 2 or 3 inches. A dry, warm surface will facilitate the distribution and absorption of the tar. The road surface should be in good condition, even, and free from pot-holes. Newer surfaces are preferable to older ones, as the interstices are not so closely filled in. Any dust and dirt should be thoroughly swept off the surface, and the joints between the macadam exposed. The tar should be heated to 150° Fahr., and, if crude, boiled for about two hours, and applied hot. Δ

grit, chippings, or sand is used, it should be frugally spread, and the surplus be removed as soon as possible. The tar should be allowed ample time to soak into the road-surface before applying the sand, &c. It is, however, a debatable question whether any sanding should be done at all, except in the neighbourhood of houses; for this practice tends to retain the tar on the surface, instead of allowing it to percolate into the joints.

Tarring by hand is under better control as to heating, distribution, and percolation than machine spraying, because the area treated is smaller, and more attention can be given to the work by the roadmen. This process is, however, a slow one; and as our climate is somewhat erratic, road engineers desire to avail themselves of short spells of dry weather in tarring as large an area as possible. The distribution of tar under pressure causes the liquid to be atomized, in which condition it must, in the author's opinion, be rapidly reduced in temperature, and thus render the tar more viscous than is desirable.

The advantages of tarring road surfaces are so manifest that they need not here be referred to. There are also certain disadvantages. The surfaces are liable to become slippery; and in the autumn, greasy black mud is produced. Furthermore, when crude tar is used, as already explained, there is danger of polluting watercourses and streams. The economy of tarring roads is generally an appreciable one. Less watering is required, the macadamized surface is more durable, and the public experience greater comfort.

Tar Macadam.—There is a closer affinity between tar and limestone than between it and granite. The former appears to absorb the tar more readily, and to adhere more firmly. Granite, if dry and carefully mixed with tar, will, however, make an excellent road material. Refined, distilled, or prepared tars only should be used for the purpose of tar macadam; and, after mixing, it is advisable to allow the same to mature for several days. The quantity of tar required per cubic yard of macadam will vary, according to the texture and porosity of the stone used.

As slag is used in the manufacture of "tarmac," it might be inferred that, owing to the inherent variability of its quality, due to the different proportions of materials used at iron-works, its durability as a road material would be inferior to natural stone. Doubtless this is the case, in some measure; yet, as a rule, its employment when mixed with tar gives satisfaction. The author has observed that even ordinary cinders mixed with well-boiled crude tar will stand considerable traffic; but the blows caused by the unloading of carts on the pavement resulted in the formation of depressions. When this pavement was taken up, the material was found to be exceedingly tough and difficult to remove. The results of boiling cinders and stone in tar are remarkable; but space will not permit dealing with this matter.

Grouting.—Refined, distilled, or prepared tars mixed with hot, dry sand form an excellent bituminous grouting. The City Engineer of Liverpool has used a similar grout with satisfactory results. In this case, the labour of mixing macadam and tar is obviated. The dry macadam is rolled to an even surface, the grout is poured on the top, and worked into the interstices by brooms and squeegees. The steam-roller is run over the grouted macadam, and the whole fabric consolidated, forming an impervious, durable, and smooth roadway.

Association of Gas and Water Engineers of Austria-Hungary.

The "Zeitschrift" of this Association for the 15th inst. announces that this year's meeting of the Association will be held at Innsbruck from May 26 to 29, under the presidency of Professor A. Friedrich, of Vienna. There will be a reception on the evening of May 26, followed by a concert; and on the following day technical papers will be read and discussed in the morning. In the afternoon, there will be a visit to the Corporation electricity works of Innsbruck, to be followed in the evening by a military concert. On Saturday May 28, the morning will be again devoted to technical papers, and the afternoon to a visit to the Corporation gas-works, to be followed by a short excursion; and in the evening there will be a banquet at the Hotel Tirol. It would have been seen from the translation in last week's "JOURNAL" of a paper by Herr O. Peischer, the Manager of the gas-works, that the carbonizing plant there now consists exclusively of horizontal carbonizing chambers or ovens on the Koppers system. The meeting will conclude with an excursion on the Sunday to Bregenz. The Tyrolean Aeronautical Society have arranged to fill a new balloon of 78,000 cubic feet capacity at the Innsbruck gas-works early on the morning of the Friday or Saturday; so that those attending the meeting may witness the process of filling and the ascent. The meeting has been arranged for the dates named with a view to enabling members attending the meeting of the Association of Bavarian Gas and Water Engineers at Regensburg, on May 22 to 24, to travel direct from the latter place to Innsbruck.

At the annual general meeting of the Institution of Civil Engineers last Tuesday evening, the result of the ballot for the election of officers was declared as follows: President, Mr. Alexander Siemens. Vice-Presidents, Dr. W. C. Unwin, Mr. R. Elliott-Cooper, Mr. Antony G. Lyster, and Mr. Cuthbert A. Brereton. Among the other members of Council, we notice the following: Mr. William B. Bryan, Mr. E. B. Ellington, Mr. Maurice Fitzmaurice, C.M.G., Mr. Walter Hunter, and Mr. Harry E. Jones. The Council take office the first Tuesday in November next.

PARLIAMENTARY INTELLIGENCE.

MIDDLESBROUGH GAS BILL.

Local Legislation Committee.—Wednesday, April 27.

(Before Sir FRANCIS LAYLAND-BARRATT, Chairman, Sir WILLIAM PRIESTLEY, Mr. GOLDSMITH, Mr. HELME, Mr. FLETCHER, and Mr. ROCH.)

This is a Bill promoted by the Middlesbrough Corporation, Part II. of which deals with gas and electricity matters.

Mr. JEEVES, who appeared for the promoters, said they proposed that the illuminating power of the gas should be reduced to 12 candles. When the question of the reduction of the illuminating power was considered by Committees of the House, the practice generally was to make a reduction from 17, 18, 19, or 20 candles to 14 candles. In this case, they were asking for a reduction of 3 candles. From 1868 to 1898, the gas supplied was of 12-candle power; but this was raised to 15 candles. With the now general practice of incandescent lighting, there was no reason why they should not be given power to supply at 12 candles. If this authority were given, it would be in the interests of consumers of gas, because the Corporation would be able to manufacture more cheaply. The supply given would be of 3 per cent. less illuminating power at a considerably cheaper rate. At present, the gas was practically being supplied at cost price; and the policy of the Corporation had been to give a large measure of any benefit there might be in the reduction of the cost of gas to the consumer. For heating, the lower candle power was as effective as the higher one.

Mr. David Terrace, the Gas Manager to the Corporation, then gave evidence. He said a great number of houses were occupied by the working classes; and the Corporation wished to extend the prepayment meter system. Tests had been made with 12 and 15 candle power gas with incandescent fittings; and it was found that the former gave 64.66-candle light and the latter 64.2. With 12-candle power gas, they would be able to produce more cheaply than with the present 15-candle power. It was felt that the change would be in the interests of everybody, and that to supply 15-candle power gas was pursuing a course of extravagance. The price charged was 2s. 2d. per 1000 cubic feet for all meters.

Mr. JEEVES admitted that there was no precedent; but the circumstances were peculiar, in so far as they had originally supplied 12-candle power gas.

Mr. J. Calvert, a colliery owner, said that it had been proved that they could reduce gas till it had no luminosity in the shape of candle power and still, by an incandescent burner, give a considerable candle power light. Their contention was that reducing the candle power, while it took a little from the light, did not destroy the calorific value of the gas, but, indeed, improved it, because they found in Middlesbrough that when the carburetted water gas mixed with the coal gas there was lack of uniformity in the calorific value. They could not store carburetted water gas in the gasholders mixed uniformly with the coal gas. If the consumers could get uniformity of calorific value, it was better for a gas-cooker and gas-engine than intermittent calorific value; and they thought that if they could reduce the price of gas to the consumer they could, among other things, obtain a largely increased use of gas-stoves in the houses. In Middlesbrough they were peculiarly placed with regard to the Durham coalfield. The Metropolitan supply of gas was made chiefly from Durham coal. The coal that they got in the Metropolitan was largely that which was produced in Mid and North Durham. The coal produced in the South Durham district was 1s. a ton nearer to Middlesbrough than the highly bituminous coal that was used in the Metropolitan. While the coal from North Durham gave a higher illuminating power and a similar calorific value, that from South Durham gave as good a calorific value, though of slightly less illuminating power. If they had a lower candle standard in Middlesbrough—say, 12 candles—they could employ cheaper coal by 1s. per ton in the carriage alone, and produce, through the use of the incandescent burner, the same luminosity to the consumer, with a more uniform calorific value for power purposes. The Company's annual production of gas was 500 million cubic feet. Against the loss of something less than 4d. per 1000 cubic feet in the light, there would be a saving of 2d. to 3d. in the cost of manufacture. For heating purposes, the consumer would get the benefit of the reduction, with practically no reduction in the heating value of the gas. As the cost was reduced, it was the intention to correspondingly reduce the price charged. The Corporation would have to educate the very poor to the use of the incandescent burner. Through prepayment meters they were supplying 26 cubic feet of gas for a penny.

The Committee decided that, under the special circumstances, they would grant the powers asked for.

Mr. JEEVES, with regard to a clause providing that the consumers of gas should give 48 hours' notice to the Corporation before removing, said it was found that the usual 24 hours' notice was not sufficient in this case, and that 48 hours was not unreasonable.

After a short discussion, the Committee inserted "24" for "48." Considerable discussion arose upon a new clause which provided that, with regard to the sale of coke from a vehicle in the street, it must be sold in sacks, with a metal label affixed indicating the correct weight therein.

Evidence having been given in support of the clause by the Chief Inspector of Weights and Measures of Middlesbrough,

The CHAIRMAN said he thought a case had been made out.

It was decided that the Board of Trade should be asked for their views upon the matter, and further discussion was postponed.

Thursday, April 28.

On the resumption of the proceedings this morning,

The CHAIRMAN remarked that, on the evidence, they were very much impressed with the necessity to ensure the sale of coke by weight.

Major MacMahon, representing the Board of Trade, said that at the time of the passing of the Weights and Measures Act the question of

bringing coke into the same category as coal was thoroughly considered, and it was decided to omit coke from compulsory sale by weight. One reason for this was that the weight of a given volume of coke could be very much altered in making. According to experiments, the difference might be as much as 17 per cent.; while others pronounced it to be 30 per cent. It would not be possible to say by inspection that a particular piece of coke had been damped. It would be a good thing for the Local Authority to make bye-laws and regulations in regard to the sale by weight. If, in order to protect the very poor, it was thought necessary to make it compulsory to sell coke by weight or by measure, the Board were of opinion that it should be made the subject of a General Act and not of a Local Act.

Mr. FITZGERALD said they were only seeking to prevent a particular kind of bad fraud on poor people.

The CHAIRMAN remarked that what the Committee had in mind was that there was a lot of fraud carried on. In Middlesbrough a very large amount of coke was used by the poorer classes. If they had to wait for general legislation, what protection were these poor people to have?

Witness pointed out that if a customer were to ask for a definite weight and the hawker pretended to give that weight, he would come under any particular regulations that the Middlesbrough Corporation might frame. Witness further remarked that it was not unusual to sell coke by measure, because a special 4-bushel measure was created for the gas companies.

Eventually the clause was granted and inserted in the Bill in the following form:

(1) Every person who shall sell or offer for sale coke from any vehicle in any street shall sell the same, or offer the same for sale, in sacks with a metal label affixed to the top of every such sack indicating the correct legal weight or measure of coke therein.

(2) Any purchaser of coke from any vehicle in any street, and any inspector of weights and measures or other officer appointed by the Corporation, may require that any coke sold or offered for sale as aforesaid be weighed or re-weighed, or measured or re-measured, by any instrument or measure stamped by an inspector of weights and measures. Provided

(a) No seller of coke, or person in charge of a vehicle in which coke is carried, shall be required under this section to carry coke beyond such distance not exceeding half-a-mile as may be prescribed in that behalf by the Corporation.

(b) Where any such coke has at the instance of the purchaser been weighed or re-weighed, or measured or re-measured, in pursuance of the section and found to be of the weight or measure stated in that behalf by the seller of the coke or the person in charge of the vehicle, the purchaser shall be liable to the payment of all reasonable costs actually incurred and incidental to the weighing or re-weighing, measuring or re-measuring.

(c) If the owner or any person in charge of any vehicle from which coke is being sold, or offered for sale, in any street wilfully makes any false statement as to the weight or measure of the coke in any sack, or wilfully increases such weight by damping such coke, or wilfully does any other act by which the purchaser of the coke shall be defrauded, or fails to comply with the other provisions of this section, or obstructs any weighing or re-weighing, measuring or re-measuring, authorized by this section, he shall be liable for every such offence to a penalty not exceeding five pounds.

The Bill was ordered to be reported.

RHONDDA DISTRICT COUNCIL BILL.

The Local Legislation Committee of the House of Commons, presided over by Sir FRANCIS LAYLAND-BARRATT, had the above Bill under consideration last week. The only point of interest relating to gas is contained in the following clause:

Notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or any other Act, a person shall not be entitled to demand from the Council a supply, or the continuance of a supply, of gas for premises having a supply of gas or electricity from an installation other than that of the Council, unless he shall have previously agreed to pay the Council such minimum annual sum as will give to them a reasonable return on the capital expenditure and standing charges incurred by them to meet the possible maximum demand for those premises, and the minimum annual sum to be so paid shall be determined, in default of agreement, by arbitration in manner provided by the Arbitration Act, 1889.

Mr. BOYCE, who appeared for the Local Government Board, pointed out that this was an exceptional clause in regard to the supply of gas; but clauses on the subject were allowed by the Local Legislation Committee in the Mountain Ash Bill and the Heywood Corporation Bill of last session. The words "or electricity" were not contained in the Mountain Ash clause, and the provisions allowed in the Heywood case differed materially from those of the clause.

Mr. JOHNSON, representing Messrs. Torr and Co. (the Parliamentary Agents for the Bill), said they would take out the words "or electricity."

The CHAIRMAN remarked that the matter had been thrashed out, and inserted the clause in the Bill.

UNOPPOSED PRIVATE BILLS.

(Before Mr. ALFRED EMMOTT, Chairman, Mr. WHITLEY, Mr. MOON, Mr. MOONEY, and Mr. VIVIAN.)

The Unopposed Bills Committee of the House of Commons, constituted as above, had before them last week the following Bills.

Bristol Gas Bill.

This is a Bill which proposes to raise additional capital to the amount of £400,000 by the creation and issue of further nominal sums of general capital stock with a dividend limited to 5 per cent. per annum.

Mr. BROWN (on behalf of Messrs. Dyson and Co., the Parliamentary Agents) pointed out that the auction clauses were applied to the issue both of the general capital stock and the new debenture stock. The

quality of the gas was to be 14 candles; and the burner to be used was the No. 2 "Metropolitan" argand.

Mr. John Phillips, the Secretary of the Company, said the present capital was £1,500,000. Since obtaining their last Act, the expenditure had been about £40,000 per annum.

A good deal of discussion arose upon clause 19 of the Bill, which provides as follows:

Whenever any gas shall escape from any pipe or fitting laid down or set up by, or belonging to, any consumer, and situate between the boundary of his premises and the meter of such premises, or between such meter of the consumer, such consumer shall forthwith, after receiving notice thereof in writing from the Company, prevent such gas from escaping; and in case any consumer shall not within thirty-six hours next after service of such notice effectually prevent the gas from escaping, it shall be lawful for the Company to cut off and discontinue the supply of gas to the premises of such consumer and recover the expenses of such cutting off and discontinuance, together with any moneys due from such customer to the Company, and the costs of such recovery, in the same manner as damages for the recovery of which no special provision is made, are recoverable under the "Gas-Works Clauses Act, 1847."

Mr. BROWN, replying to the CHAIRMAN, said the pipe was the property of the consumer. He paid for it, and, presumably, it was his property. It was not imposing any new obligation on the consumer, occupier, or owner. It simply provided that the consumer was now bound to repair the service-pipe. The pipe was his property; and he must not have it in such a condition as to cause a nuisance to his neighbours. If he did not now do his duty, the Company would cut off his gas.

Mr. MOONEY pointed out that this was going to be an alteration of the general law.

Mr. BROWN contended that it was a more effective remedy for making sure that the general law was given effect to.

Mr. MOONEY: I think if the clause comes in it is going to be a precedent for every other Gas Bill that comes before the House.

The CHAIRMAN said the question was whether the matter was one of such importance that the Committee ought to go out of their way to alter the general law.

Witness said the Company had had about half-a-dozen cases in which there had been escapes; and in some of the cases other consumers had been injured.

Mr. BROWN pointed out that the clause matter was also under the consideration of the Local Government Board; and he thought the Committee might defer their decision until the views of the Board were made known.

The CHAIRMAN said he would not agree to this. This was a year when he did not want to put off Bills to wait for a report.

Ultimately, the Committee decided not to allow the clause.

A discussion also arose upon clause 24, which provides:

In any case in which, in consequence of any default on the part of the occupier of any premises, the Company shall have cut off or discontinued the supply of gas to such premises (whether under the existing powers of the Company or under the powers conferred by this Act), and the occupier so in default shall desire to resume such supply, he shall pay to the Company the expenses of re-connecting the supply, and the Company shall not be under any obligation to supply gas to such occupier until he shall have paid such expenses.

Mr. BROWN, in reply to the CHAIRMAN, said there were many cases where people had refused to pay their gas-rents, and it had become necessary in houses of a substantial character to cut off the supply in order to force the consumer to pay. But having cut it off, they had had to reinstate it and incur other expenses; and they wanted to make it clear that if the consumer desired re-connection he must pay.

The Committee struck out the words "or discontinued," and allowed the clause to stand part of the Bill.

The various other clauses having been adjusted, the Bill was ordered to be reported.

Gowerton Gas Bill.

Mr. BAKER, the Agent for the Bill, very briefly stated its objects. It was proposed to incorporate the Company and dissolve the limited Company who had constructed works and were now giving a supply.

The various amendments, which were of a small nature, having been made, the Bill was ordered to be reported.

Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill.

The portion of this Bill dealing with gas matters was passed at a meeting of the Committee a week ago (*ante*, p. 249); but their decision with regard to the electricity proposals was deferred, in order that they might learn the opinion of the new Bishop's Stortford Council as to the electricity undertaking being in the hands of the Gas Company.

The Clerk to the Council now produced a resolution which the previous Council had passed and one passed at a meeting held recently, which was carried by a majority of one—three members not voting.

The Committee now agreed that the electricity proposals should pass, and ordered the Bill to be reported.

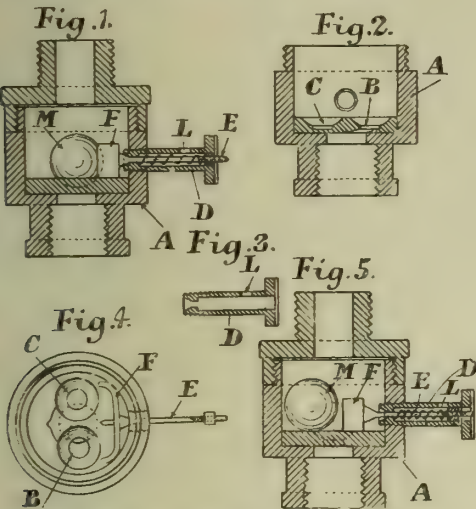
Camberwell Public Lighting.—At the meeting of the Camberwell Borough Council last Wednesday, Mr. William Oxtoby, the Borough Engineer, reported that up to Lady Day the following conversions of street-lamps to inverted burners had been made: Single, 633; twin, 76; triple, 16. The public lamps authorized to be altered, but remaining unconverted, numbered 465; while the number of No. 2 burner lamps not authorized to be converted numbered 3111. In regard to the last-mentioned, the South Metropolitan Gas Company, in submitting their proposals for conversion, stated that experiments were being made with an inverted burner to take the place of the existing No. 2; and pending the satisfactory issue of this experiment, the Council decided to defer consideration of the conversion of that class of burner. The 254 public lamps supplied by the South Suburban Gas Company are not affected by the present conversion scheme.

REGISTER OF PATENTS.

Lighting and Extinguishing Gas-Lamps.

GIORGI, A., of Florence, Italy.
No. 7522 ; March 29, 1909.

This invention relates to gas-lamp lighters and extinguishers of the kind referred to in patent No. 27,297 of 1904—a casing adapted to be screwed on to the gas service pipe and to receive the burner fitting ; a ball being struck by the armature of an electro-magnet within the casing so as to close in one position the passage to the burner, and in the other position the passage to an electric igniter. In that arrangement, however, the ball-valve could not be operated from outside the casing. But in the present apparatus, the ball which closes the gas-passage to the burner is designed to be moved from its open or closed position by a striker when force is applied to it outside the apparatus, while at the same time the striker opens a passage for the gas to a lighting device while the pressure on the striker continues.



Giorgi's Lamp Lighter and Extinguisher.

Fig. 1 is a vertical section of the apparatus. Fig. 2 shows more particularly the seats for the ball. Fig. 3 is a sectional view of a tube which forms the passage to the flash lighting device. Fig. 4 is a plan of the casing and striker. Fig. 5 is similar to fig. 1, but shows the ball midway in its travel between the two seats, after being struck.

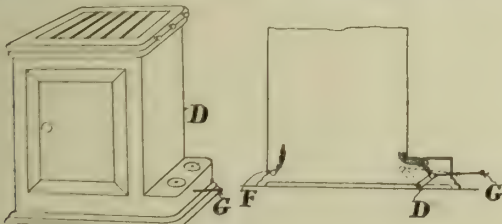
On the floor of the casing A are two seats B C ; B being in direct communication with the gas supply, while C has no communication whatever—the ball M, of necessity, always resting on one or other of the seats. In the side of the casing is screwed a short tube D, in which works a spring push-rod E carrying a striker F, so formed that it will move the ball from either seat to the other. The inner end of the push-rod forms a valve whereby gas is admitted into the tube D so long as pressure is applied to the push-rod ; the said tube being in communication through the hole L with the flash lighting device. The outer end of the rod E carries a ring or piston, which slides inside the tube and serves to prevent the escape of gas and to compress a spring which tends to keep the valve closed.

The operation is as follows : Suppose the ball to be closing the passage B to the gas supply, if the push-rod E is struck, the ball will be knocked on to the seat C, and gas will pass to the burner. At the same time, so long as pressure is continued to be applied to the push-rod the gas will pass to the lighting device through the tube D which communicates with it. When it is required to extinguish the light, the striker F is again operated, when the ball will be knocked back on to the seat B communicating with the gas supply.

Gas-Stoves.

CALVERT, G., of Stoke Newington, N.
No. 7710 ; March 31, 1909.

This invention relates to gas-ovens wherein a burner placed within a projection forming part of the oven, performs the dual function of heating the interior of the oven and a portion of the exterior casing projecting from it, and upon which cooking vessels may be placed.



Calvert's Gas-Stove.

The gas-burner within the pocket is so movably mounted as to permit of transference partially or wholly from the interior of the pocket to the interior of the oven, or the reverse, and permits of the heat being directly utilized in the oven when the pocket is not required for the purpose specified.

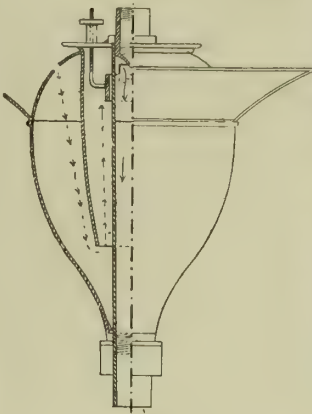
In the arrangement shown, the extension of the oven casing has an

atmospheric burner, pivotally mounted at D and with a rod G for moving it. On the opposite side of the oven is the usual fixed burner F.

Inverted Incandescent Gas-Burner.

EDE, E. P., of Highbury, N., and KEMPTON, C. H., of South Lambeth Road, S.W.
No. 7711 ; March 31, 1909.

The gas-nipple and bunsen tube of this inverted burner are enclosed in a cylinder covered by a closed outer shell or casing having primary air holes in its top through which the air passes—"causing it to be superheated by contact with the hot outer casing before mixing with the gas, whereby greater efficiency is obtained, and through the downward and upward course which the air has to travel the back-lighting of the gas is prevented."



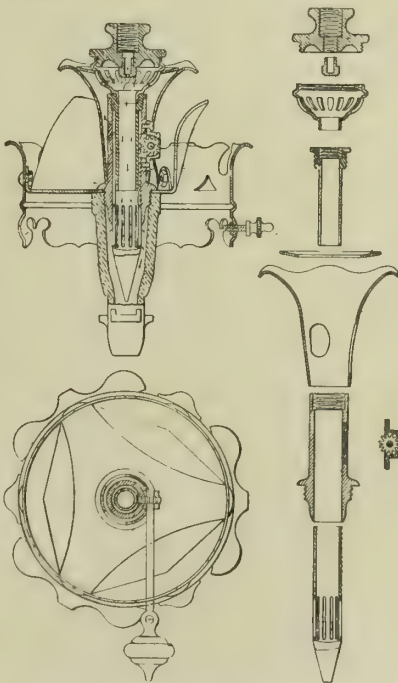
Ede and Kempton's Inverted Incandescent Burner.

The burner contains (as shown) an inner cylinder attached to the top of the outer casing by a plate, in the centre of which is a hole, through which the gas supply is carried to the nipple. Attached to the burner is a bunsen tube containing secondary air holes ; the tube passing through the centre of the cylinder and out through an opening at the bottom into the mantle-holder to which it is fixed. The air to mix with the gas passes through the primary air holes in the top of the outer shell or casing, and travels down the space between the inside wall of the outer shell or casing and the outer wall of the inner cylinder, where, during its progress, it is superheated by contact with the inside of the hot outer shell or casing, and is then sucked up through the open end of the inner cylinder, and drawn into the bunsen tube through the secondary air holes, by the gas, and passes with it down the bunsen tube to the point of combustion.

Inverted Incandescent Gas-Burners.

DARWIN, H., of Birmingham.
No. 12,546 ; May 27, 1909.

This invention has for its object to provide a construction of burner in which the ordinary air and gas regulators at the upper end of the induction tube are dispensed with, and which is provided with simple and self-contained, but efficient, means for regulating or controlling the proportions of gas and air in the combustible mixture according to requirements, so as to enable the user to adjust or correct the mixture so as to obtain "perfect combustion" and the best possible results with a gas of any particular character or richness, and according to the locality in which the burner is used. The regulator forms part of the burner itself, and is arranged within the mixing-chamber, between the air inlets and the burner-nozzle ; the construction and action being such that as the regulator is opened or closed more or less, so more or less air is automatically drawn into the mixing chamber along with a constant known quantity of gas.



Darwin's Regulating Inverted Burner.

As shown, the burner comprises an induction tube having attached to its upper end an intake chamber (having slits or apertures through which the air necessary for forming the combustible mixture is drawn) screwed on to the gas inlet or nozzle fitting through which a constant known quantity of gas passes. Surrounding the induction tube, but separated from it by an annular space, is a concentric outer sleeve

whose upper end is screwed on to an external collar or enlargement of the induction tube, while its lower end is screwed into the upper end of a mixing and expansion chamber wherein the combustible mixture is formed. The jacket or casing has air apertures surrounding the sleeve and closed at its top by a plate. The incoming air is thus drawn into the jacket through the apertures, and thence passes into the intake chamber.

The regulating device consists of a sliding sleeve arranged within the annular space between the outer sleeve and the induction tube, so as to telescope over and be vertically adjustable upon the latter. The lower end of the regulator sleeve is closed by a tapering needle or conical head which (conforming generally to the contour of the inside of the mixing-chamber) gradually contracts internally towards the nozzle or outlet. Immediately above the conical end the walls of the sleeve are slotted vertically; the slits being arranged to be more or less uncovered by the lower end of the outer sleeve (which acts as a shutter) by the sliding or telescopic action of the regulator. This action is effected by rack-and-pinion mechanism.

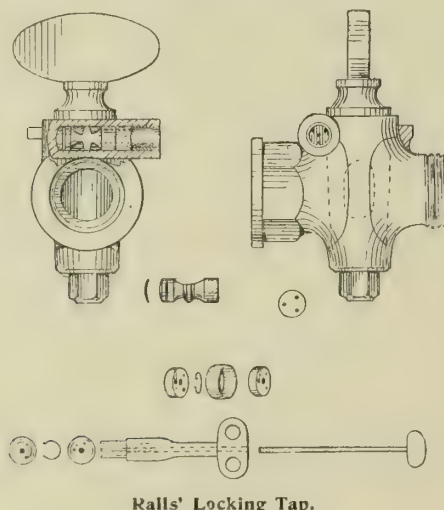
When the slotted regulator sleeve is fully raised, only the extreme lower ends of the slots are uncovered, with the result that only undiluted gas passes through, as its velocity is not sufficient to draw in any air; but by gradually lowering the regulator sleeve by the rack-and-pinion mechanism, the slots are uncovered to a greater extent, whereby the velocity of the known constant quantity of gas passing through it is increased. This causes the correct quantity of air for forming the combustible mixture to be automatically drawn into the mixing-chamber along with the gas; the mixture being formed in the chamber and thence passing to the burner-nozzle. As the regulator is further lowered, so more and more air is automatically taken in—due to the increased velocity of the gas. "The mixture can thus be accurately adjusted by the user to suit the particular richness or character of the gas being used."

Locking Gas or Other Cocks to Prevent their Unauthorized Use.

RALLS, J. C., of Sheffield.

No. 10,358; May 1, 1909.

This invention consists in casting a lug on the plug-box, either projecting at right angles to the diameter of the box or tangentially to its circumference. The lug is bored out and screw-tapped for a portion of its length to take a locking screw plug; but for its whole length, when a central locking flanged plug is used, the remainder of the bore of the lug is left plain. Into the outer end of it is fixed a piece of tube with a space between the screwed part of the lug and the tube to take a loose die to protect the locking plug from being picked.



Ralls' Locking Tap.

The locking screw plug referred to consists (as shown) of a screw working in the tapped part of the lug, and having at its front end a reduced straight or taper locking pin or nozzle. The central locking flanged plug consists of a stationary plug turned and recessed to form a locking flange, a portion of which is cut away for the unlocked position and drilled with holes as in the screw plug and loose protecting die. The back or outer end of the locking plug is drilled with (preferably) three, five, or seven holes to correspond with the number of pin projections on the end of the key. In the plain space between the screw plug and retaining tube, a loose protecting die is introduced, drilled with holes to correspond with the number in the locking plug, through which the key pins pass before finding and entering the holes in the locking plug so as to operate it. The key to operate the locking plugs consists of a bow and stem, the end of which is provided with a number of pins to correspond with the holes in the locking plug.

Obtaining Bye-Products in the Dry-Distillation or Gasification of Fuel.

KOPPERS, H., of Essen-Ruhr, Germany.

No. 19,959; Aug. 31, 1909. Date claimed under International Convention, Sept. 1, 1908.

In the process described in patent No. 20,870 of 1904, a thin saline solution of fixed ammonia is separated with the tar before the gas enters the saturation apparatus, for the production of sulphate. Various methods were indicated for dealing with this solution; one method being to evaporate it, and conduct the vapour to the tar separator, or directly to the saturation apparatus. Another method was the treatment of the solution like ordinary gas liquor, for obtaining ammonia—

ordinarily consisting in introducing the liquor into a distilling column, where it is acted on by lime and steam. In patent No. 16,386 of 1905, the patentee also described a process wherein liquor separated by cooling is treated with lime and steam in distillation apparatus, for separating ammonia, which is then superheated and led into a bath.

As set forth in the first of the two earlier specifications mentioned, the treatment in the saturation bath takes place at a temperature sufficiently high to prevent condensation in the bath. It is, therefore, desirable to prevent unnecessary addition of water vapour to the gases before they enter the bath. It is clear, the patentee points out, that addition of water vapour does take place if the vapours generated in the distilling column, by treatment with lime and steam, are led into the saturation bath. Moreover, the precipitated liquor contains a considerable proportion of tarry constituents; and in the process of distillation, the greater part of these tarry bodies accompanies the ammonia. If the tarry constituents of the gas liquor pass with the vapours from the distilling column into the acid bath, they are for the most part separated there, and soil the bath and salt, and are themselves attacked by the acid.

The object of the present invention is to remove these disadvantages; and the invention consists in mixing the vapours from the distilling column with the crude gases which are not yet cooled and freed from tar. All the ammonia is thus led back to the gas without loss, while by the subsequent treatment of the gas current in the cooler and tar separator, the water added in the distilling column is condensed, and the tarry constituents derived from the gas liquor are retained. Pure gas is thus obtained, in which the proportion of water is solely determined by the saturation corresponding to the lowest temperature reached in the cooler. The state of superheating, including the requisite margin of safety, can consequently be obtained at a much lower temperature, so that the chemical conversion in the saturation bath can be effected at about 40° C. For the purpose of obtaining the ammonium salt as neutral as possible, this reduction of temperature is said to be highly important; and the efficiency of the process is increased with regard to the production of tar, since the constituents formerly forming impurities are also obtained—being separated with the bulk of the tar in the tar-separator.

Under certain conditions, it is sufficient to mix the distillation vapours with the gas in front of (or in) the tar-separator, where they are subjected to sufficient cooling.

The improvement described has a further effect: In the case of the hitherto used processes for obtaining sulphate of ammonium, discoloration of the ammonium salt by ferro-cyanide compounds it is known frequently occurs; these compounds being produced by the action of the constituents of the gas on the iron pipes, in the presence of water. In the process set forth in the first invention cited above, the occurrence of such compounds is excluded, inasmuch as, by reason of the superheating, the water is not present in the liquid state. But in the separate treatment of the gas liquor, it is possible that such ferro-cyanide compounds may occur, inasmuch as the vapours from the distilling column are themselves in a saturated, or only slightly superheated, state. Reduced external cooling of the conduit leading these vapours to the saturation bath may cause such compounds to occur; and they may then pass into the bath and discolour the salt. According to the present process, such ferro cyanide compounds are not introduced into the bath, but are carried away with the precipitate without deteriorating the salt.

Distilling Coal and Recovering Bye-Products.

RICHARDS, R. S., of Wraybury, and PRINGLE, R. W., of Richmond.

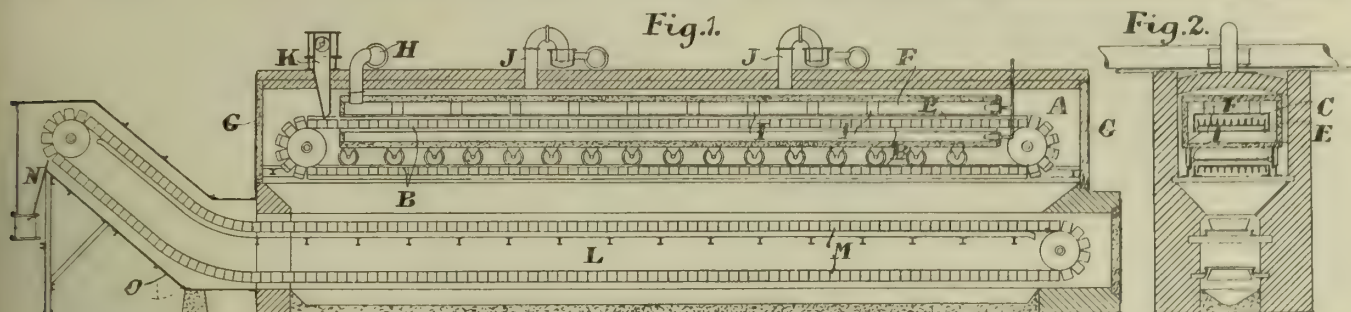
No. 15,643; July 5, 1909. No. 22,290; Sept. 30, 1909.

The complete specification of these combined patents was accepted on March 24 last. It points out that the proposal is to employ, in a form of muffle-furnace (horizontal or inclined), an endless conveyor, consisting of a continuous series of trays attached to chains, forming an endless band, caused to travel slowly by mechanical means. The upper stretch of the conveyor passes through a distilling chamber closely enveloping the band, and enveloped on all sides by heating flues; the arrangement being such that the upper stretch of the conveyor travels slowly through the distilling chamber surrounded by, or sandwiched between, flues, while on the return journey the conveyor does not pass through the distilling chamber—the whole apparatus at the same time being enclosed for the purpose of excluding air. The coal while it is on the conveyor is thus heated efficiently as it travels through the distilling chamber; but the band, on the other hand, is only subjected to the high temperature of the flue while passing through the distilling chamber.

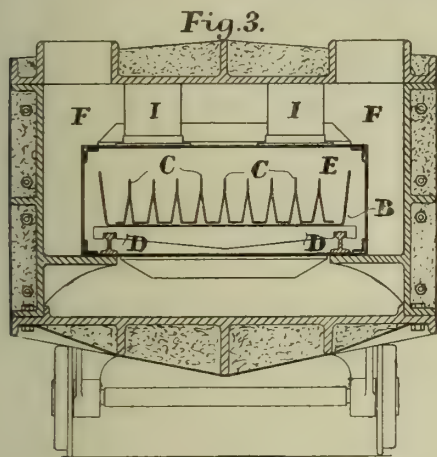
Fig. 1 (p. 321) is a longitudinal section of the apparatus, fig. 2 a cross section, and fig. 3 a section (on a larger scale) through the self-contained retort formed by the distilling chamber and its heating flues.

The upper chamber A of the structure has mounted in it an endless conveyor B, consisting of open-ended and open-topped trays divided into a transverse series of channel-shaped compartments by webs or plates C passing around chain wheels, and the links of which have lateral supporting arms D. The upper stretch of the conveyor passes through to the distilling chamber E, which has rails on which the arms D travel, and the under stretch of the conveyor returns outside the distilling chamber. This latter is enveloped by a heating flue F, which, together with the distilling chamber, forms a separate and independent structure (a self-contained retort) mounted on wheels and capable of being run into and out of the upper chamber upon rails. The ends of the chamber are provided for this purpose with doors or covers G, lined with refractory material. The distilling chamber and heating flue are constructed of boiler plate, and the outer walls of the heating flue are all lined with refractory material. The distilling chamber is heated by producer or other gas burnt in the enveloping flue F and admitted to burners at the far end of the flue.

With this arrangement, the material travelling through the chamber is subjected to a progressively increasing temperature as it proceeds. The waste heating gases pass away from the end of the flue F to a waste-heat main H, and can be utilized for generating steam for the gas-producer from which the burners are supplied, or for any other



Richards and Pringle's Coal-Distilling Apparatus.



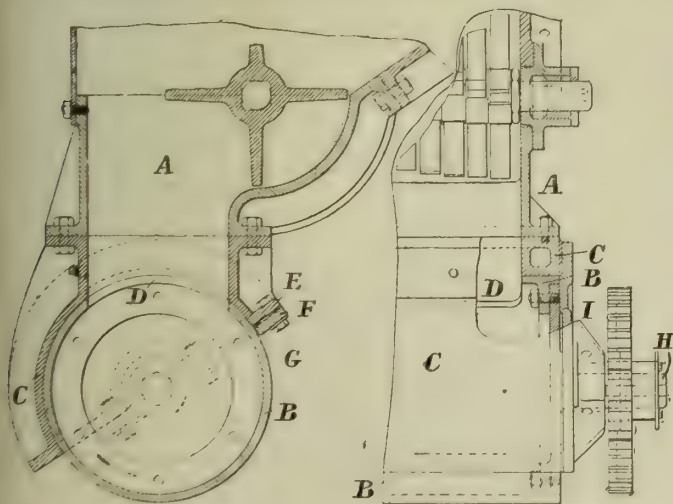
purpose. Pipes I open at intervals into the distilling chamber, and through the top of the enveloping flue F for the escape of the gases and distillation products, which are led away by rising pipes J from the top of the chamber A to hydraulic mains connected to foul mains. The coal is fed continuously to the trays of the conveyor by a hopper K, and the feed is regulated by a revolving drum arranged to prevent the access of air to the chamber A. The coal is supplied to the drum by a screw conveyor or other means. The upper chamber communicates with a lower cooling chamber L by a hopper-like passage the whole length of the upper chamber. M is an endless cooling band formed of open-ended and open-topped trays supported in its travel on rails. The material discharged from the endless conveyor B at the delivery end drops into the trays of this conveyor, which carries it slowly through the cooling chamber and delivers it through a double door discharge outlet N into trucks or otherwise. O is a door for giving access to the cooling conveyor.

Removing the Residue from Gas-Retorts.

WOODALL, H. W., of Bournemouth, and DUCKHAM, A. M'D., of Little Bookham, Surrey.

No. 22,811; Oct. 6, 1909.

A common device for removing the residue from gas-retorts or the like consists (the patentees point out) of a drum revolving in, and closely fitting, a stationary cylindrical casing. The latter has an opening coinciding with the discharge mouth of the retort, or the hopper forming a continuation of the retort; and the revolving drum has a like opening. Then, as the two openings register with each other, the drum receives residue which falls from the retort or hopper and subsequently discharges the residue through a second opening in the casing



Woodall and Duckham's Vertical Retort Discharge Drum.

when it has turned through an angle of 180° . To diminish friction and for other purposes, the casing has been cut down to a segment of a cylinder having only sufficient surface to ensure that the opening in the revolving drum shall never make communication between the interior of the retort and the atmosphere; and this surface has been reduced to a minimum by substituting for the revolutions of the drum an oscillation on the axis of the drum, "for in this case the portion of

the segment on one side of the opening in the casing can be very short in cross section, since the opening in the drum never has to pass this portion."

There is considerable difficulty in keeping such a casing gas-tight. Gas escapes not only circumferentially between the surface of the drum and the shorter portion of the casing, but also in directions parallel to the axis of the drum between the surface of the latter and the casing. But this difficulty is to a great extent removed by the present invention, which provides a faced plate in contact with the end of the drum and the end of the segmental casing, both of which ends are suitably faced; there being such a plate at each end of the drum—thereby preventing any longitudinal leakage. In addition, there may be provided a stuffing-box at the longitudinal edge of the shorter portion of the casing to prevent the circumferential leakage, "which is in itself a known device for preventing leakage between a furnace discharging drum and its part casing."

In the illustration—a cross section through the drum and its casing and a part longitudinal section—A is the hopper from which the coke, discharged from the retort by a known device, falls into the drum B. The portion C of the casing on the left hand of the cross section is long enough to prevent the opening D in the drum from making communication between the atmosphere and the hopper; but the portion E on the right hand is much shorter in cross section—the drum only turning in the direction of the arrow sufficiently to discharge the coke, and then returning to the position shown. According to the invention, to the longitudinal flange E of this part of the casing there is bolted a plate F, between which and the flange is an asbestos or other suitable packing G bearing against the surface of the drum. As shown, there is made in one with the bearing of the axle H of the drum, a plate I, the inner faced surface of which abuts against the similarly faced ends of the casing and the drum.

APPLICATIONS FOR LETTERS PATENT.

- 9314.—DAWSON, A., "Gas cooking-stoves." April 18.
 9360.—CHANDLER, D., "Inverted burners." April 18.
 9408-9.—DEMPSTER, R., AND SONS, LTD., and BROOKE, R. M., "Gas-retorts." April 19.
 9412.—RAE, J., "Incandescent gas-regulator." April 19.
 9415.—BETHEL, E., and MAGUIRE, J., "Automatically regulating the supply of gas when used as fuel on boiling apparatus." April 19.
 9417.—WILLIAMS, T. J., "Acetylene generators." April 19.
 9469.—KEYMER, W., PARSONS, F., and CLYMO, G. H., "Boiler attached in the roof of gas-ovens." April 19.
 9494.—WOODALL, H. W., and DUCKHAM, A. M'D., "Heating vertical retorts." April 19.
 9559.—HAMILTON, F., and BERINGER, R., "Acetylene generators." April 20.
 9600.—HAYES, J. R. S., "Ball and screw-down valves for water or gas." April 20.
 9610.—LAKE, H. W., "Gas-producers." A communication from Tait Producer Company. April 20.
 9652.—WILLIAMS, H., "Taps or cocks." April 21.
 9692.—RICHMOND GAS STOVE AND METER COMPANY, LTD., and THORNTON, H. M., "Gas-cooker plate-racks." April 21.
 9729.—WALTON, C., and RAYNER, G. H., "Trough conveyors." April 21.
 9770.—LIGHTFOOT, C., "Regulators for acetylene gas." April 21.
 9792.—JEFFERY, F. W. J., "Automatic gas-economizer for naked flame burners." April 22.
 9808.—WANDBY, H. W., and PORTER, W. H., "Pressure-reducing valves." April 22.
 9849.—SPROTT, E. W., "Acetylene generators." April 22.
 9915.—HELPS, G., "Lamps." April 23.
 9940.—FLETCHER, RUSSELL, AND CO., LTD., and FLETCHER, T. W., "Gas-fired furnaces." April 23.

Blackbirds' Nest in a Retort-House.—Writing on the 25th ult., a correspondent at Coatbridge said: In the retort-house at the Pitlochry (Perthshire) Gas-Works is at present to be seen a pair of blackbirds feeding their young. An iron spike had been driven into the wall, and some pieces of old chain hung on it; and on this the blackbirds built their nest. They take no notice of the men in the retort-house or the work that is going on. This is the fourth season they have taken up their abode in the same place.

Woodhall Spa Gas Scheme.—Last Thursday evening there was a meeting of Woodhall Spa ratepayers, when it was decided by a substantial majority not to ask the Urban District Council to oppose the establishment of a local gas-works by Mr. T. G. Marsh, of Manchester, who undertook to find the capital and supply gas at a maximum charge of 5s. per 1000 cubic feet—the Council having the option of purchasing the concern at a valuation after fifteen years. Several people present expressed the opinion that the Council ought to have the matter in their own hands, and not let private individuals reap the profit. Mr. Hotchkin, who presided, remarked, however, that in this case the already overburdened ratepayers would have to pay the loss entailed on the first two or three years' working.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Local Government Board and their Powers.

An engineering firm well known to many of our readers write under date of the 25th ult., as to the extent of the power which they consider the Local Government Board should possess of vetoing the use of certain materials by municipal engineers. They agree that the Board should have some measure of control and advisory power over the various local authorities; but they express the opinion that this important power, in order to secure the maximum of impartiality and efficiency, should not be in the hands of any single official, who may not be in complete touch with all the modern improvements in plant or who may hold views not in line with those entertained by other engineers of experience and the profession generally.

In this age of speciality and rapid progress, our correspondents continue, what is wanted in such an important department (dealing as it does with engineering works of great magnitude in constant succession) is a committee of gentlemen of knowledge and experience, to whom can be referred questions such as the permissibility of the use of certain materials, and the loan period which should be assigned for works carried out with such materials. This committee should include representatives of the other great spending departments who have much to do with engineering—such as the Admiralty, War Office, Post Office, &c., who naturally have opportunities of ascertaining the reliability and behaviour of different appliances and materials in the course of their experience. In this connection, they call attention to the fact that some of the materials vetoed—or penalized—by the Local Government Board are in extensive use by the other departments.

Nor should even the deliberations and decisions of this committee form a final resource, they contend. In important cases, the matter should be submitted to another and larger committee, composed of gentlemen of eminence in the profession. They suggest that a suitable panel would comprise the Presidents (or an elected member) of the various big Societies—such as, for instance, the Institutions of Civil, Mechanical, and Electrical Engineers, the Gas Institution, the Iron and Steel Institute, &c. This would ensure that matters in regard to which there is any doubt or difference of opinion would be probed into by men of extensive experience and of authority in the engineering world, and prevent any question of arbitrary judgment, pet theory, and unfair restriction arising.

LEGAL INTELLIGENCE.

Kitson Empire Lighting Company, Limited.

Last Tuesday, a petition presented by Messrs. W. M. Still and Sons, Limited, for the winding-up of the above Company, which has been before the Court on several occasions, was again mentioned before Mr. Justice Swinfen Eady. Mr. Maugham said the petitioners were creditors of the Company; and during the adjournment, a resolution had been passed for voluntary winding-up. Under these circumstances, he was instructed to ask that the petition should be dismissed. His Lordship thereupon dismissed the petition, without costs.

A Magistrate on Prepayment Meters.

At the Children's Court at Old Street, presided over by Mr. Cluer, William Bond and Henry Goddard, both 12 years old, were charged with being concerned together in stealing 7s. 4d. from an automatic gas-meter at No. 10, Hilton Street, Commercial Road, the money of the Commercial Gas Company. Bond was further charged with stealing 2s. 7d. from another meter. Mr. Cluer (to Mr. Young, solicitor, who appeared for the Company): You are responsible for three of the charges before me this afternoon by reason of the trumpety locks your Company put on these automatic gas-meters. You place temptation in the way of boys. I have no doubt if I had been in their places, I should have stolen from gas-meters. The temptation is too great. Why do you not put strong locks on these things, or place them high up against the ceiling, so that boys cannot reach them? I have before me a boy, who is on remand, charged with breaking the padlock from a gas-meter with a pair of scissors. Mr. Young: In this case, a hammer was used. Evidence was given that Bond said to a police-officer: "Goddard went indoors and got a hammer, and we knocked off the lock and took out 2s. I had 1s." Both boys pleaded guilty. Mr. Cluer: I cannot send you boys to a reformatory until you are 19, or it will be too long. I cannot send you to an industrial school; for it would be said that your characters would affect the characters of other boys there. I must either discharge you or birlch you. Try the effect of six strokes each.

An Unsuccessful Compensation Claim.

At the Oldham County Court last Thursday week, Judge Bradbury, who had the assistance of Dr. Corns as Medical Assessor, heard an application under the Workmen's Compensation Act by Mrs. Hough, of Middleton; the respondents being the Middleton Corporation. Mr. Backhouse appeared for the applicant, on the instructions of the National Union of Gas Workers; the respondents were represented by Mr. Douglas Knockner. The application was for compensation in respect of the death of Thomas Hough, who was employed at the Middleton Corporation Gas-Works. On Nov. 18, 1907, as the deceased man was about to leave his work, and was walking along a plank in the engine-house, he slipped and fell into a pit, in the middle of which was a pipe projecting upwards; and this pipe caught him just below the heart. He proceeded home, and went to his work the next night, and worked all night; but the following day, he was unable to go to work.

He was treated by a doctor, and resumed his occupation a few days later. He worked regularly for twelve months, and then was away two days in October, 1908, and five in November. Then he was absent for about a month; and on Jan. 28, 1909, he had to go to the Oldham Infirmary, where he died on June 9. The question was whether death was due to the accident or to natural causes; and on this point evidence was given by Dr. Whitestone, of Middleton, who first attended the man after the injury, and by Dr. Godson, who had charge of him at the Infirmary. The former said that after the accident the man suffered from cardiac asthma, due to dilation of the heart, and death was, if not directly due to the accident, at least accelerated by it. For the respondents, evidence was given by Dr. Henderson (who made a post-mortem examination) that death was due to an aneurism which was of five or six years' standing, and which could not have been caused by the accident. Dr. Alexander M. Sharp, of London, also gave evidence that the accident could not have caused the aneurism. After other evidence, the Judge said Dr. Corns was of opinion that the man had suffered from the aneurism before the accident; and it had simply run its course. Judgment was therefore for the respondents.

Liability for Water-Rate.

Last Tuesday, in the Shoreditch County Court, before his Honour Judge Bray, Emma, Louise, William, and Harry Goodman sued their tenants, Frederick William and Harry Bishop Garnham, of Eldon Street, E.C., tailors, to recover £2 12s. 6d., being two quarters' water-rate paid to the Metropolitan Water Board under compulsion, as the defendants refused to pay. Mr. Battcock, who appeared for the plaintiffs, said the defendants covenanted to pay all outgoing rates; and he submitted that the water-rate must be included. There had been trouble before with the defendants; and they finally paid £7 17s. 8d. But at the March period, they again refused to pay, despite the demand note; and the landlords (plaintiffs) were forced to pay. One of the defendants submitted that he was not liable at all for the water-rate to the landlord, but only to the Water Board, who, however, for reasons best known to themselves, declined to sue. He denied that he had ever had a demand from the Board for fourteen years. He also submitted that he had no water-pipes, apparatus, or water on his premises; and he had been informed by the Board that in consequence they could not sue him. Under these circumstances, as he was liable to the Board, if anybody, the landlord could not sue. Mr. Edmund Woolridge, City Cashier to the Board, said demand notes were always sent; and he could not imagine anyone out of the office saying the defendant could not be sued. They had an agreement with the plaintiffs that the water-rate should be paid by them, as landlords, if the tenants did not do so; but this was only a measure of protection against bad tenants. They could still sue. Judge Bray: It seems clear that if he will not pay the Board, the landlord must. Defendant: But I want the Board to sue me. Why should I pay if I have no water or apparatus? I have a separate assessment. His Honour: And you have to pay 5 per cent. on that. Defendant: But why to my landlord? His Honour: Because you have agreed to. Defendant: And I am to pay for water I do not have? His Honour gave judgment for the amount claimed, and awarded the plaintiffs costs.

A Point in Water-Supply Law.

The Lexden and Winstree Justices were called upon to decide a lengthy legal argument, when George Littlewood was summoned by the Brightingsea Urban District Council for the non-payment of £2 expenses incurred by the Council in executing certain works on his premises. For the Council, Mr. Prior explained that the case arose out of an action taken by the Council under the Public Health Act of 1875. It was admitted that in consequence of a report made to the Council by their Surveyor, notice was served on defendant to obtain a proper supply of water; that the notice was disregarded; that the Council then did the work; and that their charge was a fair and reasonable one. He understood it was to be contended that, before the Council could recover the expenses incurred, they must satisfy the Bench that the house in question had not a proper water supply before they took action. He knew of no authority for such a proposition. The Act of Parliament and all authorities were diametrically opposed to this contention. The Act said: "Where, on the report of the surveyor of a local authority, it appears that a house is without a proper supply of water, the local authority shall give notice," &c. Mr. Jones, for the defence, said that if the Bench decided they had jurisdiction to go into the question as to whether the house had a proper supply of water before the Council took action, expert evidence would be called at a later date. If they decided they had no such jurisdiction, he would ask them to state a case for the High Court. According to Mr. Prior, the Surveyor was master of the situation. If a person said he did not want the Council's water, he would have to have it, merely on the report of the Surveyor. They were living in England; and yet, according to his friend, this was what the law was. Just think of the autocratic position in which Mr. Prior would put a surveyor, who very often was the cheapest man a Council could get. The premises in question had a perfectly wholesome water supply; and it was mere temper on the part of the Council to try and force the defendant to take their water. After a brief consultation in private, the Bench decided that they had no power to question the authority of the Surveyor; and they made an order for payment, with costs. Mr. Jones submitted that there were authorities diametrically opposed to this ruling; and he asked the Justices to state a case.

Liverpool Gas-Fittings Company, Limited.—The report of the Directors for the twelve months to March 31 states that the net profit for the year is £1513, which, with £134, the balance after paying last year's dividend and bonus, leaves the sum of £1647 to the credit of profit and loss. The Directors recommend that a dividend be declared for the year at the rate of 10 per cent., with a bonus of 1s. per share (free of income-tax). This will leave a balance of £147 to be carried forward to next year's accounts.

MISCELLANEOUS NEWS.

PUBLIC LIGHTING OF WESTMINSTER.

The New Gas Lighting Contract.

At the Meeting of the Westminster City Council last Thursday, the new gas lighting contract (*ante*, p. 192) came up on a report from the Works Committee.

The Committee stated that the Council having accepted the tender of the Gaslight and Coke Company, for the various lighting units for five years, in the streets at present lighted by gas and in those lighted by the St. James's and Pall Mall Electric Light Company, they had considered a scheme for the distribution of the light and selection of the units, and now submitted same for consideration. The whole scheme, while costing less than the present lighting in the areas affected, would yield two to three times the amount of light; and it should be stated that the needs of each district had been considered separately, and the improvement in lighting spread over every street and every parish. Table I. set out the streets which would be lighted by high-power gas-lamps, in units of 1800 and 3000 candles. Table II. set out the streets which would be lighted with gas-lamps of 300-candle power; and as these would be fixed on existing columns, the lighting of these streets would be very effective. Table III. set out the general distri-

bution of the lamps in the different areas; and from it, it would be gathered that the remaining streets would be lighted by 90 and 180 candle power lamps suitably arranged—thus completing the general improvement in lighting. The numbers of the different unit lamps would be subject to adjustment, as might be found necessary when dealing with each district in detail. Table IV. set out the present cost of lighting the areas in question, and the cost of the new scheme (*a*) for the first five years, (*b*) for the second five years, (*c*) average for ten years. The annual proportion of capital cost was included.

TABLE I.—Streets to be Lighted with 1800 and 3000 Candle Power Lights.

| | | |
|---------------------------|--------------------|-------------------------------|
| Aldwych | Pall Mall | Victoria Street |
| Bridge Street | Parliament Square | Waterloo Place |
| Cambridge Circus | Parliament Street | Whitehall (part) |
| Charing Cross Road (part) | Piccadilly (part) | Law Courts (refuges) |
| Coventry Street | Piccadilly Circus | National Gallery (refuge) |
| Cranbourn Street | Regent Street | Piccadilly Circus (refuge) |
| Horse Guards Avenue | Sanctuary | St. Martin's Church (refuge) |
| Kingsway | Shaftesbury Avenue | Trafalgar Square (3 refuges) |
| Leicester Square | St. James's Street | Wellington Street (2 refuges) |

TABLE II.—Streets to be Lighted with 300-Candle Power Lamps.

| | | |
|-----------------|---------------------|----------------------|
| Artillery Row | Exhibition Road | Knightsbridge |
| Bow Street | Great Chapel Street | Millbank Street |
| Broadway | Greycoat Place | Tothill Street |
| Buckingham Gate | Grosvenor Road | Vauxhall Bridge Road |
| Caxton Street | Kensington Road | Wellington Street |
| Drury Lane | (to City boundary) | |

TABLE III.—Schedule of Lights at Present Existing and Proposed New Lighting.

| Candle-Power. | Low-Pressure Gas. | | | | | High-Pressure Gas. | Electric Arcs. | | | Low-Pressure Gas. | | | High-Pressure Gas. | | |
|----------------|-------------------|------|------|------|------|--------------------|----------------|-------|-------|-------------------|------|------|--------------------|-------|-------|
| | 53. | 83. | 130. | 160. | 220. | About 1000. | About 1000. | 1800. | 3000. | 90. | 180. | 300. | For Refuges 1000 | 1800. | 3000. |
| A | 303 | 20 | 3 | .. | .. | .. | .. | .. | .. | 146 | 133 | 107 | .. | .. | .. |
| B | 951 | 79 | 10 | 1 | .. | 33 | .. | .. | .. | 694 | 110 | 161 | .. | 59 | .. |
| C | 254 | 580 | 8 | 8 | 6 | 20 | .. | .. | .. | 406 | 360 | 29 | 10 | 39 | .. |
| D | .. | 556 | 6 | .. | .. | .. | 51 | 4 | 16 | .. | 562 | .. | .. | 55 | 16 |
| Totals | 1568 | 1235 | 27 | 9 | 6 | 53 | 51 | 4 | 16 | 1246 | 1165 | 297 | 10 | 153 | 16 |

NOTE.—This table excludes the Strand district electric lighting contract terminable in 1913 or 1920, at the option of the Council, and St. George's Parish electric lighting contract, which is not terminable until 1931, but the revision of which the Committee now have under consideration.

TABLE IV.—Estimated Cost of Scheme Proposed Compared with Present Cost.

| Present Cost (per Annum). | New Cost for more than Double Present Lighting. | | |
|--|---|--------------------------------|-----------------------------------|
| | First Five Years (per Annum). | Second Five Years (per Annum). | Average of Ten Years (per Annum). |
| £ 15,642 | £ 14,450 | £ 13,150 | £ 13,800 |
| Cost if carried out by electricity . . . } | 24,900 | 18,700 | 21,800 |

The capital cost of the new scheme (the annual proportion of which, £900, was included in the above estimate) would be £4500—

| | £ | s. | d. |
|--|-------|----|----|
| 45 new high-pressure gas-lamps and columns, at £17 . . . | 765 | 0 | 0 |
| 10 „ 1000-candle power refuge lamps, at £5. | 50 | 0 | 0 |
| 71 „ 3000 and 1800 candle power high-pressure gas-lamps, at £10. | 710 | 0 | 0 |
| 53 „ 1800-candle power high-pressure lamps on existing gas-columns, at £2 10s. | 132 | 10 | 0 |
| 1246 90-candle power lamps averaging between 7s. 6d. and 25s., say 15s. | 935 | 0 | 0 |
| 1165 180-candle power lamps averaging between 12s. 6d. and 25s., say 20s. | 1165 | 0 | 0 |
| 297 300-candle power lamps averaging between 30s. and 80s., say 50s. | 742 | 10 | 0 |
| | £4500 | 0 | 0 |

The Committee proposed to endeavour to agree with the Company to a reduction of the tender rates for installation, in consideration of the Council paying the cost thereof on completion, instead of payment being spread over five years as offered by the Company.

In conclusion, the Committee recommended (*a*) That the scheme now submitted for the execution by the Gaslight and Coke Company of the works of installation, lighting, and maintenance of public lamps in districts A, B, C, and D of the city, in accordance with the Company's tender of March 15, 1910, subject to such variation in regard to payment for installation as may be agreed, be approved and adopted, subject to such modifications of the said scheme in detail as the Chairman of the Works Committee may deem to be expedient and necessary as the work of installation proceeds; and that the Town Clerk be authorized to affix the Council's common seal to the contract. (*b*) That the City Engineer be authorized, with the approval of the Chairman, to arrange for the installation by the Gas Company of such specimen lamps of different lighting units as may be found necessary.

The Committee referred, in a further report, to the petition presented to the Council at the last meeting by the ratepayers of St. James's parish, asking the Council to postpone any contract for the gas lighting of Regent Street until the desirability of such a change had been further considered. The Committee stated that a letter had been sent to the petitioners pointing out that, after full discussion, the Council had decided to accept the lowest tender—namely, that of the Gaslight and Coke Company—that a given candle power had exactly the same value whether produced by gas or electricity, and informing the petitioners of the percentages of difference in favour of gas in the tender prices.

Councillor PULMAN said he had been so pertinaciously approached by members of the Regent Street Ward that he felt it his duty to once more raise the question of the expediency of including the St. James's parish in the gas-lighting contract. The streets he took exception to as being included in the contract were some of those in Table I in the report—namely, Pall Mall, part of Piccadilly, Piccadilly Circus, Regent Street, and St. James's Street. It had been pointed out to him that the extra cost of lighting these streets by electricity was approximately £250 per annum; but in view of the rateable value of the streets, and the heavy rates each individual had to pay, it did seem to him that the Council might re-consider the matter. He would say at once that, from his personal experience, he believed that high-pressure gas would be quite as satisfactory as the old light (hear, hear); but the tradesmen in Regent Street appeared to regard the electric light as a sort of fetish, and they alleged that they would be done some injury by the removal of this light in favour of high-pressure gas. This was a point the Council ought to consider; and he moved that they disagreed with the recommendation so far as it referred to the district indicated, and that the Works Committee be instructed to continue the electric light in these streets. It had also been suggested that the St. James's and Pall Mall Electric Light Company had suffered some injustice through the terms of the tenders on which they had to submit their prices, inasmuch as while the Company had plant and mains established in the districts under discussion the tenders were not drawn up in such a manner as to allow the Company to quote for this district only.

Councillor THOMSON-LYON said he did not attach much importance to the petition. He remembered on a former occasion a leading frontager telling him that he had signed a petition merely to get rid of the canvasser. As to a letter from the Electric Light Company that had been sent to every member of the Council, in which they complained that the conditions of the tender were unfavourable to them, he believed it was quite open to the Company to have proposed an alternative scheme; but now that the tenders had been made public, they surely would not allow one of the tenderers to submit new figures.

Councillor GATTI said he would like to point out that there was a distinct benefit in allowing the electric people to continue the lighting in Regent Street. He was glad to see from the discussion at the last Council meeting that the bogus idea prevalent a few years ago that 1-candle power gas was not equal to 1-candle power electricity, or *vice versa*, was disposed of, and there was no need to argue this point.

Councillor ABADY: You agree with that?

Councillor GATTI: Certainly I do. I always agree with the obvious. (Laughter.) You have this advantage in continuing the electric light—the arc lamps are there, and you save the trouble and the interference with the traffic in using what you have got already, besides, under a new tender, you will have a reduction in the cost of the lighting.

Councillor ABADY: While this matter was being discussed at the last meeting, I suggested that we should delete any streets objected to; and it was denied that we could do this. It is certain we cannot now, having passed the recommendations that we have.

Councillor GATTI said they had a perfect right to go back on the contract; otherwise why was this resolution again before the Council?

Councillor ABADY said he was sorry to trouble the Council again in this matter after the exhaustive manner in which it was dealt with on the last occasion; but there were one or two points he wished to make perfectly clear. To begin with, he wanted to recall to the Council the terms

of the resolution they passed on the last occasion. It was perfectly clear from the resolution that the Council accepted the tender of the Gaslight and Coke Company (which was the lowest) for the districts lighted by them and the areas lighted by the St. James's and Pall Mall Electric Light Company. This was the case; and he understood that the Town Clerk's Department had written to the Gas Company notifying the acceptance of the tender, and had also given notice to the electric people that their tender had been declined, and reminding them that their contract terminated in November, 1910. So that, on the point of the intention of the Council, there was no room for ambiguity. But if Mr. Gatti held that the matter was still before the Council for its consideration, he would submit most strongly that if this was a case where tenders were still before them, the St. James's and Pall Mall Company should be barred from having their tender considered under Standing Order No. 108, which laid down that contractors or tradesmen were prohibited from canvassing members or officers of the Council in support of their tenders. The letter which had been sent to members of the Council, and which was full of misleading statements, contained the following passage: "We trust, in view of the real facts as above, you will see your way to deal with this matter on the merits of the case." If this letter was not canvassing, he would like to know what was. He did not think it was the sort of thing to do. There was another point he wanted to put strongly. Here was a case where the Council drew up specifications and invited rival firms to tender. These firms did so; and the lowest tender was accepted. Then the other tenderer came along and said: "We are very sorry, we made a mistake, we did not understand." It would be striking at the principle of all tendering if a tenderer was to be given the right to revise his prices under any circumstances. He did not think that to a Council with the reputation of the Westminster City Council it should be necessary for him to say anything more on this point. Surely the Council were not going to encourage this Dutch auction sort of business. If they did, they ought to give the Gas Company a chance of having a "pot shot" at the electric light revised prices. In their letter, the Electric Light Company said that, under clause 2 of the general conditions of contract, they were not permitted to tender for the lighting of any particular district, or to submit particular prices for that district. He held that this was not a fair construction to put upon the wording of the clause; and the Town Clerk had given it as his opinion that such a condition could not be read into the contract at all. There was nothing in the clause which said that the contractor was not permitted to tender for a part or district or to submit a special price. It was perfectly clear that the Electric Light Company thought of this idea after they had made the offer in the first place, and saw the lower prices of their competitors. They said that the reason why they had to put up their price for the arc lamps in Regent Street, Pall Mall, and Piccadilly from £17 to £21 or £28 was because they had to consider the possibility of their tender being accepted for other lamps and columns in streets where they might not have mains; and therefore they had to lump the whole cost of the installation on the lamps in Regent Street. This was simply fudge, because the contract was clearly divided into two parts—one for installation and the other for maintenance, and the cost of running mains might affect installation costs, but could not, under any circumstances, affect the maintenance, which would be just the same whether the lamps were on old columns or new columns which might have to be erected, and their cost debited to installation. The contract was perfectly clear in this respect, and there was no room for ambiguity. The maintenance prices of the electric people were exceedingly high. They were £28 as against the Gas Company's £22 in one place, and, he thought, £19 or £20 as against the Gas Company's £15 10s in another. These prices had nothing to do with installation. Mr. Gatti, a Director of an Electric Light Company, had admitted that 1-candle power of gas was equal to 1-candle power of electric light; while the prices for gas were lower beyond all comparison. The Council had accepted the lowest tender; and how could they properly allow one of the tenderers, under the guise of having made a mistake, to tender again? He would stake his reputation that in twelve months' time the shopkeepers in Regent Street and Piccadilly would be sorry they had raised any question on the matter. He was certain they would have the best lighting in London when the installation was completed. He could read extracts from three electric papers all blaming the Electric Company for having charged such a high price.

Councillor PULMAN asked leave to withdraw his amendment. It could not become operative; and after hearing the able speech of Councillor Abady, he was perfectly satisfied that the contract made with the Gas Company was fair and reasonable.

Councillor Captain JESSEL, M.P., also congratulated the Chairman of the Works Committee on his exceedingly lucid and interesting statement of fact. He differed, however, as to there being anything improper in the letter sent out by the Electric Company. It was a course taken on every occasion by companies of this description when they had a case to put forward; and he remembered that not so many years ago the Gas Company, on their tender being rejected, took a similar course.

Councillor GATTI complained that in Table IV. of the report the comparative costs of lighting by electricity and gas were only given over two periods of 5 years and the average over 10 years, though the tenders asked for prices over three periods of 5, 10, and 15 years. If the comparisons had been carried out over 15 years, the Electric Company's proposition would have appeared in a more favourable light. This table indicated to him the general tenour that had run right through the Committee's consideration of the matter. There had been a tendency throughout to make it as difficult for the electric people as possible. There had been conditions imposed which he did not believe were to the benefit of the Council, and which might have been a great burden to the contractor. He admitted at once that the Electric Light Company were not in it for price; but the prices were based on comparisons of five years, which gave the Gas Company the benefit. When Councillor Abady went on to say that the reason why the electric people lost the contract was because the prices were exorbitant, he did not know what he was talking about. Electric light would always be able to hold its own for public lighting as a matter of cost when put on a fair level with gas.

Councillor BINGHAM said he did not like the Electric Light Com-

pany being knocked out for this particular reason—he was afraid it was going to do away with competition. But for the stand before made by the St. James's and Pall Mall Company, they would not have now the beautiful light they had in Regent Street. This was going to be substituted by a 3000-candle power gas-lamp; but such a thing did not really exist. There was only one nominal 3000-candle power gas-lamp in existence for street lighting, and that was in front of the Mansion House; and the City authorities reported that they had never succeeded in getting more than 2500-candle power from it. They knew that a nominal 3000-candle power electric light of the present day gave on an average 3500-candle power. They might well forgive the tradesmen of Regent Street for protesting against the removal of the beautiful arc lamps put there only a month ago for something that was problematical. As to the petition, it was signed by tradesmen of Regent Street whose names were known all over the world; and at the meeting held in connection with it, these gentlemen speedily took the conduct of the proceedings out of the hands of anyone who might have been financially interested in the electric light scheme, and managed it themselves.

Councillor ABADY said the reason the comparative tables were not given for fifteen years was that the Committee would not entertain a contract for more than five years, although they offered to make it renewable for a second five years. The comparative prices under these two periods and the average thereon were therefore given. The comparative prices for 15 years were given in the last *agenda*, and the electric light people were high all along the line. The Committee would not look at the contract for 15 years. They had been bitten once. As to the prices given by the electric people, he read an extract from the "Electrical Review" in which it was stated that the tender was too high, and had done a lot of harm to electric undertakings in London and elsewhere.

The Committee's report was then accepted; and the recommendations were passed without dissent.

SHEFFIELD GAS COMPANY'S ORDER.

Fifteen-Candle Gas Prescribed.

At the end of February, an inquiry was held at the offices of the Board of Trade, by the Hon. T. H. W. Pelham, with regard to an application by the Sheffield United Gaslight Company for a Provisional Order to enable them, among other things, to reduce the candle power of the gas supplied by them from 16½ to 14 candles, and to adopt for testing the "Metropolitan" No. 2 burner. The Order has now been issued; and its more important provisions are as follows.

QUALITY OF GAS.

5.—(1) The quality of gas supplied by the undertakers shall, with respect to its illuminating power, be such as to produce at the testing-place provided by the undertakers under the Act of 1855, when burned at the rate of five cubic feet per hour, a light equal in intensity to the light produced by fifteen sperm candles of six to the pound, each consuming one hundred and twenty grains of sperm per hour, and shall be in all respects in accordance with the provisions of the Gas-Works Clauses Act, 1871.

(2) For testing the illuminating power of the gas, the burner to be used shall be that known as the "Metropolitan" argand No. 2, the photometer shall be the bar photometer, the standard light shall be that supplied by Harcourt's ten-candle pentane lamp, and in making the test the burner shall be so used as to obtain from the gas when burned at the rate aforesaid the greatest amount of light. Provided that the Board of Trade may, on the application of the undertakers or the Corporation, approve the use of any other burner, photometer, or standard light which may appear to the Board to be equally or more suitable for the testing.

6.—The undertakers, if and when required, at any time within two years after the commencement of this Order, by any consumer of gas supplied by the undertakers, shall supply him and fix free of charge a sufficient number of flat-flame burners suitable in all respects for the consumption of gas of the illuminating power prescribed by this Order in substitution for the burners (not being incandescent burners) in use at the commencement of this Order.

Notice of the provisions of this section shall be given on each demand note of the undertakers during the period of two years hereinbefore mentioned.

7.—No penalty shall be incurred by the undertakers for defect of illuminating power or excess of impurity in the gas supplied by them in any case in respect of which it is proved that such defect or excess was caused by circumstances beyond the control of the undertakers provided that the want of sufficient funds shall not be held to be a circumstance beyond the control of the undertakers.

MEETINGS, INTERIM DIVIDENDS, AND AUDIT.

8.—(1) From and after the commencement of this Order, section 52 (ordinary meetings to be held half yearly in Sheffield) of the Act of 1855 shall be read, and have effect, as if the words "and the future ordinary meetings shall be held in the month of March in every year, or at such other time as shall be appointed for that purpose by an order of a general meeting," were inserted in that section in lieu of the words "and the future general meetings shall be held in the months of April and October in every year."

ISSUE OF DEBENTURE STOCK.

14.—(1) Sections 9, 10, 11, and 12 of the Order of 1893 are hereby repealed; and in lieu thereof the following provisions shall have effect with respect to the issue after the commencement of this Order of any debenture stock authorized to be created and issued under the powers of the Order of 1893.

(2) All debenture stock so to be issued shall be offered for sale by public auction or tender in such manner, at such times, and subject to

ch conditions of sale, as the undertakers shall determine. Provided follows:—

- (A) Notice of the intended sale shall be given in writing to the Town Clerk of the City of Sheffield and to the Secretary of the London Stock Exchange at least twenty-eight days before the day of auction or the last day for the reception of tenders as the case may be, and shall also be duly advertised once in each of two consecutive weeks in one or more local newspapers circulating within the said city.
- (B) A reserve price shall be fixed by the Directors, and notice thereof shall be sent by the undertakers in a sealed letter to be received by the Board of Trade not less than twenty-four hours before, but not to be opened till after the day of auction or last day for the receipt of tenders as the case may be.
- (C) No lot offered for sale shall comprise debenture stock of greater nominal value than one hundred pounds.
- (D) In the case of a sale by tender, no preference shall be given to one of two or more persons tendering the same sum. In the case of a sale by auction, a bid shall not be recognized unless it is in advance of the last preceding bid.
- (E) It shall be one of the conditions of sale that the total sum payable by the purchaser shall be paid to the undertakers within three months after the date of the auction or of the acceptance of the tender as the case may be.

THE COALITE PROCESS AND ITS PRODUCTS.

A Report by Dr. Knublauch.

Under date of the 20th ult., the British Coalite Company, Limited, sent to their shareholders a circular letter, giving some particulars as to the "commercial working of the process." The statement—signed by the Chairman (Sir W. H. Preece)—is as follows:

At the last general meeting of this Company, held in December, I informed the shareholders that Dr. Knublauch, of Cologne—the most eminent tar expert in Europe—was investigating the various processes in connection with our bye-products and the tar distilleries at our works.

This exhaustive investigation has now been completed; and your board take the earliest opportunity of giving you the actual figures as to the commercial working of the process, which fully confirm our previous estimates.

We have now proved in practice that our low-temperature tar, produced from one ton of coal, contains:

4'75 gallons of naphtha solvents.
4'07 " tar acids.
3'10 " disinfectant oils.
98 lbs. of pitch or coalite bitumen.

We are pleased to inform you that contracts have been made for the sale of the whole output of naphtha solvents and tar acids from our Wednesfield works for the next six months at very satisfactory prices.

We have also sold during the past two months 150 tons of our bitumen at an average price of £3 18s. per ton; and, following Dr. Knublauch's advice, we are sanguine we shall get still better prices in the future.

Our sulphate of ammonia sells readily, as soon as it is made, at about £12 per ton.

These contracts and sales show us that the estimate we have placed on the value of our low-temperature tar has been more than borne out. We obtain practically twice the amount of tar in bulk produced under the ordinary gas process.

Our solvent naphthas are already being appreciated by rubber manufacturers, dry-cleaners, dyers, &c.; while our bitumen and coalite pitch, in which "free carbon" is non-existent, constitute perfect non-conductors of electricity—proving highly advantageous for insulating purposes in connection with electric cables of all kinds.

In addition to the above, our bitumen is also being used for waterproof materials, asphalt, felt roofing, varnish, glue, and ship's deck walking.

Our tar acids and disinfectant oils, Nos. 1 and 2, will prove of great service to the large disinfectant manufacturers.

The tar distillery, which is in course of erection at the Barking works, will be brought into operation next month, and will place at our disposal a further supply of the various distillates above mentioned at the disposal of the Company, and for which satisfactory markets are being sought.

Owing to the large demand for our smokeless fuel ("Coalite") at the end of last year, we decided to raise the price of this domestic commodity and commercial necessity; and we are glad to advise you that, even at the higher price, our sales, since February, have considerably increased.

Mr. F. H. Smith has been appointed General Manager and Engineer of the Company in succession to Mr. H. Gamman.

Another Cause of Weakness in the Company's Shares.

Noting the circular, the "Iron and Coal Trades Review" says: In this connection, it is interesting to refer to an article in the JOURNAL OF GAS LIGHTING, of April 12, headed 'Weakness in Coalite Shares.' In this paragraph, the Editor of the JOURNAL OF GAS LIGHTING makes a number of guesses as to the cause of the fall in the shares, and suggests that somebody is unloading shares on the market. While this may be true, it would seem that there is likely to be another reason for the weakness of these shares. The Coalite Company recently opposed the granting of the patent under which a Glasgow syndicate propose to manufacture and put on the market smokeless fuel. The patent was opposed on the ground that it infringed what the Coalite Company regard as, and claim to be, their master-patent, and in which the value of all their further and subsidiary patents must largely depend. The Coalite Company have failed in their action; and

they now know that they do not hold a monopoly (as they have hitherto claimed) of the manufacture of the class of material made by them, but that the Scotch Company in question are equally free to manufacture, and are likely to soon put on the market, a material which is in all and every respect equal to their own. This in itself is sufficient to make the shares suffer considerably in value."

MANCHESTER AND ITS RATES.

Like the Gas Committee, the Electricity Committee of the Manchester Corporation, though pressed by the members of a deputation including the Lord Mayor, have declined to increase their grant in aid of the rates out of the profits of the department. The amount to be contributed by the electric works will therefore be £12,000 as last year; and the Gas Committee will hand over £40,000. Each spending Committee has had to revise its estimates; and the Finance Committee hope, with the economies effected under this head and an increased sum from the tramways (£75,000, instead of £60,000), to keep the rates at the same level as last year.

A member of the City Council, discussing the situation, thus expressed himself: The time has arrived for a more sane policy with regard to the estimates. We have had Committees this year actually reducing their figures by £20,000 at the instigation of the Lord Mayor and the Chairman and the Vice-Chairman of the Finance Committee. What is the reason? Simply because they knew that the inevitable deputation would come along, and they could make a great show of their desire to avoid any increase in the rates. Obligations that are real are always met in a private business of financial standing; and the same rule should apply to municipal undertakings. It is for this reason that I admire the attitude of the Chairman of the Electricity Department and the members of his Committee. They declared at the first estimate that they were prepared to give £12,000 in relief of the rates; and in spite of deputations, they refused to increase the amount—being more desirous to supply current at the lowest possible rate. On the other hand, the Tramways Committee fixed their first estimate at £60,000, well aware that a further sum would be demanded. Along comes the civic deputation, who secure a sort of promissory note for another £15,000, and beg the Committee to preserve the utmost secrecy regarding the extra grant, in order that the deputation might be able to squeeze the Electricity Committee, the Gas Committee, or anybody else. This is the modern obligation put upon a Lord Mayor.

QUESTION OF THE RATES AT ROCHDALE.

Rochdale rates will for the ensuing year be the same as last—namely, 7s. 9d. in the pound. This has only been made possible, however, by a pruning of the estimates of the different spending Committees, and forcing the gas and electricity undertakings respectively to give £1000 more out of profits than the Committees controlling these departments considered fair. Thus, the Gas Department will contribute out of profits £9000, instead of £8000; and the Electricity Department £5000, in place of £4000.

The Town Council, meeting in General Committee last Thursday, approved of the "budget" as revised. The proposal to take an extra £1000 from the gas-works profits met with considerable opposition, as did the further "milking" of the electricity profits by a similar amount. Mr. Walker, the Chairman of the Gas and Electricity Committee, objected strenuously to both propositions—especially the first. It was pointed out in regard to the gas-works that the department had a heavy expenditure to meet, and that this must be provided for out of reserve and revenue. The new works would cost £25,000; and towards this there would have been only £16,000 in the reserve fund, if the £5500 which the Committee proposed to allocate this year had been added. To take away another £1000, would leave £10,000 still to be raised for the re-building and equipment of the retort-house. Mr. Walker also stated that in the last sixteen years no less than £175,000 had been contributed out of gas profits to the relief of rates, as much as £7700 being taken from the reserve. Other members of the Council objected to the system of making large gas profits for rate relief, as being an unfair form of indirect taxation—arguing that gas consumers were entitled to relief in the shape of a reduction in price.

For the Electricity Department, it was submitted that, owing to the short life of the machinery, the concern should be differently treated, and be allowed to make reasonable provision for depreciation. To all the appeals on behalf of the two departments, however, the Council turned a deaf ear, and "seized," as one member put it, an extra £1000 from the profits of each. The Finance Committee's report was finally approved.

BLACKPOOL GAS-WORKS PROFITS.

Mr. John Chew, the Manager of the Corporation Gas-Works, has, says the "Blackpool Times," always produced a handsome profit at the end of each year; and the Council always look with confidence to him having a net balance in excess of the estimated surplus. So faithfully has he lived up to this expectation, that the gas undertaking has come to be regarded as the "milk cow" for the Corporation. Once more has Mr. Chew accomplished a fine piece of management, in exceeding the estimated profit in the year just ended (March 31); for, according to the statistics submitted to a meeting of the Gas Committee a few days ago, the net available balance for the relief of the rates is £9557—being £1666 more than the estimate, and £764 in excess of the actual profit for the previous year. The income was only about £500 more than for the year 1909—being £85,889, as compared with £85,397—and is £1581 more than the estimated amount. Mr. Chew, by wise and judicious administration, gains in the working expenditure for the year; for while the estimated amount was £63,006, the actual was £62,991. This, with £11,232 allowed for interest and sinking fund,

and £2109 contribution to the reserve fund, reduces the gross profit of £22,898 to the amount already mentioned as available for the relief of the rates—£9557. It might be anticipated that this would be somewhere near the estimate for the ensuing year; but a careful computation shows that the total cost for the manufacture of gas is expected to be £50,875—an increase on last year, accounted for by the fact that the price of gas coal is again rising, notwithstanding that steam coal shows a falling tendency. Hence the estimated net profit for the coming year is placed at £7461; but it will be surprising if Mr. Chew does not improve on this in actual results. He has never failed to do so.

Blackpool's indebtedness to the gas undertaking for the relief of rates during the time that Mr. Chew has had the management was never so clearly demonstrated as when he informed the Gas Committee, at the meeting above referred to, that the total reached £280,000, £75,000 to the reserve fund, and £10,000 to the renewal fund. Truly a remarkable record since 1869, when the Corporation took over the gas undertaking. Other interesting facts were placed before the Committee, over which Alderman J. Battersby presided. It was shown, for instance, that 55,000 tons of coal are used at the gas-works; that the actual output of gas last year was 555 million cubic feet (an increase of 22 millions over the previous year); and that customers number 14,150—670 new ones having been added in the year, demonstrating a satisfactory growth of the borough. From the report submitted, the candle power of the gas manufactured is maintained at a high standard; but if all customers used incandescent mantles for lighting purposes, the Corporation could manufacture gas of a lower standard at a cheaper rate, which would have greater heating power for cooking purposes, and the public would have quite as good an illuminant by means of the incandescent mantle. This is a point that the general body of rate-payers should bear in mind, if they are desirous of the gas undertaking becoming even more profitable than at present.

GAS INSPECTION IN CANADA.

The Proposed New Regulations.

In the "JOURNAL" for March 29, p. 885, some of the contents were given of a Bill before the Canadian House of Commons to amend the Gas Inspection Act. In the last number to hand of the "Gas Journal of Canada" the proposed changes in the law of the Colony are editorially referred to.

Our contemporary writes: Generally speaking, there are no radical changes proposed to which the gas companies could make serious objection, though two of the regulations recommended are somewhat new to the gas practice in Canada, as follows:

"(b) In the case of inodorous gas, to require the addition of such substances as the Governor-in-Council deems necessary, in order to communicate odour."

"(c) To establish regulations for the testing of the calorific power of gas."

Inodorous gas, so far as artificial practice is concerned, is a thing not known; and it is scarcely likely that this new feature will disturb the present methods of manufacturing gas, or impose additional expense upon gas companies for such substances or chemicals as are deemed necessary for communicating odour. This, however, may be a regulation that natural gas men in some districts would offer objection to; natural gas free from sulphur being more inodorous than coal or water gas. The regulation which provides for the establishment of rules for the testing of the calorific power of gas, we think, will be welcomed by the Canadian Gas Association, because they have been working along these lines for now over a year, with the intention of making some recommendation to the Government concerning the lowering of the candle power, and the possible substitution of a calorific-power test for the candle-power test. We are not sure as to whether the Governor-in-Council intends to establish a calorific-power test to regulate the supply of gas, or whether it is simply an instruction from him to the gas inspectors to familiarize themselves with the testing for calorific power, recognizing, as he doubtless does, that the calorific-power test will be the test of the future. What the precise meaning of the regulation is, the gas fraternity will anxiously await a fuller explanation.

UNITED STATES STREET LIGHTING AND WATER SUPPLY.

Comparisons appear in the United States Census Bureau's report for the year 1907 on the statistics of the 158 cities having a population of over 30,000.

The section devoted to the subject of street lighting includes payments for expenses of street lighting per acre of land area and *per capita*, lights classified by kind, number, candle power, price per light per year, number of hours lighted per year, and average number of each kind of light to each 100 miles of streets. The cities with the highest *per capita* payments for lights were Yonkers, New York (\$1.59), and Los Angeles (\$1.37); and those with the largest payments per acre of land area were Hoboken (\$35.03), and Boston (\$32). Owing to the great length of their unimproved streets, the average number of lights to 100 miles of streets is very small in some cities. Of the cities using Welsbach lights, largely in the residential districts, Boston leads in the number used in proportion to street mileage, followed by Washington, St. Louis, Cleveland, New York, and Baltimore. In comparison with similar statistics for 1905, it is seen that the flat-flame gas-lamp is fast disappearing from use; the percentage of decrease in number reported amounting to 43.7. This decrease has been offset by a large increase in the number of Welsbach incandescent and arc lights.

Of the 158 cities, 117 owned water-supply systems whose estimated value at the close of 1907 was \$647,334,495. The revenue receipts from the public amounted to \$52,831,096, and the actual expenses of operation to \$21,231,273. The excess of receipts over operating expenses was, therefore, \$31,599,823, nearly two-fifths of which was consumed in payment of interest on the outstanding debt. The remaining

three-fifths was apparently net profit; but it is impossible to argue from this result that municipally owned water-supply systems are exceedingly profitable. Cities owning their water-works do not receive taxes from them, and in few cases charge off a sufficient amount for depreciation. The report states that the financial results indicate, when these factors are taken into consideration, that few systems are operated at great profit, while some are conducted at an actual loss. Some cities, however, aim to furnish water to their citizens at cost; and it is possible that in such cities water-rates are lower than they would be if the water system was owned by private parties.

A PRESENTATION AT STOCKTON.

The officials and workmen of Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, had a pleasant gathering on the 19th ult., for the purpose of bidding "Good-bye," and making a presentation to the General Manager, Mr. T. P. Barker, who has resigned his position to take up the more important post of Managing-Director of Messrs. Thomas Piggott and Co., Limited, of Birmingham. The meeting took place in the large machine shop at the Parkfield works; and the number present was about 600. The presents, which took the form of genuine antique Sheffield plate, consisted of a pair of handsome candelabra, three pairs of candlesticks, a tea and coffee service, and a beautiful jardinière centre-piece about 36 inches high.



Mr. W. Beswick (who succeeds Mr. Barker) was in the chair, and in opening the proceedings remarked that it was with mixed feelings that the company had assembled. On the one hand, they were losing a chief who had been very much liked and esteemed, and who came to the Company's service when they were badly in need of a man of Mr. Barker's experience and ability. Mr. Barker had been very kind and considerate to those who had served under him, and in parting with him all would have feelings of regret. He was going to a position of greater responsibility; and in leaving Parkfield he would carry with him the good wishes of all who had been co-operating with him. They wished him and his wife prosperity, health, happiness, and well-being. At the last Board meeting of the Company, the Chairman expressed the regret of the Directors at Mr. Barker's resignation; and a resolution was unanimously passed expressing hearty appreciation of his services during the past five years as General Manager, and good wishes for his success in his new appointment. There was the pleasing fact that Mr. Barker was leaving in the height of prosperity. During his five years of "generalship," the Company had been passing through a time of great depression; but fortunately the works had been well employed, which meant much to the employees. Mr. Barker had been to the far ends of the earth to get orders, and had been very successful in doing so.

Mr. Hodgson, in a well-chosen speech, asked Mr. Barker to accept the gifts from the officials and workmen at Parkfield, the agents of the Company, and the erectors. He offered Mr. Barker the congratulations of everyone on the new and important position he was called upon to take up. The presents were not, he said, offered for their intrinsic value, but as a token of true affection, regard, and esteem; and the donors hoped they would recall many happy memories of Stockton.

Mr. Barker thanked them all for the support and co-operation received during his five years of office, as well as for the beautiful gifts, which, he remarked, would be treasured by himself and his wife as long as they lived, and would afterwards be a heirloom in the family. They would be a constant reminder of the five years he had laboured in Stockton, and of those with whom he had been associated during his term of office there. They had been reminded that the past five years had been lean ones; but he was thankful he had been able to scrape enough work together to keep the "ship sailing," if the cargo had not been quite a full one. He hoped the future would be satisfactory to the workmen, officials, directors, and shareholders. He thanked them all, and wished them "Good-bye."

Mr. Griffiths and Mr. A. E. Atkinson having also addressed the gathering, a hearty vote of thanks was accorded to Mr. Beswick for presiding, and to Mr. Hodgson for the way in which he had voiced the feelings of all the subscribers to the presentation. Three cheers for Mr. and Mrs. Barker, and the singing of "He's a Jolly Good Fellow" concluded a very pleasing function.

Gas Profits at Nelson.—The gross profit for the Nelson gas undertaking during the past year amounted to £16,295. After setting aside £11,945 for interest and sinking fund charges, there remains a net surplus to be carried to revenue appropriation account of £4350. This has been arrived at after allowing £400 in settlement of claims and expenses in connection with a gas explosion, and £300 for extensions at Brierfield. Given an increased consumption of 5 per cent., it is estimated that there will be a net surplus next year of £5035.

ASSOCIATION OF MUNICIPAL CORPORATIONS.

There was little of direct interest to "JOURNAL" readers in the proceedings at the recent meeting in London of the Association of Municipal Corporations; but two short extracts from the address of the President (Mr. J. S. Harmood-Banner, M.P.) are given below.

UNDUE GOVERNMENT INTERFERENCE.

With regard to legislation of 1909, one of the features not only of the last session, but for several years past, has been the increasing desire on the part of the Government Departments to obtain more or less absolute control over local authorities. This is, I think, one of the greatest dangers threatening municipal life at the present time, and unless it is faced, and wherever possible averted, it will in time go far towards depriving municipalities of that reasonable degree of independence which they have enjoyed in the past, and in the enjoyment of which they have achieved many things for the welfare of the country. We do not, of course, claim that they should be uncontrolled in all their actions. When they seek to make new bye-laws, which are to become part of the local law of their towns and binding upon all the inhabitants, we agree that it is not unreasonable that a central department should have a voice in framing such bye-laws, so that any objections may be impartially considered and conflicting interests adjusted. Again, where it is sought to borrow money which might become a burden upon a future generation of ratepayers, it is fully recognized that some Government control is justified.

While, however, we do not object to reasonable control in regard to matters of this kind, it appears to me that the action of the Government Departments is, according to the modern practice, going too far—both in that they seek to interfere in regard to matters of administration frequently of a comparatively trivial character, which ought to be left to the persons elected for the purpose, and in that they seek to take the initiative and to force local authorities into action against their wishes.

MUNICIPAL TRADING.

We do not hear so much on the subject of municipal trading from our critics; and we may take it, I think, that most reasonable persons have been by this time convinced by the action of municipalities during (say) the last decade that, in providing such important public services as the supply of water, electricity and gas, tramways, and other matters, they have met the public requirements both efficiently and economically. I observe that Mr. Balfour Browne, K.C., has been secured by the Society of British Gas Industries as their President this year; and in his presidential address he complains of the want of security of capital invested in gas and water undertakings, owing to Parliament conferring powers for the compulsory purchase of such undertakings. The complaint appears to me entirely unfounded, as the invariable practice of Parliament when giving powers for the compulsory purchase of gas and water is to fully compensate the shareholders for the loss of their

revenue—and, indeed, I should think it highly probable that many of those who were shareholders in the late London Water Companies have been able to invest their money in equally sound securities, and are receiving a larger income therefrom.

It appears to me to be eminently satisfactory that Parliament should allow local authorities to acquire these undertakings—fair terms being, of course, conceded—particularly undertakings for the supply of water. No water company would be prepared to incur such heavy capital expenditure as the large corporations have incurred in recent years in making provision for the supply of water to their inhabitants—not with the view to obtaining an immediate return in money, but with the view to rendering an adequate supply of water absolutely secure for many years to come. Such works, for example, as those which the Liverpool Corporation have completed at Vyrnwy, and which, on their completion, were opened recently by the Prince of Wales, would never have been undertaken if the supply had been in the hands of a company. When we remember that these magnificent works will, no doubt, last for centuries, I think we all agree that municipal trading has done its work.

Public Lighting at Launceston.

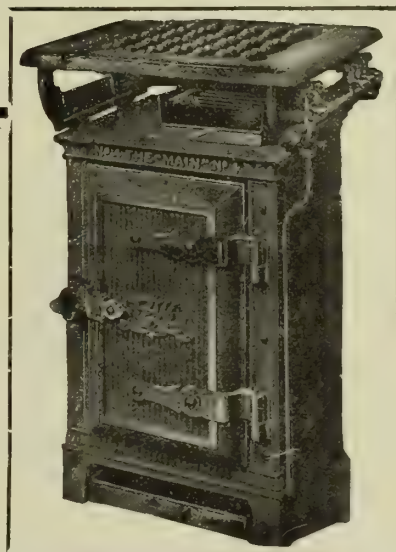
A report presented to the last meeting of the Launceston Town Council by the Lighting Committee recommended the adoption of the meter system in connection with the payment for lighting the public lamps, and that all the lamps be supplied with incandescent burners. It was also proposed that the use of bye-passes be reconsidered. Mr. Hicks, in moving that the Committee be empowered to negotiate with the Gas Company for a supply of gas on this basis, said that for some years there had been dissatisfaction with the existing arrangement; and though they had never had a Committee more friendly disposed to the Gas Company than the present one, some alteration was desirable. They did not know how the Company made up their figures, and how much gas was really consumed. If they adopted the meter system, they would have the satisfaction, whether they saved money or not, of knowing how much gas they consumed, and whether they were paying for what they used. It was proposed to put meters on certain lamps, and strike an average. At present, there were 123 lamps in the town, of which 79 were incandescent. The Mayor said the alteration of the remaining lamps to the incandescent system would cost £90 to £100; but it would result in economy. Mr. Treleaver, jun., thought that the Committee would be unwise to discontinue the use of all bye-passes. In some situations, they were necessary for the protection of the mantles. The recommendation of the Committee was unanimously approved.

Imperial Ottoman Gas-Works, Constantinople.—Owing to improved working results and greater economy in the management, the Council, acting upon the advice of their Engineer (Mr. W. S. McGregor) have reduced the price of gas by 10d. per 1000 cubic feet—the reduction taking effect from the 1st ult.

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SUMMER SEASON 1910.

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MAIN

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

There has not been much progress in the determination of the question of what to do with the Glasgow Gas Consolidation Bill; but, as was stated in the Town Council last week, there is time to consider it before Parliament sits again. The Bill has passed its third reading in the House of Commons. Locally, what has happened this week is that on Tuesday the Parliamentary Bills Committee met and had a long discussion upon the situation. A motion was made that the Corporation proceed with the Bill, and an amendment that it be dropped was moved. Neither of these was adopted, as, on the suggestion of Mr. M. W. Montgomery, the Convener of the Gas Committee, it was agreed to postpone coming to a decision until after the meeting of the Gas Committee. The Gas Committee held a special meeting the next day, and, after a long discussion, resolved to re-commit the matter to the Parliamentary Bills Committee. Whatever resolution this Committee may come to will be submitted to the Town Council.

At the ordinary monthly meeting of the Edinburgh and Leith Gas Commissioners on Monday, the minutes submitted gave the information that the purchases of coal, agreed upon at a meeting on April 11, amounted to a total of 204,500 tons. Mr. W. R. Herring, the Engineer, reported that the German Association of Gas and Water Engineers, who were to be in this country next month, desired to visit the Granton Gas-Works, and were also to visit gas-works in Glasgow. The approximate date was May 24; and the most convenient arrangement would be that they should visit the Granton works in the morning, as in the afternoon they would go to Glasgow, where they were to be entertained at a banquet in the evening. If it were the wish of the Commissioners that the visitors should see the gas-works, the question remained whether they should entertain them at luncheon at the works. Lord Provost Brown thought they should fall in with the arrangement, having regard to the manner in which all of them had received kindness in Germany and France, and elsewhere, when they had gone on municipal business of any kind. The Commissioners agreed to the proposal, and appointed a Committee to make arrangements for the visit.

The list of applicants for the post of Treasurer and Collector to the Edinburgh and Leith Gas Commissioners has now been reduced from 113 to 4. The appointment is to be made at a special meeting of the Commissioners on Monday.

The announcement is made in the "Fife Free Press" to-day that "the Directors of the Kirkcaldy Gaslight Company, Limited, held a meeting on Tuesday, at which a resolution was passed expressing their sense of the loss the Board had sustained by the death of one of their number, who was also Chairman of the Company—Mr. George Prentice Davidson—and instructing the Secretary to send on an extract of the minute to his relatives. To fill the seat on the Board thus rendered vacant, the meeting unanimously appointed Mr. Adam Macpherson, who for many years, as their Engineer and Manager, so successfully

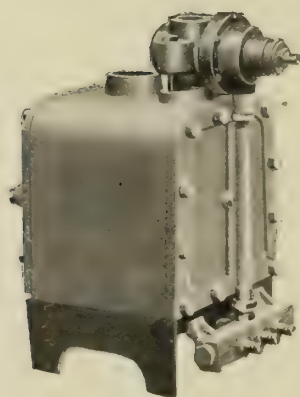
conducted the business of the Company; and they thereafter elected him to the chairmanship of the Board. In view of the Corporation acquiring the business of the Company, we consider this a wise and prudent selection, and one which we are sure will meet with the cordial approval of the shareholders, by whom Mr. Macpherson is so highly and deservedly esteemed." It is also announced that, in view of the transfer, a deputation from the Kirkcaldy Town Council, consisting of Provost Munro Ferguson, M.P., and others, had an interview last week with the permanent officials in the Scottish Office in London, at which some discussion took place with regard to the sinking fund and the division of the profits; and that the deputation also discussed the question of acquiring control of the foreshore.

A gas transfer is in progress at Barrhead; and in connection with it a poll of the ratepayers was taken last Saturday, upon the question of the adoption of the Burghs Gas Supply (Scotland) Act of 1876. Only 542 votes—less than a fourth of the ratepayers—were recorded. The result was: For, 446; against, 96. There was thus a majority of 350 in favour of the proposal.

The Gas Committee of the Dundee Town Council have agreed to recommend that a contribution of ten guineas be made to the William Young Memorial Fund.

This afternoon a woman named Black, residing in Livingstone Place, Edinburgh, was found dead in her house. She had taken her seat beside a small gas-fire, having a flexible tube, and had lifted the fire on to her lap; the gas being turned on. It was in this position that she was found by her son when he returned from work. A medical man was called, who pronounced life to be extinct.

Preparations are being made for raising the level of Lintrathen Loch, from which the greater portion of the water supply to Dundee is obtained. A Sub-Committee have reported to the Water Committee of the Corporation that, in proposing to raise the loch from 676 to 680 feet Ordnance Datum, the Engineer—Mr. J. Baxter—is simply resuscitating a scheme which was adopted by the Commissioners in 1890, and for which powers were obtained by the Dundee Water Act of 1891. The works were estimated by the then Engineer of the Department to cost £17,642, independent of land claims, tenants' damages, engineering fees, and parliamentary expenses. The statutory powers obtained in 1891 were allowed to lapse, because an arrangement was come to under which less water was required to be given as compensation. In 1890, the average daily consumption of water was 8,705,551 gallons per day during the past six months, it has been at the rate of 11,592,000 gallons—an increase of nearly 3 millions per day. Mr. Baxter has pointed out that the existing storage at Lintrathen is only capable of supplying the requirements of the undertaking with 10½ million gallons daily over 150 days of drought. Therefore, in dry weather, the old works at Monikie, which are capable of yielding 2 million gallons per day, alone prevent a shortage of supply. The proposals submitted by Mr. Baxter include all the works previously recommended and approved of; and their construction would increase the storage capacity of the reservoir from 1601 to 2175 million gallons, and would provide for an average daily draught of 14½ million gallons over a period of 150 days



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of extremely dry weather. Mr. Baxter's estimate is £15,000; but he expects to be able to accomplish the work within this figure, if it be taken in sections, and the administration be under his own supervision. Almost all the expenditure will be required for wages; there being sufficient material available within the Commissioners' own grounds. The Water Committee were of opinion that they could not, in view of the advice given by the Engineer, longer delay the execution of the work; and they resolved to recommend to the Town Council that the work be proceeded with as suggested, and that a Provisional Order authorizing it be applied for. Having regard to the fact that the work devolving on Mr. Baxter during the next two years will be exceptionally heavy, and that he will have increased personal expenses in carrying through the scheme, it is recommended that they agree to pay him, after the works have been completed, a sum sufficient to cover all his reasonable outlay.

After an inquiry extending over ten days, and involving the examination of thirty-six witnesses—nineteen on the side of the promoters and seventeen on the side of opponents—a House of Lords Committee on Thursday rejected the Avon water scheme of the Corporation of Aberdeen. The scheme was first suggested in 1898. It was adopted by Mr. Alex. Wilson, now Lord Provost of the City, who became its champion, and has striven to have it carried into effect, but as yet unsuccessfully. Aberdeen is at present supplied with water which is taken from the River Dee, about twenty miles up the river. It has all along been an unsatisfactory supply, in the matter of purity, in consequence of which the attention of public men has frequently been occupied by the problem of finding another source of supply. Various schemes were considered; and in the end the Town Council adopted that in which it was proposed to take water from the River Avon. The Avon is a tributary of the Spey, and therefore outside the natural watershed for Aberdeen. The scheme involved the construction of a reservoir of immense size at Inchroary, at the eastern base of the Cairngorm Mountains, and of an aqueduct forty-seven miles in length. The cost, for a first instalment of 10 million gallons per day, was estimated by Sir Alexander Binnie and Mr. G. F. Deacon at £1,068,500. The scheme was fiercely opposed, chiefly by city traders, in whose opinion the present supply could be augmented and made quite satisfactory, by filtration, at a cost of £600,000. The Avon water is of sufficient purity not to require any treatment. As indicated above, the Parliamentary Committee refused to pass the preamble. There is much consternation in the city at the result, not only on account of the loss of the measure, but of the costs incurred, which are estimated to amount to not less than £10,000.

Great scarcity of water has been experienced in the Rhymney Valley, chiefly in Bargoed, Tirphil, and Brithdir. The cause of the water stoppage is said to be a further burst of the Rhymney and Aber Valley Water Company's mains about a quarter-of-a-mile below Pontllynn. This trouble is the result of subsidence near the spot where the mountain was recently reported to be moving.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, April 30.

During the week there has been again an inactive market, and the demand has barely been sufficient to absorb current reduced output. This has resulted in a further decline in values; and the quotations at the close are £12 per ton f.o.b. Hull, £12 1s. 3d. to £12 2s. 6d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. Although there have been several inquiries in the forward position, no actual business has transpired; the ideas of consumers and makers being too divergent to admit of transactions taking place.

Nitrate of Soda.

The tone of the market for this article has become rather easier again, and the price has been reduced to 9s. 6d. per cwt. for ordinary quality and 9s. 9d. for refined, on spot.

Tar Products.

LONDON, May 2.

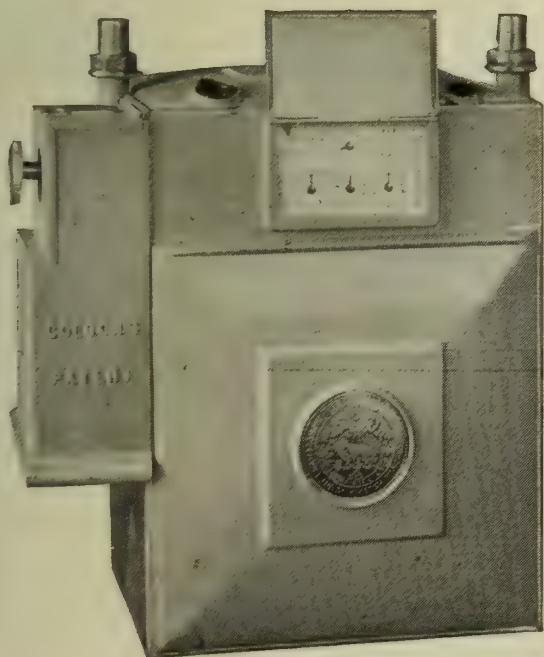
The markets for tar products have been very firm during the past week—one notable feature being the substantial rise in pitch since the last report. Crude carbolic remains about the same; and it is very difficult to do business in this article. Benzol and naphthas are firm, and prices are well maintained. Creosote is steady; but the business transacted is not very large.

The average values during the week were: Tar, 18s. to 22s., ex works. Pitch, London, 38s. to 38s. 6d.; east coast, 38s. to 38s. 6d.; west coast, 38s. to 38s. 6d. f.a.s. Mersey ports, 38s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 8d. to 8½d.; North, 8d.; 50-90 per cent., casks included, London and North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4½d. to 4¾d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has shown a further weakening during the past week; but there was little business transacted towards the close, owing to manufacturers being slightly more reasonable in their ideas. To-day, Beckton is quoted at £12 2s. 6d.; London, £11 12s. 6d. to £11 13s. 9d.; Hull, £12; Liverpool, £11 18s. 9d. to £12; and Middlesbrough, £11 18s. 9d. to £12.

The Parish Council at Chiddingfold (Sussex) have resolved to support a private company for supplying water to the district.



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COAL TRADE REPORTS.

Northern Coal Trade.

There is now a fuller production of coal at the Northern collieries, and prices have shown ease. In the steam coal trade, best Northumbrians are from 11s. 3d. to 11s. 6d. per ton f.o.b.; and second-class steams are also a little lower at from 10s. 3d. and 10s. 9d. per ton, with a rather limited business. Steam smalls are generally steady, and prices vary from 6s. 3d. to 7s. 6d. per ton f.o.b. It is hoped that there will be a better demand for steam coals now that the shipping season is being entered upon. In gas coals, the local consumption is less, but there is a fair shipment generally. Prices are easier, with Durham gas coals from 10s. 2d. to 10s. 9d. per ton f.o.b., according to quality, for the usual classes; and "Wear specials" are about 11s. 6d. per ton. In contracts, those for the Companies of the Metropolis make slow progress—offers and counter offers defining prices only slowly. It is, however, quite possible that ultimately there may be a settlement somewhere between 10s. and 10s. 3d. per ton; but as some of the Companies have full stocks, the settlement is not pressed forward by them. One or two small quantities of gas coal have been contracted for at near the current quotations—for export, during the season. In the coke trade, the demand is steady; and with a limited production, gas coke is firm at from 14s. to 14s. 3d. per ton f.o.b. on the Tyne for good quality.

Scotch Coal Trade.

The coal market has been quiet and without any special feature, except that splint is not going off so well, and there is an easier tendency in price. Ell is in fair request for prompt shipment, with the price steady. Treble and double nuts are not in demand. All kinds of small are being disposed of promptly, and prices continue firm. The quotations are: Ell, 9s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; and splint and steam, 10s. to 10s. 6d. The shipments for the week amounted to 322,283 tons—an increase of 6991 tons upon the preceding week, and of 16,782 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,720,110 tons—an increase of 615,788 tons upon the corresponding period.

Tar Spraying of Roads.—It has been decided by the Exeter City Council to accept a tender of £400 for the tar spraying of certain roads. Mr. Varwell said they were all agreed as to the desirability of tar spraying; but the roads should be put in a suitable state first. It was useless to do it on rough, uneven surfaces. Mr. Gardner, in reply to a criticism of the cost, said the price quoted was less than that at which the Corporation could do the work, besides which they would have to buy a suitable machine at a cost of £100 to £150. Mr. Reed stated that the price quoted was 8d. per superficial yard, and he knew another public body who were paying 1d.

Llandrindod Wells Gas Company.

The second annual general meeting of the Llandrindod Wells Gas Company was held at the Offices of the Company, No. 17, Victoria Street, Westminster, S.W., on the 25th ult.—Mr. Charles Hunt in the chair. The report stated that there were now 210 consumers; and additional applications for gas were under consideration. The accounts showed that the result of the first eight months' trading was a small profit, after paying all the expenses incidental to the starting of the works. In moving the adoption of the report and accounts, the Chairman said that he had recently paid a visit to Llandrindod Wells, and was gratified with the signs of progress which were there exhibited, and which augured well for the future of the Company. The retiring Director (Mr. F. R. Smith) and the retiring Auditor (Mr. F. A. Cad-dick) were re-elected. The meeting was afterwards made special, and a resolution adopted authorizing the Directors to exercise the borrowing powers of the Company by the issue of debenture stock. A vote of thanks to the Chairman terminated the proceedings.

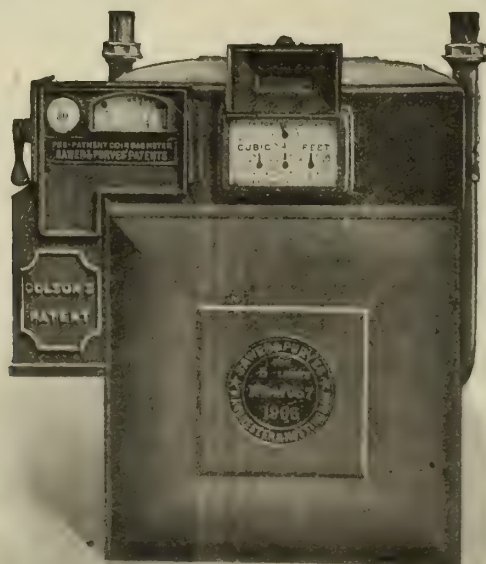
Gas Purchase Question at Monaghan.

The Monaghan Urban District Council some time ago had under consideration the question of introducing electric light into the town; but one member suggested as an alternative that the Council should acquire the gas-works. As the result, the Gas Company held a meeting for the purpose of ascertaining the minds of the shareholders as to the disposal of their property. After discussion, the following resolution was passed by a majority; many proxies being recorded against selling the property: "That we, the shareholders of the Monaghan Gas Company, summoned to consider at this extraordinary general meeting the proposal of the Monaghan Urban District Council to purchase the Company's works and plant, together with their entire interest in the same, hereby agree to sell the said property at a fair and reasonable price, the value to be ascertained by two expert Arbitrators, one to be appointed by the Company and one by the Urban Council, with power to call in an Umpire in the event of their failing to agree; the award of the two Arbitrators to be final, and should they fail to agree the Umpire to decide. Further, that before the Arbitrators are appointed, the parties shall sign a deed binding themselves to carry out the award as determined by the foregoing arrangement. We further make it a condition of the said contemplated sale that the present Manager be retained in office, subject to his being paid at least his present salary and emoluments."

Birmingham Gas Profits.—At a meeting of the Gas Committee of the Birmingham Corporation on Monday of last week, it was announced that the amount to be handed over to the rates as the result of last year's working will be not less than the amount for the previous year, which was about £71,000. The exact sum has not at present been ascertained.

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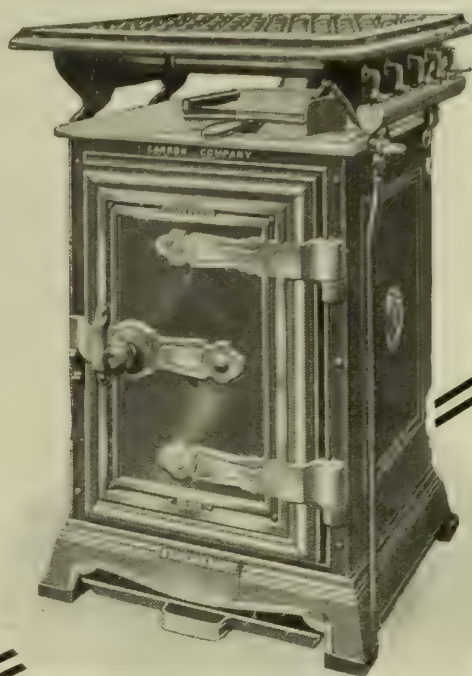
Middlesex Gas-Meter Testing-Station.—The annual report of the work carried on at the Middlesex gas-meter testing-station has just been issued by Mr. W. E. Barney. During the twelve months, 82,184 meters were tested; the fees charged being £2492. The previous year's totals were 82,558 meters, and £2497 fees. Out of the total of 82,184 meters last year, 68,705 were tested at the minimum fee of 6d. There were 77,362 meters received from the makers; and of these 2005 were rejected. From gas companies and consumers 4822 were received; and of these 2979 were rejected. The number of meters received from gas companies and consumers shows an increase as compared with the previous year, when there were 4244 submitted. During the year, the total expenditure in connection with the upkeep of the station amounted to £1540.

Electrical Expectations Unfulfilled at Elland.—When returning thanks for his re-election for the fifth time to the office of Chairman of the Elland Urban District Council, Mr. H. Sharratt remarked that it was to be regretted that their expectations with regard to the electricity works had not been fulfilled. This, however, was entirely due to the lack of support from the ratepayers themselves. He appealed to his fellow townsmen to rally round, and to help to make the department a paying concern. It was a splendid installation, and well managed; but many more consumers were needed. If, through lack of support, it should have to be carried on at a loss, it might mean an addition to the rates. On the other hand, if it was made into a paying concern, it would be possible to keep the rates at their present level, and even some day to make a reduction.

Huddersfield Gas and Water Supply.—Alderman Woodhead, the Chairman of the Huddersfield Corporation Finance Committee, when moving the adoption of the estimates, as recommended by the various Committees, as a basis for the next borough rate at 7s. 6d. in the pound, informed the Council that the total amount of rate levied last year was £186,786. The actual sum collected was £173,152. The water-works revenue account showed a deficiency of £17,155, including £16,537 in respect of interest previously capitalized; and the Committee asked for an amount equal to a rate of 9d. in the pound. The water-works depreciation and contingencies account stood at £20,359. The revenue account of the gas-works fund showed a surplus on the year of £5884, as compared with a deficit of £5593 the previous year. There had been an increase in the gas-rental of £2117; while the working expenses had been reduced by £8789—principally in carbonization, purification, and distribution accounts. The Committee had decided to transfer £5718 in relief of the borough rates (equal to 3d. in the pound), and the balance of £166 to the depreciation and contingencies account, which now showed a credit balance of £31,740.

Cheltenham Electricity Supply.—At a Local Government Board inquiry with regard to an application by the Cheltenham Town Council for a further loan of £4000 for the purposes of the electricity undertaking, the Town Clerk said there was an unexpended balance of previous loans amounting to £18,078. The Inspector (Mr. H. R. Hooper) wanted to know how this balance was arrived at; but neither the Town Clerk nor the Electrical Engineer could give the details. The latter explained that he had only come on the scene five years ago, and that since then he had allocated the capital expenditure strictly to the purposes for which the loans in his time were obtained. In the earlier days this practice had not been followed, and it was impossible to say exactly how much of certain loans remained unexpended, though he could give approximate figures. The Inspector expressed himself as dissatisfied with this method of conducting the accounts of the concern. An electricity undertaking, he observed, was a matter of pounds, shillings, and pence, and the amount of the expenditure on the loans raised ought to be ascertainable within even a few pence. He did not know how they could proceed with the present application if they could not tell him how the unexpended balance was made up. Where was the necessity for borrowing another £4000 if they had an unexpended balance of £18,078 in hand? The Town Clerk replied that the money was not in hand. What he meant by "unexpended balance" was the aggregate amount of the money they had taken power to raise under different loans, but had not raised. The Inspector: Then these balances should have been cancelled. The Town Clerk replied that he was taking steps to get this done.

The Purity of the Truro Water Supply.—At the last meeting of the Truro Town Council, the Sanitary Committee presented a report in which they stated that they had considered an analysis by Mr. Kitto of a sample of the water supplied by the Truro Water Company, and recommended that it be forwarded, with copies of previous reports, to the Local Government Board, with a view to obtaining the co-operation of the Board in inducing the Company to ensure filtration of the water and the provision of a pure supply. Mr. Crews thought that before taking the action recommended by the Committee, they should ascertain from the Company what had been done in regard to the statement recently made that they were doing in the services of eminent experts. He understood the Council had expressed approval of the undertaking the Company gave; and unless they could prove that the Company had been dilatory in the matter, and were not doing what they promised to do, it would be better not to bring the matter into prominence, and raise anything like a scare or want of confidence in the purity of the water supplied to the city. Alderman Whitworth was of opinion that it would be premature to adopt the report and take the course suggested. He said they had an assurance from the Water Company that they had called in one of the greatest experts in reference to water supply with a view to remedying any defects which might exist. Little harm would be done by deferring the matter for a month. The Mayor (Mr. T. Beard) said the Committee felt it was necessary to get the Company to move quickly. Alderman Whitworth remarked that the Company were as anxious as the Council to get the water as pure as possible; but these things could not be done in a day or a week. Mr. J. J. Smith, the Chairman of the Water Committee, said the matter had been deferred many times, and the Committee thought it necessary, after the recent analyses, that something practical should be done, so that the city might be assured of being supplied with good water within a reasonably short period. The report was referred back to the Committee.



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South Luton District Gas Company.—The "Financial News" states that Mr. D. Hawkins, the Secretary of the South Luton District Gas-light and Coke Company, Limited, has issued a circular, dated April 25, convening an extraordinary general meeting of the shareholders to be held at Moorgate Station Chambers, this afternoon, when the following resolution will be submitted: "That Mr. Augustus Edwards, chartered accountant, of Capel House, New Broad Street, London, E.C., be, and is hereby, appointed Liquidator for the purpose of winding-up the Company."

Laindon Gas-Works Disposed Of.—As advertised, the freehold gas-works of the Laindon and District Gaslight, Coke, and Water Company, Limited, were, by order of the Court, put up to auction on the 12th ult. by Messrs. A. & W. Richards, at the Mart, Tokenhouse Yard; but the reserve figure was not at the time reached. The firm have, however, since succeeded in selling the works for £650. And these works form part of a gas and water concern on which the Eaton group in 1906 endeavoured to secure £12,000 of capital, of which the vendors (the Water-Works, Lighting, and Power Investment Corporation) were apparently to get £9500.

The Clerk to the Ripley Urban District Council has been instructed to make inquiries of other councils who have purchased gas-works, with a view to his own Council acquiring the local undertaking.

From the "Local Government Journal" we gather the information that Mr. C. E. Gravely, a blind councillor, has been elected on the Lighting Committee of the Clayton Parish Council, Sussex.

The Belfast Gas Committee have resolved that an engineering assistant be appointed to prepare the necessary plans and estimates in connection with the proposed new gas-works, and that the appointment be left in the hands of the Manager (Mr. R. Sharpe).

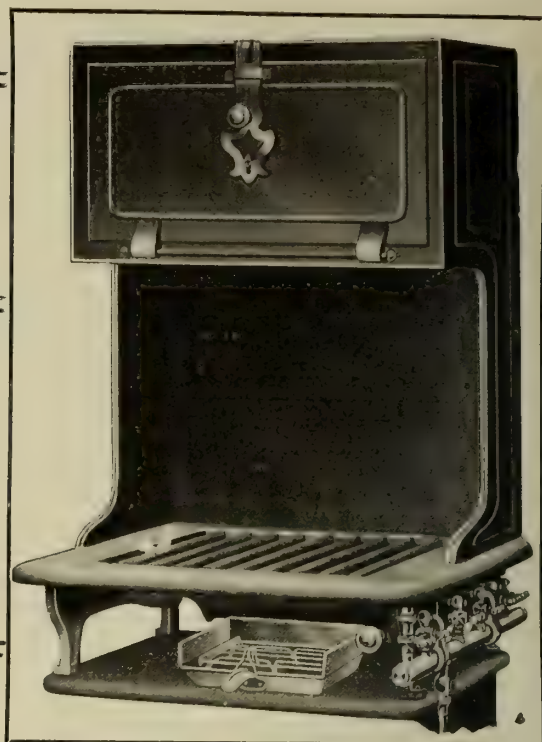
At a meeting of the Finance Committee of the Darwen Town Council, intimation was given by Councillor T. Duxbury that he would, when the matter came before the Council, oppose the proposal to take profits from the Gas Department for the relief of the rates.

At an inquest at Shipley, some complaint was made as to the dangerous position of gas-meters in the district. The inquiry had reference to the death of John Trotter, aged 74 years, a wool scourer, of Saltaire, who died from injuries received from a fall sustained while in the act of putting a copper in the penny-in-the-slot meter, which, it was stated, was situated over the kitchen sink. In returning a verdict of "Accidental death," the Jury requested the Coroner to communicate with the District Council in reference to the way that meters are fixed in the district.

Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, have just secured orders for Livesey washers for Bahia, Colombo (2), Sutton-in-Ashfield, and Japan (2); stills for Cologne and Sunderland; heater for Newcastle; annular condensers, exhauster, pumps, and rotary washer-scrubber for Sutton-in-Ashfield; two purifiers for Japan; roofs for the Cardiff Gas Company; a retort-bench and fittings, and also retort-house and coal-store roofs, for Frizington; a spiral-guided gasholder and steel tank for Carfin; an additional lift 98 feet diameter to a two-lift gasholder in a steel tank at Morecambe; a rotary washer-scrubber for Seaham; a condenser and tar extractor for the Luton Gas Company, and several other important contracts in other districts.

At the meeting of the Chelsea Borough Council last Wednesday, the Works Committee reported that in February last it was decided to terminate the contract with Messrs. D. Anderson and Co., Limited, for the maintenance of Scott-Snell lamps, and to substitute others therefor. In order to test the merits of various types of burners, experiments had since been carried out in various parts of the borough; and as a result of these experiments, the Committee had come to the conclusion that the "Daco" lamps were most suitable. The cost of gas for a four-light "Daco" lamp was £5 18s. 4d. a year, as against £6 10s. 2d. for a Scott-Snell lamp. It was decided that the 33 Scott-Snell lamps be replaced by "Daco" lights, and that the lanterns be adapted to take the new burners, at a cost not exceeding £3 10s. each. It was left to a Committee and the Borough Surveyor to determine finally as to whether four or a less number of gas-burners should be placed in each lamp.

The "Beautiful Sheffield League," at their inaugural meeting, were addressed at length by Mr. Edward Carpenter, who expressed the opinion that the whole of the existing "smoke plague" was unnecessary. "It has," he remarked, "been now proved that smoke might be completely abolished with economy and financial advantage, as well as with enormous gain to our lives and health. The Smoke Abatement Exhibition held last year, and the addresses given in connection with it by authorities like Sir Oliver Lodge, show this. Mechanical stokers of various forms have made the banishment of smoke from boiler furnaces easy. The use of gas instead of green coal in connection with heating furnaces of various kinds is being more and more favoured; and it is only, I suppose, the initial expense of converting furnaces to the new patterns which delays its more rapid adoption. Electric power and electric heating (which, of course, secure absolutely clean atmospheric conditions) are coming more and more into use; the economic transmission of electric energy over long distances is now an accomplished fact; and it is, I imagine, only a question of time before electric generators will be placed at the very mouths of the coal-pits, to convert the coal at once into power without any wasteful carriage, and so enable the latter to be distributed over a large city like Sheffield at a low cost, and with great economy. All these things are actually proved results of modern science and invention; and it is only the inertia of old habits and institutions which stands in the way of their adoption." He urged people at once to improve the forms and fuel of their stoves in such a way as to obviate the evil of house-smoke. It was much to be hoped that before long "naked gas" would cease to be used for lighting purposes, and that cheap heating gas would be provided instead, which would put excellent gas-fires and cooking-stoves within reach of everybody. Much might be done by encouraging this idea.



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PLATE WARMER

FOR FITTING ABOVE COOKER.

Thoroughly heated by the heat after being used in oven, also by means of the hot-plate burners.

Substantially constructed throughout, and fitted with Fall Door, which is very convenient for use as a rest for plates.

Plates are evenly warmed ready for use, and do not get discoloured or moist from condensation.

See special list for other new designs in Plate Racks, &c.

THE
PARKINSON STOVE CO.,

(Incorporating Maughan's
Patent Geyser Co.),

Stour St., Spring Hill, & 129, High Holborn,
BIRMINGHAM. LONDON.

The Corporation of Oldham have been fined 20s. and costs in each of two cases for permitting the emission of black smoke from their Greenhill electricity works. Mr. Newington, the Electrical Engineer, explained that experiments were being made with smoke consumers at the Greenhill station. Before any appliance was fixed to the boilers, they wanted to be quite sure they had the most effective to fix the one they were trying to all the boilers would cost about £2500; so that they did not want to make any mistake. He thought they would succeed in doing away with any smoke nuisance. Indeed, they had not been great sinners in the past. In the present case, he pointed out that the observation was taken about sunset. A large amount of steam was turned out of the chimney; and he defied any man in certain lights to tell the difference between steam and smoke. He did not deny that black smoke was emitted from the chimney at times; but they also turned out a lot of steam.

The Weights and Measures Committee of the Hertfordshire County Council have had under consideration a letter from the First Garden City, Limited, making application for the appointment by the County Council of an Inspector of Gas-Meters for the parish of Letchworth, under the Sale of Gas Act. The writers said they were in negotiation with a firm of gas-meter manufacturers, who might establish their works here instead of in London; and the question of stamping had arisen. The Committee have been in negotiation with the First Garden City, with the result that the Company have decided to enter into an agree-

ment with the County Council upon the following terms: (1) The Company, at their own expense, to provide a fit and proper place, to be approved in writing by the County Council, for the sole use of the County Council and their Inspectors, for the deposit of duly verified and stamped copies of the models of gasholders mentioned in the Act, with proper balances, indices, and other apparatus for testing the measurement and registration of gas-meters, and with stamps for stamping gas-meters, and also a fit and proper place for the examination, testing, and stamping of such meters, and to provide the money required for providing all such copies of models, apparatus, and stamps. (2) When the above places, articles, and things have been provided, the County Council to appoint a duly qualified person to act as Inspector of Gas-Meters for the parish of Letchworth, or for a district including that parish. (3) The Company to keep the above places, articles, and things in good order and condition, and to provide the Inspector with such workmen and other assistants as he may reasonably require to enable him to perform his duties with regard to the parish of Letchworth. (4) If in any year of office of the Inspector the fees received in respect of the parish of Letchworth are not sufficient to provide the money required for payment of the expenses of the County Council, the Company to pay the amount of such deficiency, not exceeding the sum of £50 in any one year—such expenses to include the whole of the remuneration and expenses of the Inspector attributable to the execution of the Act in the parish of Letchworth.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS LIGHTING EXPERT. No. 945. c/o Rudolf Mosse, Hamburg.
WORKING MANAGER. Cranleigh Gas Company. Applications by May 9.
REPRESENTATIVE (GAS STOVE TRADE). No. 5231.
GAS FITTER, &c. Bognor Gas Company.

Plant, &c. (Second Hand), for Sale.

EXHAUSTER, RETORT MOUTHPIECES, &c. Grays and Tilbury Gas Company.
PUMP (AIR OR GAS). Ordnance Office, Harwich.
TANK WAGGONS. Watson, Sowter, and Co., Derby.
WASHER, &c. Whitehouse's Executors, Ilkeston.

Plant, &c. (Second-Hand), Wanted.

STREET LAMPS. Alford Gas Works.

Patent for Disposal, &c.

LIGHTING CONTROLLERS, &c. L. Duvinage, Brussels.

Stocks and Shares.

BARNET GAS COMPANY. May 24.
DORKING GAS COMPANY. May 24.
LEA BRIDGE GAS COMPANY. May 10.

TENDERS FOR

Benzol Wanted. No. 5232.

FOR EXPORT TO THE CONTINENT. No 5225.

Coal and Cannel.

BARROW-IN-FURNESS CORPORATION. Tenders by May 24.
BIRKENHEAD CORPORATION. Tenders by May 12.
CAPE TOWN GAS COMPANY. Tenders by May 20.
CUPAR GAS COMPANY. Tenders by May 9.
ELSECAR, WENTWORTH, and HOYLAND GAS COMPANY. Tenders by May 11.

Coal and Cannel (continued).

HEYWOOD GAS DEPARTMENT. Tenders by May 12.
LINCOLN GAS DEPARTMENT. Tenders by May 20.
PAIGNTON GAS COMPANY. Tenders by May 7.
RAMSGATE GAS AND WATER DEPARTMENT. Tenders by May 9.
SOUTH STAFFORDSHIRE WATER COMPANY. Tenders by May 18.

Purifiers, &c.

CHESTER GAS COMPANY. Tenders by May 12.

Steel and Cast-Iron Work for Roof.

CHESTER GAS COMPANY. Tenders by May 12.

Tar and Liquor.

EASTBOURNE GAS COMPANY. Tenders by May 7.
MACCLESFIELD GAS DEPARTMENT. Tenders by May 14.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 298.

| Issue | Share. | When ex-Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue | Share. | When ex-Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---------|--------|-------------------|--------------------|------------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|--------------------|----------------------------|-----------------|---------------------|------------------------|
| £ | | | p.c. | | | | £ s. d. | £ | | | p.c. | | | | £ s. d. |
| 474,000 | Stk. | Apl. 1 | 5 | Alliance & Dublin Ord. | 82-84 | -1 | 5 19 1 | 4,940,000 | Stk. | Nov. 11 | 8 | Imperial Continental | 181-183 | .. | 4 7 5 |
| 310,000 | Stk. | Jan. 13 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 1,235,000 | Stk. | Feb. 10 | 3 1/2 | Do. 3 1/2 p.c. Deb. Red. | 94-96 | .. | 3 12 11 |
| 200,000 | 5 | Oct. 28 | 7 | Bombay, Ltd. | 68-68 1/2 | .. | 5 5 8 | 195,242 | Stk. | Mar. 16 | 6 | Lea Bridge Ord. 5 p.c. | 122-124 | .. | 4 16 9 |
| 40,000 | 5 | Feb. 25 | 15 | Do. New, £4 paid. | 5-5 1/2 | .. | 5 6 8 | 561,000 | Stk. | Feb. 25 | 10 | Liverpool United A. | 222-224 | .. | 4 9 3 |
| 50,000 | 10 | .. | 15 | Bourne 10 p.c. | 29-30 | .. | 5 0 0 | 718,100 | " | .. | 7 | Do. B. | 163 1/2-165 1/2 | .. | 4 4 7 |
| 311,810 | 10 | .. | 7 | mouth Gas B 7 p.c. | 16 1/2-16 3/4 | .. | 4 3 7 | 306,083 | " | Dec. 29 | 4 | Do. Deb. Stk. | 103-105 | .. | 3 16 2 |
| 75,000 | 10 | .. | 6 | and Water Pref. 6 p.c. | 15-15 1/2 | .. | 3 17 5 | 75,000 | 5 | Nov. 26 | 6 | Malta & Mediterranean. | 4 1/2-5 | .. | 6 0 0 |
| 380,000 | Stk. | .. | 12 1/2 | Brentford Consolidated | 251-254 | .. | 4 18 5 | 560,000 | 100 | Apl. 1 | 5 | Met. of 5 p.c. Deb. | 100-102 | .. | 4 18 0 |
| 300,000 | " | .. | 9 1/2 | Do. New | 183-190 | .. | 5 0 0 | 250,000 | 100 | .. | 4 1/2 | Melbourne 4 1/2 p.c. Deb. | 100-102 | .. | 4 8 3 |
| 50,000 | " | Aug. 12 | 5 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 0 | 541,920 | 20 | Nov. 11 | 3 1/2 | Monte Video, Ltd. | 12 1/2-13 1/2 | .. | 5 5 8 |
| 266,250 | " | Dec. 20 | 4 | Do. 4 p.c. Deb. | 101-103 | .. | 3 17 8 | 1,775,892 | Stk. | Feb. 25 | 4 1/2 | Newcastle & Gt. Tesh'd Con | 104-106 | .. | 4 2 7 |
| 220,000 | Stk. | Mar. 16 | 11 | Brighton & Hove Orig. | 213-216 | .. | 5 1 10 | 529,435 | Stk. | Dec. 29 | 3 1/2 | Do. 3 1/2 p.c. Deb. | 91-93 | .. | 3 15 3 |
| 246,320 | " | .. | 8 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 55,940 | 10 | Feb. 25 | 7 | North Middlesex 7 p.c. | 13 1/2-13 3/4 | .. | 5 1 10 |
| 469,000 | 20 | Apl. 1 | 11 | British A. | 44-45 | .. | 4 14 8 | 300,000 | Stk. | Apl. 29 | 8 | Oriental, Ltd. | 138-140 | .. | 5 14 4 |
| 109,000 | Stk. | Feb. 25 | 11 | Broimley, A 5 p.c. | 118-120 | .. | 5 0 0 | 60,000 | 5 | Apl. 1 | 8 | Ottoman, Ltd. | 6-6 1/2 | .. | 6 8 0 |
| 165,700 | " | .. | 4 1/2 | Do. B 3 1/2 p.c. | 88-90 | .. | 5 0 0 | 31,800 | 53 | Feb. 25 | 13 | Portsea Island A. | 134-136 | .. | 5 1 0 |
| 82,278 | " | .. | 5 1/2 | Do. C 5 p.c. | 105-107 | .. | 5 2 10 | 60,000 | 50 | .. | 13 | Do. B. | 126-128 | .. | 5 1 7 |
| 55,000 | " | Dec. 29 | 3 1/2 | Do. 3 1/2 p.c. Deb. | 87-89 | .. | 3 18 8 | 100,000 | 50 | .. | 12 | Do. C. | 119-121 | .. | 4 19 2 |
| 50,000 | 10 | Oct. 14 | 7 | Buenos Ayres (New) Ltd. | .. | .. | .. | 114,800 | 50 | .. | 10 | Do. D and E. | 100-102 | .. | 4 18 0 |
| 250,000 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 98-100 | .. | 4 0 0 | 398,490 | 5 | Apl. 29 | 7 | Primitiva Ord. | 7 1/2-7 3/4 | .. | 4 10 4 |
| 100,000 | 10 | .. | 6 | Cape Town & Dis., Ltd. | 4-5 | .. | .. | 796,980 | 5 | Jan. 27 | 5 | Do. 5 p.c. Pref. | 5 1/2-5 3/4 | .. | 4 9 11 |
| 50,000 | 50 | Nov. 2 | 1 | Do. 4 1/2 p.c. Pref. | 6-7 | .. | .. | 488,900 | 100 | Dec. 1 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 100,000 | Stk. | Dec. 29 | 4 1/2 | Do. 6 p.c. 1st Mort. | 49 1/2-50 1/2 | .. | 5 18 10 | 1,000,000 | 10 | Oct. 14 | 8 | River Plate Ord. | .. | .. | .. |
| 157,150 | Stk. | Feb. 25 | 5 | Do. 4 1/2 p.c. Deb. Stk. | 96-98 | .. | 5 2 3 | 312,650 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 513,280 | Stk. | Feb. 25 | 5 1/2 | Chester 5 p.c. Ord. | 109-111 | +1 | 4 10 1 | 250,000 | 10 | Apl. 1 | 9 | San Paulo, Ltd. | 15 1/2-15 3/4 | .. | 5 14 3 |
| 56,000 | " | .. | 5 1/2 | Commercial 4 p.c. Stk. | 105-108 | .. | 4 16 4 | 62,500 | 10 | .. | 6 | Do. 6 p.c. Pref. | 11 1/2-12 1/2 | .. | 4 18 0 |
| 85,000 | " | Dec. 29 | 3 | Do. 3 1/2 p.c. do. | 103-105 | .. | 4 15 3 | 125,000 | 50 | Jan. 3 | 5 | Do. 5 p.c. Deb. | 5 1/2-5 1/4 | .. | 4 17 1 |
| 470,000 | Stk. | Dec. 10 | 5 | Do. 3 p.c. Deb. Stk. | 81-83 | .. | 3 12 3 | 135,000 | Stk. | Mch. 16 | 10 | Sheffield A. | 232-234 | .. | 4 5 5 |
| 200,000 | " | .. | 7 | Continental Union, Ltd. | 98-100 | .. | 5 0 0 | 209,984 | " | .. | 10 | Do. B. | 232-234 | .. | 4 5 5 |
| 492,270 | Stk. | .. | 1 1/2 | Do. 7 p.c. Pref. | 138-140 | .. | 5 0 0 | 523,500 | " | .. | 10 | Do. C. | 232-234 | .. | 4 5 5 |
| 55,000 | " | .. | 4 | Derby Con. Stk. | 121-123 | .. | 4 9 5 | 70,000 | 10 | Oct. 14 | 10 | South African. | 12 1/2-12 3/4 | .. | 7 16 11 |
| 141,095 | " | Apl. 1 | 5 | Do. Deb. Stk. | 104-105 | .. | 3 10 2 | 6,429,895 | Stk. | Feb. 10 | 5/9/4 | South Met., 4 p.c. Ord. | 120-122 | .. | 4 9 7 |
| 466,400 | 10 | Jan. 27 | 12 | East Hull 5 p.c. Ord. | 96-98 | .. | 5 2 0 | 1,895,445 | " | Jan. 13 | 3 | Do. 3 p.c. Deb. | 81-83 | .. | 3 12 3 |
| 351,000 | Stk. | .. | 12 | European, Ltd. | 24 1/2-25 1/2 | .. | 4 17 0 | 209,820 | Stk. | Mar. 16 | 8 | South Shields Con. Stk. | 157-158 | .. | 5 1 3 |
| 153,571 | Stk. | Feb. 10 | 4 1/2 | Do. £7 10s. paid. | 18 1/2-19 1/2 | .. | 4 16 0 | 605,000 | Stk. | Feb. 25 | 5 1/2 | S'th Suburb'n Ord. 5 p.c. | 121-123 | .. | 4 12 0 |
| 600,000 | " | .. | 3 1/2 | Gas 4 p.c. Ord. | 103 1/2-104 1/2 | .. | 4 9 3 | 60,000 | " | .. | 5 | Do. 5 p.c. Pref. | 121-123 | .. | 4 1 4 |
| 602,235 | " | .. | 4 | light 3 1/2 p.c. max. | 88-90 | .. | 3 17 9 | 117,058 | " | Jan. 13 | 5 | Do. 5 p.c. Deb. Stk. | 122-124 | .. | 4 0 8 |
| 531,706 | " | Dec. 29 | 3 | and 4 p.c. Con. Pref. | 104-106 | .. | 3 15 1/2 | 502,310 | Stk. | Nov. 11 | 5 | Southampton Ord. | 110-112 | .. | 4 11 3 |
| 256,740 | Stk. | Mar. 15 | 5 | Coke 3 p.c. Con. Deb. | 81-83 | .. | 3 12 3 | 120,000 | Stk. | Feb. 10 | 6 1/2 | Tottenham A 5 p.c. | 133-135 | .. | 5 1 9 |
| 62,500 | " | .. | 6 1/2 | Hastings & St. L. 3 1/2 p.c. | 117-119 | .. | 5 5 3 | 453,940 | " | .. | 5 1/2 | and B 3 1/2 p.c. | 113-115 | .. | 4 13 6 |
| 70,000 | 10 | Apl. 29 | 11 | Do. do. 5 p.c. | 97-99 | .. | 5 9 3 | 149,470 | " | Dec. 29 | 4 | Edmonton 4 p.c. Deb. | 69-101 | .. | 3 19 3 |
| 131,000 | Stk. | Mar. 16 | 7 | Hongkong & China, Ltd. | 17-17 1/2 | .. | 6 5 9 | 182,380 | 10 | Dec. 29 | 8 | Tuscan, Ltd. | 94-98 | .. | 8 4 2 |
| 65,700 | " | .. | 5 1/2 | Ilford A and C | 145-147 | .. | 4 15 3 | 149,900 | 10 | Jan. 3 | 5 | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 19 0 |
| 65,500 | " | Dec. 29 | 4 | Do. B | 108-110 | .. | 5 0 0 | 236,476 | Stk. | Feb. 25 | 5 | Tynemouth 5 p.c. max. | 113-115 | .. | 4 0 11 |
| | | | | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 255,036 | Stk. | Feb. 25 | 6 1/2 | Wands- B 3 1/2 p.c. | 139-141 | .. | 4 14 0 |
| | | | | | | | | 79,416 | " | Dec. 29 | 3 | worth 3 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |

Prices marked, * are "Ex div."

† Next dividend will be at this rate.

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"GAZINE" (Registered in England and
Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
door Chemical Works, KILLINGWORTH, or through his
agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National
Telephone No. 2497.

SULPHURIC ACID.
SPECIALLY prepared for Sulphate of
AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, and STAFFORD.
Address Correspondence and Inquiries to OLDBURY,
WORCESTER.
Telegrams: "CHEMICALS, OLDBURY."

J. E. C. LORD, Ship Canal Tar Works,
Weaste, Manchester. Pitch, Creosote, Benzole,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

GAS TAR wanted,
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, AND WAKEFIELD.

GAS OILS.
MEADE-FING, ROBINSON, & CO.
Represents the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 12, EXCHANGE STREET, MANCHESTER, and
1, OLD HALL STREET, LIVERPOOL.

SPENCER'S PATENT MURDLE GRIDS.
THE very best Patent Grids for Holding
Oxide Lightly.
See Illustrated Advertisement, April 5, p. 8.

GAS-WORKS requiring Extensions
should Communicate with **FIRTH BLAKELEY,**
SONS, AND CO., LIMITED, Dewsbury, who make a
specialty of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
faction Guaranteed.

CAST-IRON Pipes. Spigot and Socket
or Flanged. Special Quality—9 feet or 12 feet
lengths. When buying, Write us.
A. LOWCOCK, Limited, SHREWSBURY.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

LITTLE'S PATENT INVERTED GAS-BURNER.
THERMOSTATIC regulation of Air and
Gas prevents Flashbacks and Carbonization, and
gives highest Candle-Power efficiency.
THOMAS J. LITTLE, JUNR., Inventor, Bush Lane House,
Lannon Street, LONDON.

GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
LETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Barnhill, DEWSBURY.

SATURATORS made or Repaired.
Reasonable Terms (workmanship guaranteed) by
a 30 Years' Saturator Maker (Labour and Plant only),
at per Hour or Contract. Saturators improved. Per-
fect Mixing and Noiseless.
DAVIES, General Chemical Plumber and Leadburner,
117, Galloway Road, SHEPHERD'S BUSH, W.

APPOINTMENTS.—Ambitious Men of
Parts invited to write—
HERBERT GREATOR, EX,
APPLICATION SPECIALIST,
BEECHWOOD, MATLOCK.
Specimen of many results:—
"Have got the job. Quite a good start.
To you the credit is due, and I think your
fee the best investment I ever made."
BUSINESS IS REVIVING. WRITE NOW:

THE Directors of the Rainhill Gas and
Water Company THANK the numerous AP-
PLICANTS who Applied for the Position of MANAGER
to the Company, in reply to the Advertisement which
appeared in the "JOURNAL," and inform them that the
APPOINTMENT HAS BEEN MADE.
FREDK. PRITCHARD, Secretary.

GAS STOVE TRADE.
EXPERIENCED Representative on
Commission wanted for Eastern Counties and
the South of England.
Apply, by letter, to No. 5231, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

WANTED, on July 1, by the Cranleigh
Gas and Coke Company, Limited, an Experienced
WORKING MANAGER. Make Nine Millions. Wages
£2 weekly, Cottage on Works, Fuel and Light.
Application, by letter, marked "Manager," to be
made not later than May 9.
H. J. HAYMAN, Secretary.

GERMAN Firm, making a speciality of
the Construction of RETORT FURNACES, and
Possessing own Manufactory of Fire-Clay Bricks and
Retorts, want a GAS LIGHTING EXPERT for Confi-
dential Position to introduce its economically working
Furnace Constructions and well-proved Retort and
Fire-Clay Materials.
Address "F.B.T." 945, care of RUDOLF MOSSE, Ham-
burg, GERMANY.

WANTED, by the Bognor (Sussex) Gas
Company, a Good, All-round GAS-FITTER.
Must be used to Iron, Lead, and Compo, and Capable of
Laying Services and House Installations Complete;
also to Canvass and Advise Consumers respecting the
Latest Types of Fittings and Appliances.
Apply, stating Age, Experience, and Wages required,
together with copies of not more than Three Testi-
monials, to the MANAGER, Bognor Gas-Works, Argyle
Road, Bognor, SUSSEX.

WANTED—Fifty Good, Second-Hand,
STREET LAMPS. Send Price and Particulars
to the MANAGER, Gas-Works, Alford, Lincs.

100 TONS of Crude Benzol wanted
f.m.w. at once.
Quotations to No. 5232, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

FOR SALE—Good Order, One Washer
by Kirkham, Hulett, and Chandler, 8-inch Con-
nections, and Engine to drive it. All good.
Address, WHITEHOUSE'S EXECUTORS, LKESTON.

TANK Waggon for Sale, 8 to 12 Tons,
for Tar, Liquor, &c.
Apply to **WATSON, SWINTON, AND CO., 25, Iron Gate,**
DERBY.

FOR SALE—A Gas Exhauster by Alfred
Williams and Co., London. Capacity 15,000 Cubic
Feet per Hour. In good Condition. Also 19 RETORT
MOUTHPIECES and LIDS, 21 in. by 15 in. Cheap.
For further Particulars, Apply to H. C. BORRADAILE,
Secretary, Grays and Tilbury Gas Company, GRAYS.

GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap for
immediate Sale.
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

FOR SALE.
PUMP, AIR OR GAS.

THE Pump, which is designed to be
driven by Engine Power, is intended for Charging
Reservoirs for Hydro-Pneumatic Gun Mountings with
Compressed Air. It can also be used for Charging
Balloon Reservoirs with Gas.
Application for Tender Forms for the Purchase of
the above can be obtained from the CHIEF ORDNANCE
OFFICER, Colchester.
The Pump can be seen at the Ordnance Office,
HARWICH.

EASTBOURNE GAS COMPANY.
TENDERS are invited for the Purchase
of the Surplus TAR for Sale for the Twelve
Months commencing on July 1, next, delivered into
Contractor's Railway Tanks at the Gas-Works.
Terms, Cash Monthly.
Tenders, endorsed "Tar," should be addressed to the
Chairman, Eastbourne Gas Company, not later than
May 7.
JAMES S. GARRARD,
Secretary.

CUPAR GAS COMPANY, LIMITED.
TENDERS FOR COAL.
THE Directors of the Cupar Gas Com-
pany, Limited, invite TENDERS for the Supply
of about 2700 Tons of Best Quality GAS COAL, NUTS,
and CANNEL, delivered in Waggon at Cupar Station,
in such Quantities as may be required till the 31st of
May, 1911.
Sealed Tenders, addressed to the undersigned, and
endorsed "Tender for Coal," to be sent in not later
than Monday, the 9th day of May.
The Directors do not bind themselves to accept the
lowest or any Offer.
J. MACPHERSON,
Manager and Secretary.
Gas-Works, Cupar, Fife.

LINCOLN CORPORATION.
(GAS DEPARTMENT.)
TENDERS FOR COAL.
THE Gas Committee of the Lincoln Cor-
poration invite TENDERS for the Supply of
30,000 Tons of Screened or Unscreened GAS COALS
and NUTS, to be delivered during a period commencing
the 1st of July, 1910, and terminating the 30th of June,
1911.
Further Particulars and Forms of Tender may be
obtained from the undersigned.
Sealed and endorsed Tenders, addressed to the Chair-
man of the Gas Committee, must be delivered on or
before the 20th of May next.
The Committee do not bind themselves to accept the
lowest or any Tender.
JNO. CARTER,
Manager.
Gas Offices, Lincoln,
April 22, 1910.

PAIGNTON GAS COMPANY.
TENDERS FOR GAS COAL.
THE Directors of the Paignton Gas
Company are prepared to receive TENDERS for the
Supply of 5000 Tons of best approved GAS COALS,
to be delivered in such Quantities and at such times as
may be required, and to weigh 20 cwt. to the Ton over
the Gas Company's Weigh Bridge.
Tenders to be accompanied by Practical Working
Analysis, stating the Price of Coal delivered at Paignton
Station, Great Western Railway, free of all Charges.
Forms of Tender are not supplied.
The Directors do not bind themselves to accept the
lowest or any Tender.
Further Particulars may be obtained from Mr. C. G.
Dawson only.
Sealed Tenders, endorsed "Tender for Coal," specifi-
ing the description and quality of Coal, to be sent on
or before the 7th day of May next addressed to the
undersigned at the Gas Offices, 1A, Victoria Street,
Paignton.
F. W. PUDDICOMBE,
Secretary.
Paignton, April 14, 1910.

CHESTER UNITED GAS COMPANY.
TENDERS FOR PURIFIERS AND ROOF.
THE Directors of the above Company
invite TENDERS for the REMOVAL and RE-
ERECTION of Two existing PURIFIERS, 24 feet by
22 feet by 5 feet deep, and Alterations to Connections,
the SUPPLY and ERECTION of Two New PURI-
FIERS, 24 feet by 22 feet by 5 feet deep, with Con-
nections and Week Centre Valve to work the Set of Four,
Two overhead Travelling Cranes, and about 100 Tons
of STEEL and CAST-IRON WORK in Roof over
Purifiers and Oxide Sheds at the Roodee Gas-Works,
Chester.
Drawings, Specification, Bill of Quantities, and Form
of Tender may be obtained on Application to the
Manager, Roodee Gas-Works, on payment of One
Guinea, which will be returned on receipt of a bona-fide
Tender and Particulars supplied.
Tenders to be delivered (sealed) on or before Nine
a.m. on Thursday, the 12th day of May, 1910, addressed
to the undersigned and endorsed "Tender for Purifiers
and Roofs."
The Directors do not bind themselves to accept the
lowest or any Tender.
FRED. A. PYE,
Secretary and General Manager.
Gas Company's Offices,
Cuppin Street, Chester,
April 23, 1910.

TO COLLIERY PROPRIETORS AND OTHERS.
THE Corporation of Birkenhead are
prepared to receive TENDERS for the Supply of
Screened COAL, Through and Through COAL NUTS,
and CANNEL, for Gas-Making purposes, for a period of
Twelve Months, commencing from the 1st of July, 1910.
Form of Tender, together with any further Informa-
tion, may be obtained from Mr. T. O. Paterson, C.E.,
Gas Engineer, Gas-Works, Birkenhead.
Tenders (accompanied by copy of recent Analysis),
stating the Price per Ton delivered to the Gas-Works
Railway Siding, must be sent in to me, sealed and en-
dorsed "Tender for Gas-Works Coal," not later than
Five o'clock in the afternoon of Thursday, the 12th of
May, 1910.
All Deliveries to be made from time to time according
to the requirements of the Engineer.
The parties whose Tender may be accepted will be
required to enter into a Contract containing a clause as
to the payment of the Rate of Wages and the Obser-
vance of the Hours of Labour recognized and agreed
upon between the Trades Unions and the Employers in
Birkenhead or in the locality in which the work for
carrying out the Contract is executed, as the case
may be.
The Corporation do not bind themselves to accept the
lowest or any Tender.
By order,
JAMES FEARNLEY,
Town Clerk.
Town Hall, Birkenhead,
April 30, 1910.

BENZOL.

To Collieries having Bye-Product Recovery Coke-Ovens, or to Tar-Works capable of delivering for Export to the Continent 3000 Tons per Annum (more or less) of 90 per cent. Commercial Benzol under Contract covering a number of Years.

Offers are invited from Firms only who are *bonâ-fide* in a Position to enter into a Contract for the above quantity.

Address, in first instance, No. 5226, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the Supply of 12,000 Tons of COAL and 500 Tons of CANNEL.

Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager. Sealed Tenders, endorsed "Coal," to be sent to me not later than Thursday, May 12, 1910.

By order,
GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
April 20, 1910.

THE Directors of the Elsecar, Wentworth, and Hoyland Gas Company invite

TENDERS for the Supply of 3000 Tons (more or less) of Best Screened GAS COAL or NUTS, to be delivered at Elsecar Station (Great Central Railway) during the Year ending the 30th of June 1911, at such times and in such Quantities as required by the Manager.

Tenders to be delivered by the 11th of May, addressed to the Chairman, 94, King Street, Hoyland, endorsed "Tender for Coal."

ALBERT F. HALL,
Secretary.

Hoyland, near Barnsley,
April 23, 1910.

THE Cape Town and District Gaslight

and Coke Company, Limited, will be pleased to receive TENDERS for the Supply of 10,000 to 15,000 Tons of GAS COAL. Shipment to be made in lots of 2500 to 3500 Tons at intervals of Two to Four Months, at their option, to reckon from the 1st of July next. Delivery to be made c.i.f. Cape Town.

Tenders to be sealed and marked "Coal," and to be addressed to the Cape Town and District Gaslight and Coke Company, Limited, Egypt House, New Broad Street, E.C., and should reach the Company's Office not later than May 20 next.

Each Tender should be accompanied by an Analysis of the Coal offered.

BOROUGH OF MACCLESFIELD.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their works during the Twelve Months commencing the 1st of July, 1910.

For Conditions, Apply to Mr. Newbigging, Engineer, Gas-Works, Macclesfield.

Tenders for the Tar or Liquor separately to be sent in not later than Saturday, the 14th day of May, 1910, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar, &c."

The Committee reserve to themselves the right of accepting any Tender for the Tar or Liquor separately. The highest or any Tender not necessarily accepted.

By order,
F. R. OLDFIELD,
Town Clerk.

April 26, 1910.

RAMSGATE CORPORATION.

(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite

TENDERS for 22,000, 44,000, and 66,000 Tons (One, Two, and Three Years' Supply respectively) of Best Quality Soft Caking and Gas Producing Screened Durham or other COAL, delivered free into Carts on the Quay at Ramsgate Harbour, or free into the Stores at the Gas-Works.

Deliveries to be in Monthly Quantities, as set forth in the printed Particulars, and are to commence as from Aug. 1, 1910. A distinct Price to be named for each quantity.

Tenders to be sent in not later than Noon on Monday, May 9, 1910, addressed to the Chairman of the Gas and Water Committee, Gas and Water Offices, Boundary Road, Ramsgate, endorsed "Coals."

The Committee do not bind themselves to accept the lowest or any Tender.

Full Particulars and Form of Tender on Application to the undersigned.

WM. THOMSON,
Engineer and Manager.

Gas and Water Offices,
Ramsgate, April, 1910.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive

alternative TENDERS, on Forms to be obtained at the Office of the Gas and Water Manager, for the Supply of Screened GAS COAL and CANNEL for One, Two, or Three Years from the 1st of July next.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office, not later than Twelve O'clock noon on Tuesday the 24th of May, 1910. The lowest or any Tender not necessarily accepted.

By order,
L. HEWLETT,
Town Clerk.

Town Hall, Barrow-in-Furness.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

TENDER FOR ENGINE SLACK.

THE Company are prepared to receive

TENDERS for the Supply of ENGINE SLACK, at their various Pumping-Stations, for Nine Months from the 1st of July, 1910.

Forms of Tender, giving Particulars as to the Quantity of Slack to be delivered at the various Stations, can be obtained on Application to me.

Tenders, made out on the Forms provided, and endorsed "Tenders for Slack," must reach me at latest by Twelve Noon on Wednesday, May 18, 1910.

The Company do not bind themselves to accept the lowest or any Tender.

H. ASHTON HILL, M.Inst.C.E.,
Engineer.

Paradise Street, Birmingham.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to

notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

LEA BRIDGE DISTRICT GAS COMPANY.

ISSUE OF £14,000 NEW CAPITAL COMPRISING:

£4000 Four per Cent. Perpetual Debenture Stock,

£3000 Five per Cent. Preference Stock,

£5000 Consolidated Ordinary Stock.

MESSRS. A. & W. RICHARDS will

SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 10, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

DORKING GAS COMPANY.

NEW ISSUE OF £4000 FIVE PER CENT.

PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will

SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £2200 "D" CAPITAL GAS STOCK.

MESSRS. A. & W. RICHARDS will

SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

THE Proprietor of the British Patent

No. 7176, of 1907, for "IMPROVEMENTS IN APPARATUS FOR CONTROLLING THE IGNITION OF GAS BURNERS," desires to SELL his Patent or to grant LICENCES thereof.

All Communications should be addressed in the first instance, to L. DUVINAGE, Patent Agent, 10, Avenue des Nerviens, BRUSSELS.

Just Published. Price 1s. net.

THE SALE OF GAS APPARATUS

BY

J. PATER WIATT.

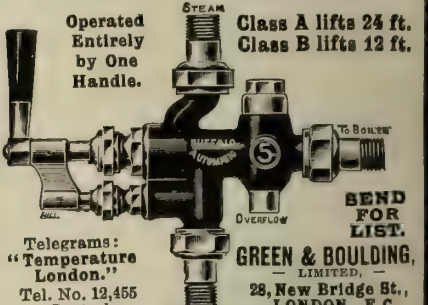
Author of "Chemistry in Physics," "Internal Combustion Engines," &c., &c.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

'BUFFALO' INJECTOR

Operated Entirely by One Handle.

Class A lifts 24 ft.
Class B lifts 12 ft.



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Tel. No. 12,455 Central.

GREEN & BOULDING,
— LIMITED, —
28, New Bridge St.,
LONDON, E.C.

JOHN HALL & CO. OF STOURBRIDGE, LIMITED,

STOURBRIDGE,

Manufacturers of

FIRE-BRICKS, LUMPS, TILES,

GAS RETORTS,

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

NEWTONGRANGE, MIDLOTHIAN.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

THOMAS DUXBURY & CO.,
16, DEANS GATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illu-
minating Power, Large Yield per ton, and
reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."

Telephone 1806.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

MIRFIELD GAS COAL.
UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

LUX'S
Gas Purifying Material

Is now used in many Gas-
Works throughout Scotland
with gratifying success.

FRIEDRICH LUX
Ludwigshafen-am-Rhein

Sole Agent for Scotland:

DANIEL MACFIE

1, North Saint Andrew Street, EDINBURGH

Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.

ARMSTRONG'S PATENT
CANDLE SAFETY LAMPS.



No. 1.

No. 2.

No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

ADDITIONAL REVENUE FOR GAS-WORKS.

COKE SELLING . . AT 11/6 A TON

COALEXLD SELLING AT 20/- A TON

IN THE SAME TOWN.

COALEXLD, LIMITED.
LANCASTER.

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IN
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THE GASHOLDERS AND OTHER OUT-
SIDE PLANT IT IS FALSE ECONOMY
TO USE A CHEAP PAINT WHICH LOSES
COLOUR AND DOES NOT PROTECT THE
IRON FROM CHEMICAL FUMES.

"SHELL BRAND" (Pure) PAINTS

POSSESS ALL THE PROPERTIES
WHICH CHEAP PAINTS LACK.

Prices and particulars on application.

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LIME & OXIDE ELEVATORS & CONVEYORS.
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STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.

HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

Special Pressure and
Pressure & Exhaust Registers.

For RETORT-HOUSE GOVERNORS.
For EXHAUSTER HOUSES.
For OFFICES AND DISTRICTS.

Fullst particulars on application to—

T. G. MARSH,
28, Deansgate, MANCHESTER.



GAS COAL AND CANNEL.

WILSON CARTER & PEARSON,
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Gas, Steam, and other Fuel for Home and Export.

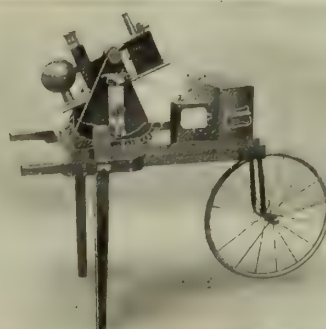
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USE THE
SIMMANCE-ABADY
PATENT
PORTABLE
PHOTOMETER

Accurate & Simple.

ALEXANDER WRIGHT & Co., Ltd.
WESTMINSTER.

METROPOLITAN GAS METERS, LIMITED,

SOLE MAKERS AND LICENSEES OF THE

"Simplex" AUTOMATIC GAS LIGHTER AND EXTINGUISHER.

Some of its Special Advantages are:

1. It is instantaneous in Lighting and Extinguishing without shock to Mantle, and can be set to its pre-determined times in a few seconds.
2. The Mechanism will act correctly, even though the Lamp-post and Controller be out of the perpendicular.
3. **THE VALVE.**—As this never leaves its seat, and the gasways being away from the seating, no impurities can collect between the valve and the seating, and by simply removing a small cap, the gasways can be freed of Naphthalene or any other matter.
4. The leakage of gas into the Clock Mechanism and its resultant troubles are entirely done away with.
5. Vibration of any description will not cause the Mechanism to operate prematurely.
6. The "Simplex" Clock also has the advantage of a Lever Escapement.

PRICES AND PARTICULARS ON APPLICATION.

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Telegraphic Address:
"Gasometer Nottingham."

Telephone:
204X Nottingham.

LONDON DEPOT:

Malt Street, Old Kent Road, S.E.

Telegraphic Address:
"Gasometer London."

Telephone:
2044 Hop.

Workmanship and Materials
of the Highest
Quality.

PECKETT'S LOCOMOTIVES.

Built to any
Specification or Gauge.

PECKETT & SONS,
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Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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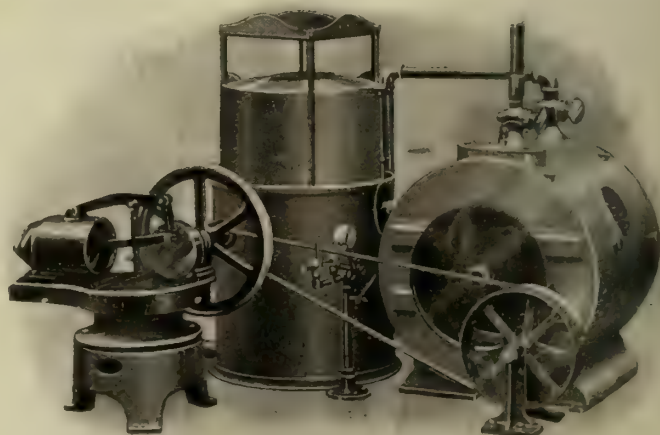
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GRAETZIN LIGHT

Important Improvements.



BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

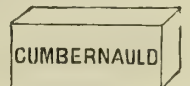
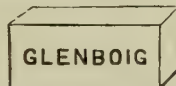
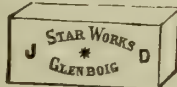
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

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The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

DEAR SIR,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

| | Raw. | Fired. |
|--------------------------------|----------|----------|
| Silica, free | 3.03 .. | 3.49 .. |
| Silica, combined | 43.20 .. | 49.77 .. |
| Alumina | 26.55 .. | 42.10 .. |
| Ferric oxide | 1.80 .. | 2.08 .. |
| Titanic oxide | 1.30 .. | 1.50 .. |
| Lime | trace .. | trace .. |
| Magnesia | trace .. | trace .. |
| Alkaline oxides | trace .. | trace .. |
| Sulphates as trioxides | 0.92 .. | 1.06 .. |
| Loss on Ignition | 13.20 .. | — .. |
| | 100.00 | 100.00 |

PHYSICAL RESULTS.

| | |
|-------------------------------------|-----------------------------|
| Density | 2.65 |
| Volume weight | 1.90 |
| Porosity | 15.4 % |
| Linear shrinkage at 100° C. | 3.70 % |
| " " " 1050° C. | 4.76 % |
| " " " Total | 8.46 % |
| Volume shrinkage at 100° C. | 10.7 % |
| " " " 1050° C. | 12.6 % |
| " " " Total | 23.3 % |
| Plasticity | 20.0 |
| Fire Stability | 1850° C. equiv. to 3362° F. |

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. — I am, yours faithfully,

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Total capacity: 45,000,000 c.ft. of pure Coal Gas per 24 hours.

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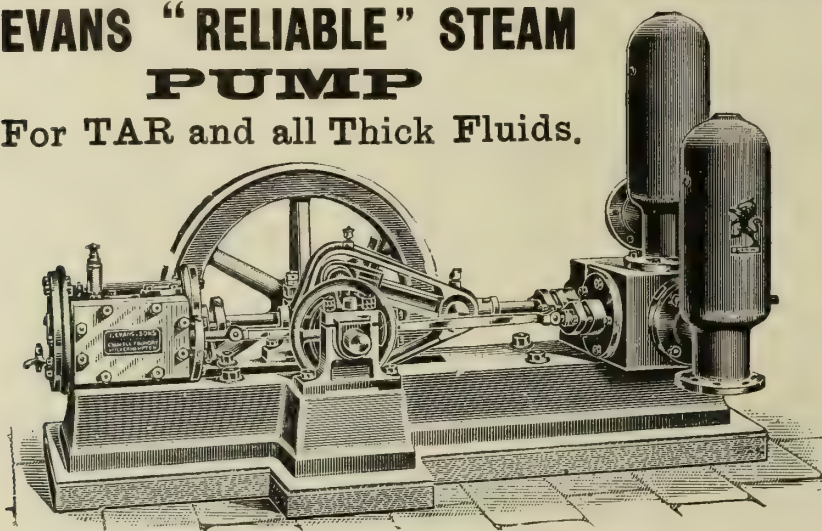
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Welsbach

LIGHT

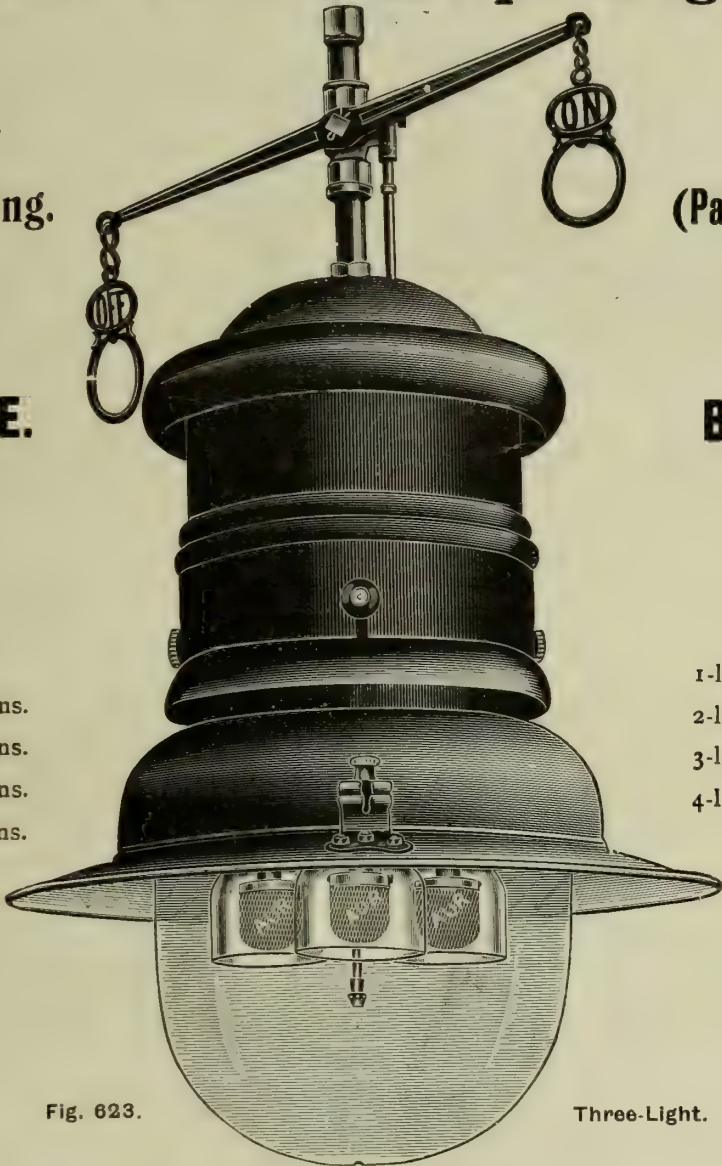
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 8 ins. |
| 2-light | . . . | 2 ft. 4 ins. |
| 3-light | . . . | 2 ft. 4 ins. |
| 4-light | . . . | 2 ft. 7 ins. |

Width over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in. |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

| | Gas per hour. | C.P. | Steel. | Copper Case. | | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
| 2-light | 8 feet | 260 | 47/6 | 6/- extra. | 4-light | 16 feet | 550 | 72/6 | 9/- extra. |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

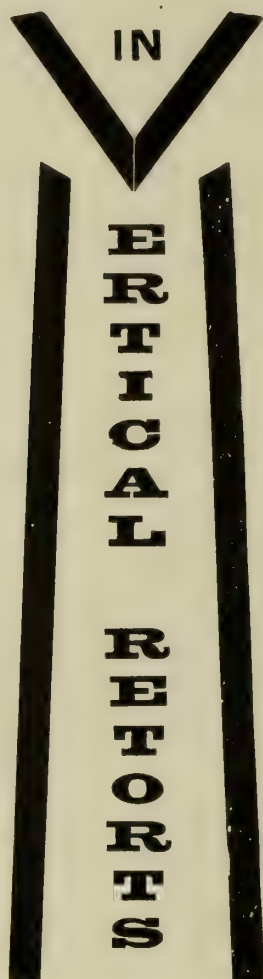
Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

| | 1-Light. | 2-Light. | 3-Light. | 4-Light. | | 1-Light. | 2-Light. | 3-Light. | 4-Light. |
|-------------------------------|----------|----------|----------|----------|----------------------------|----------|----------|-------------------|--------------|
| Clear Glass Globes, each | 2/3 | 5/9 | 5/9 | 9/- | Wired Globes, extra | each | 2/- | 2/- | 2/9 3/6 |
| " " " In Case lots per dozen. | 19/6 | 57/9 | 57/9 | 93/- | Parabolic Reflector, extra | " | 3/6 | 6/- | 7/6 Not made |
| Case contains | 80 | 18 | 18 | 12 | Welsbach Mantles, each | | 6d. | subject as usual. | |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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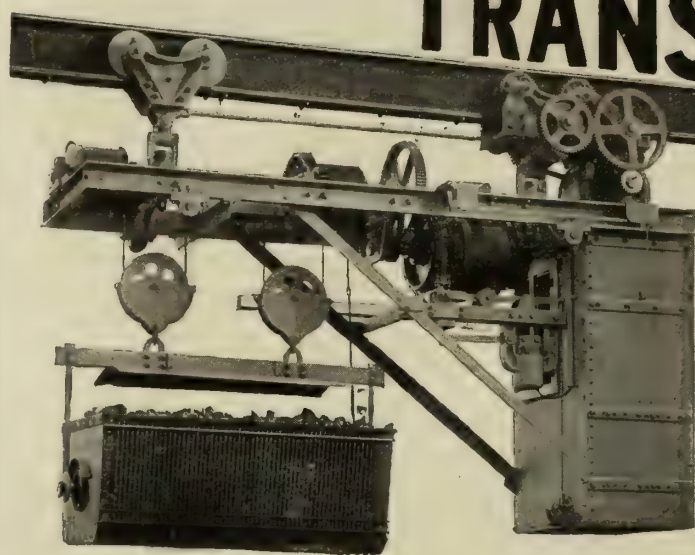
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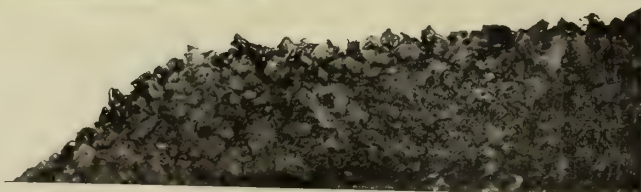
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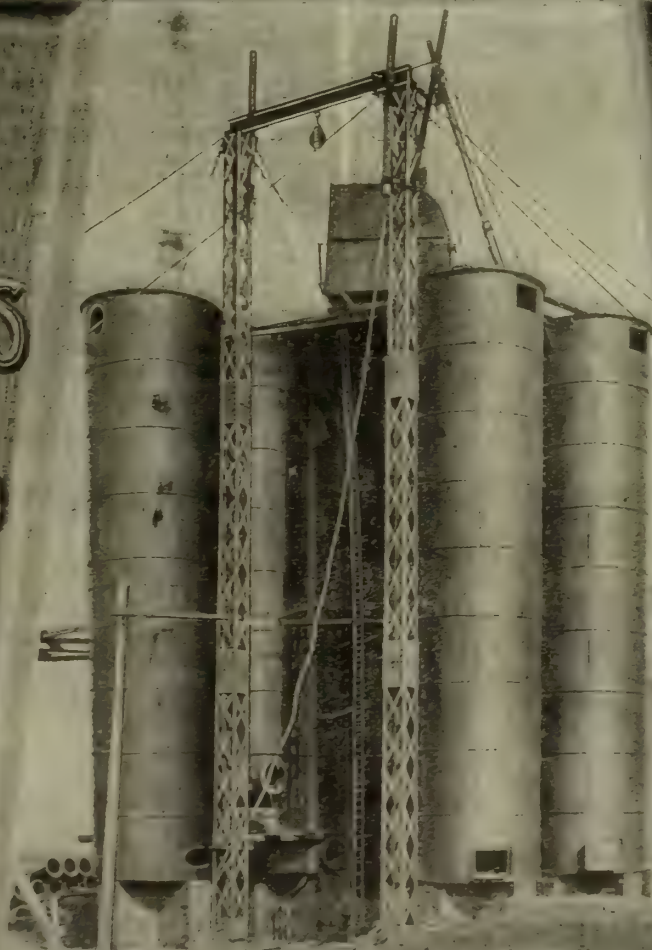
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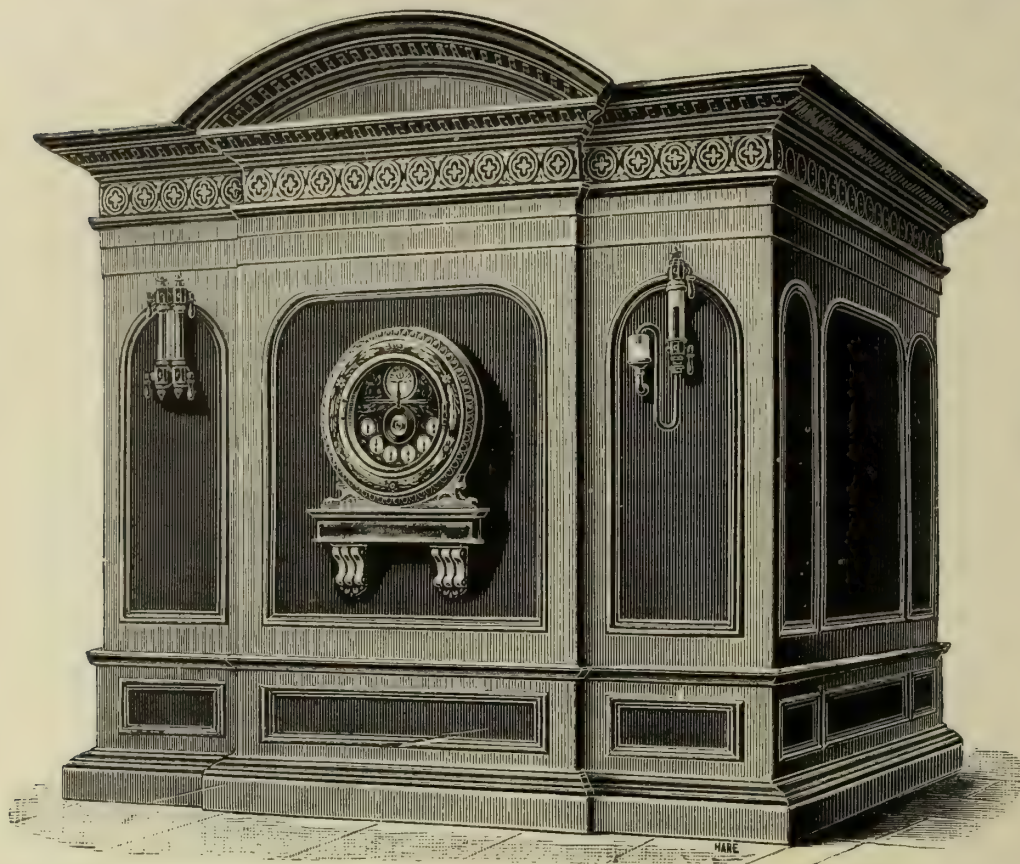
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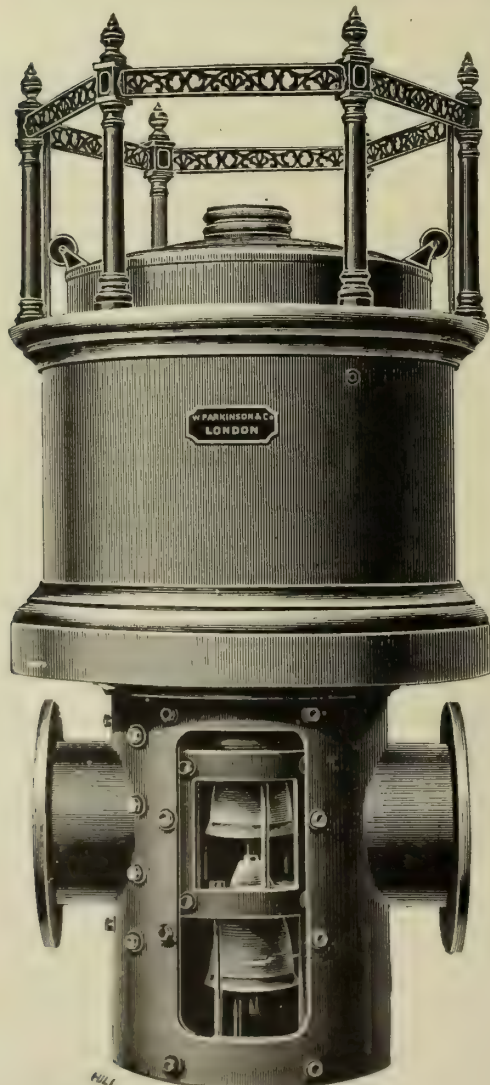
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VOL. CX. No. 2452.]

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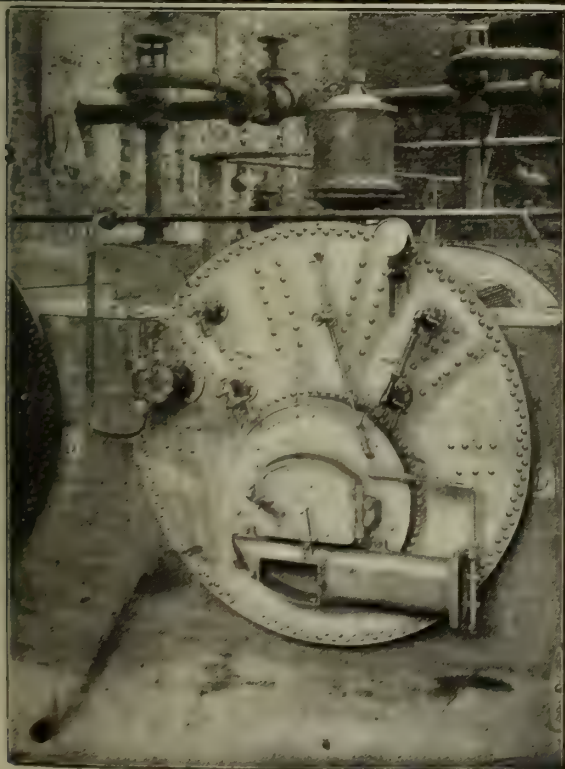
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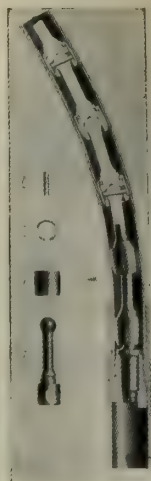


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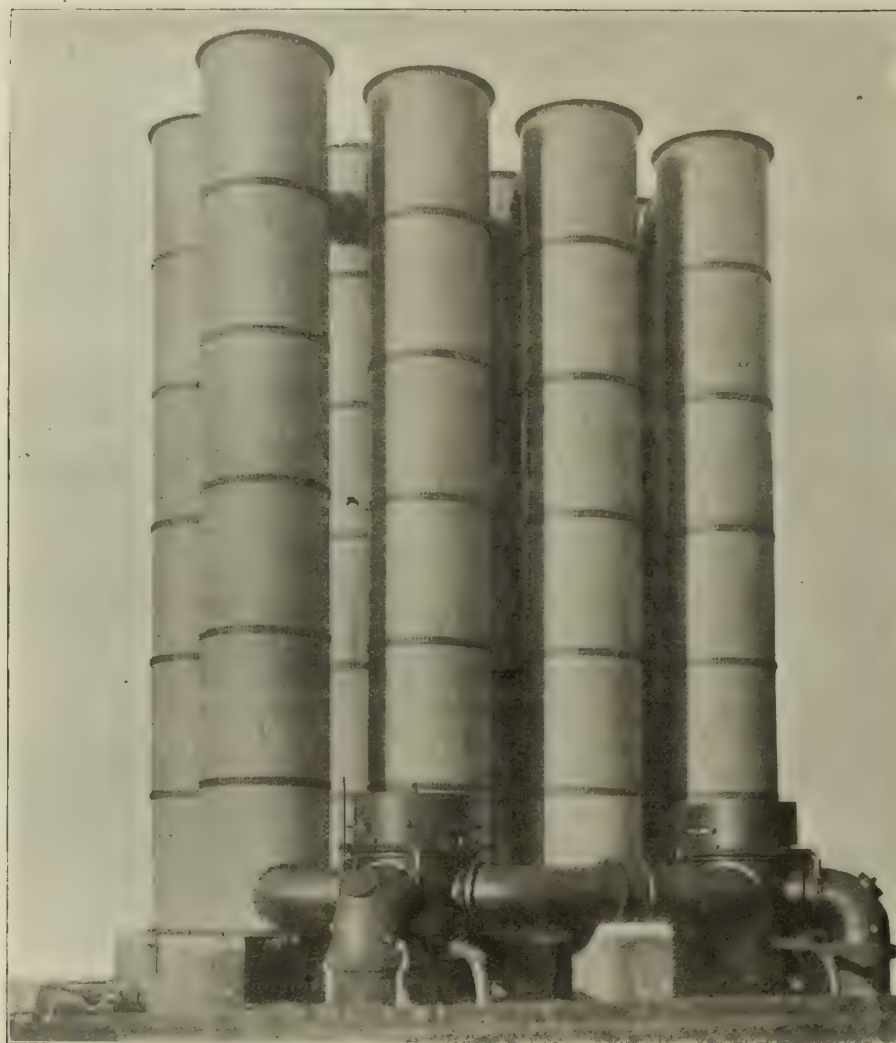
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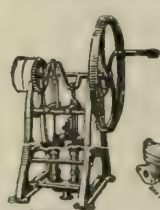
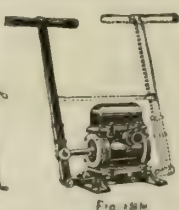
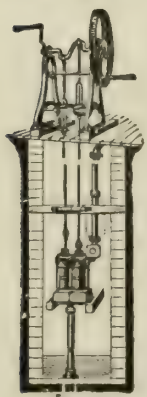
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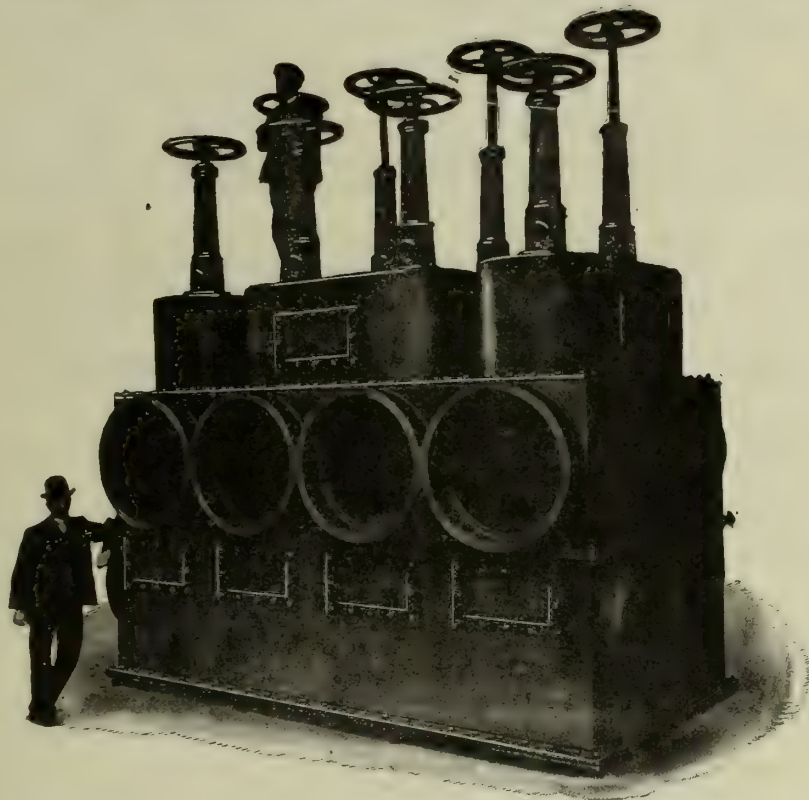
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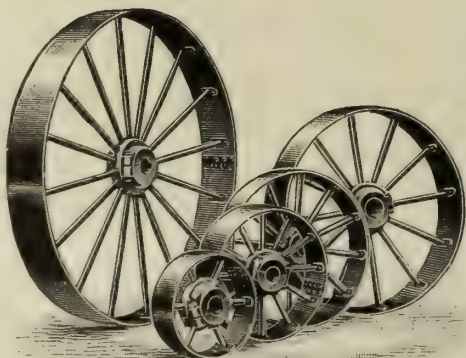
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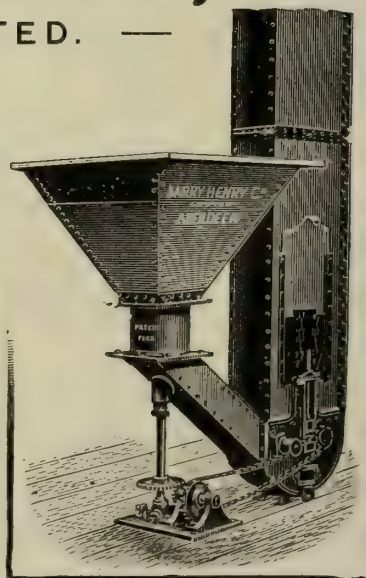
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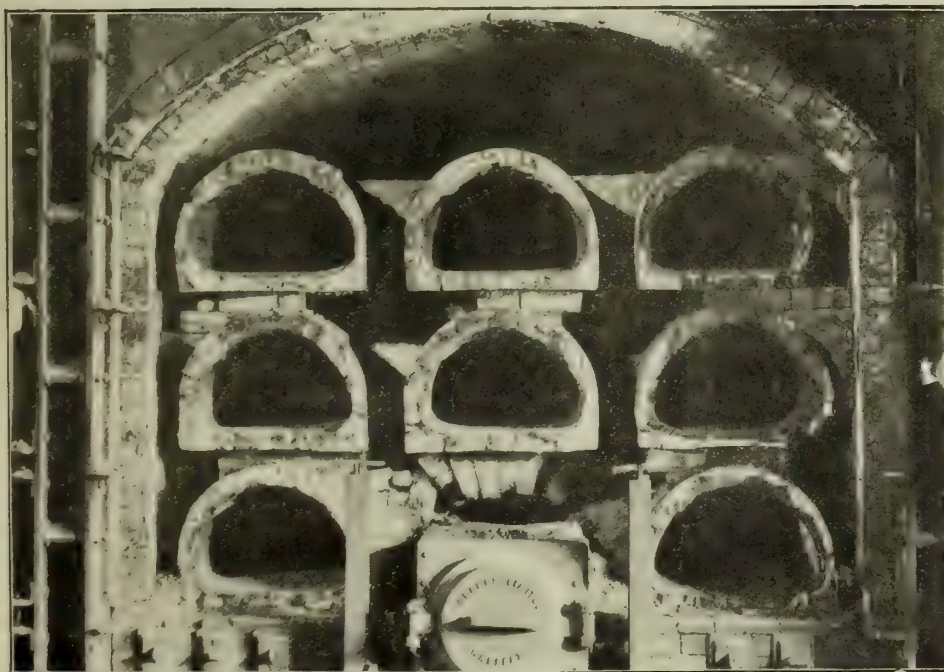
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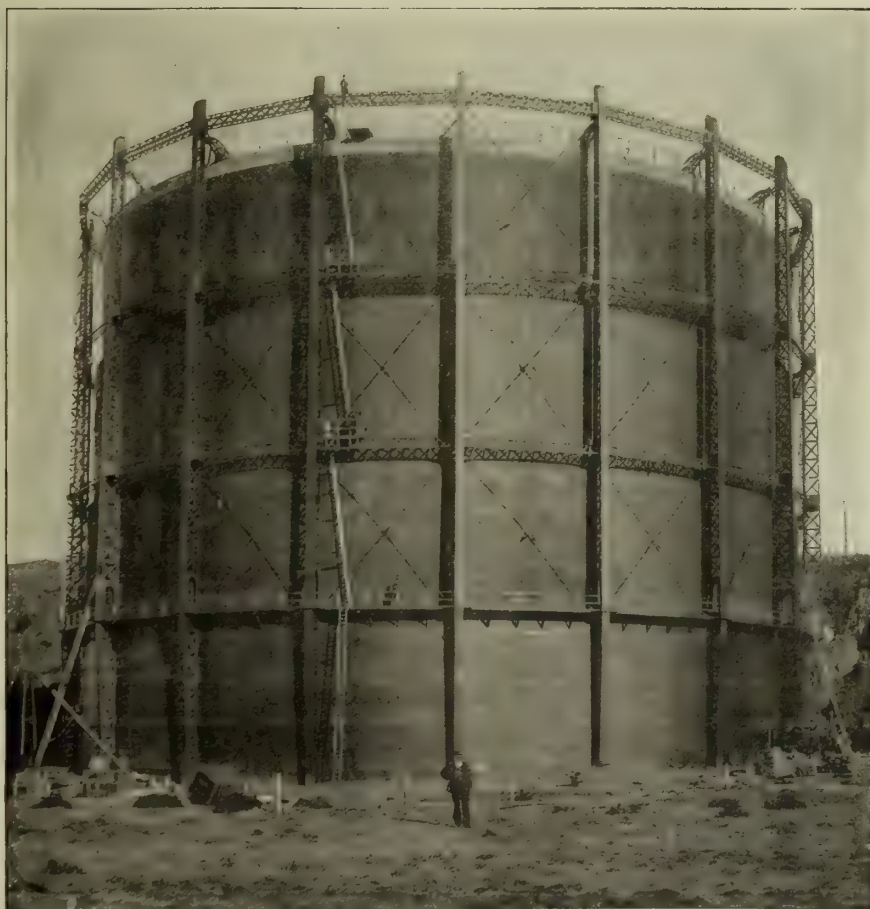
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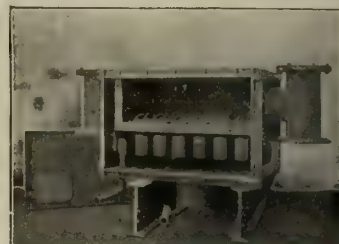
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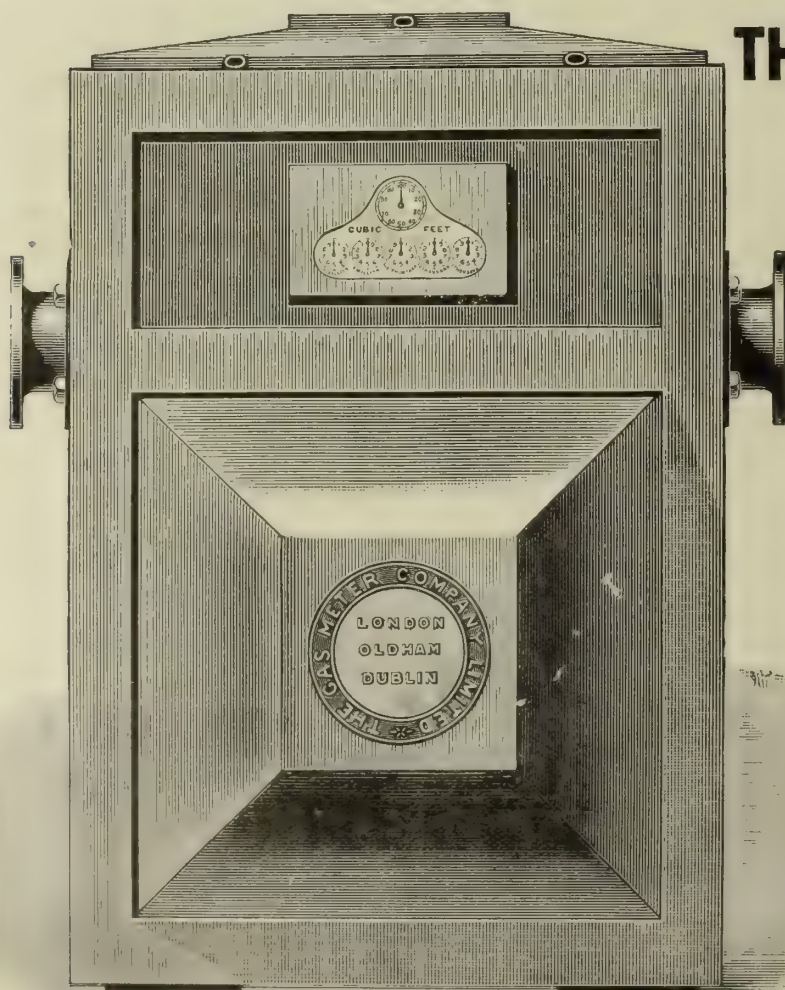
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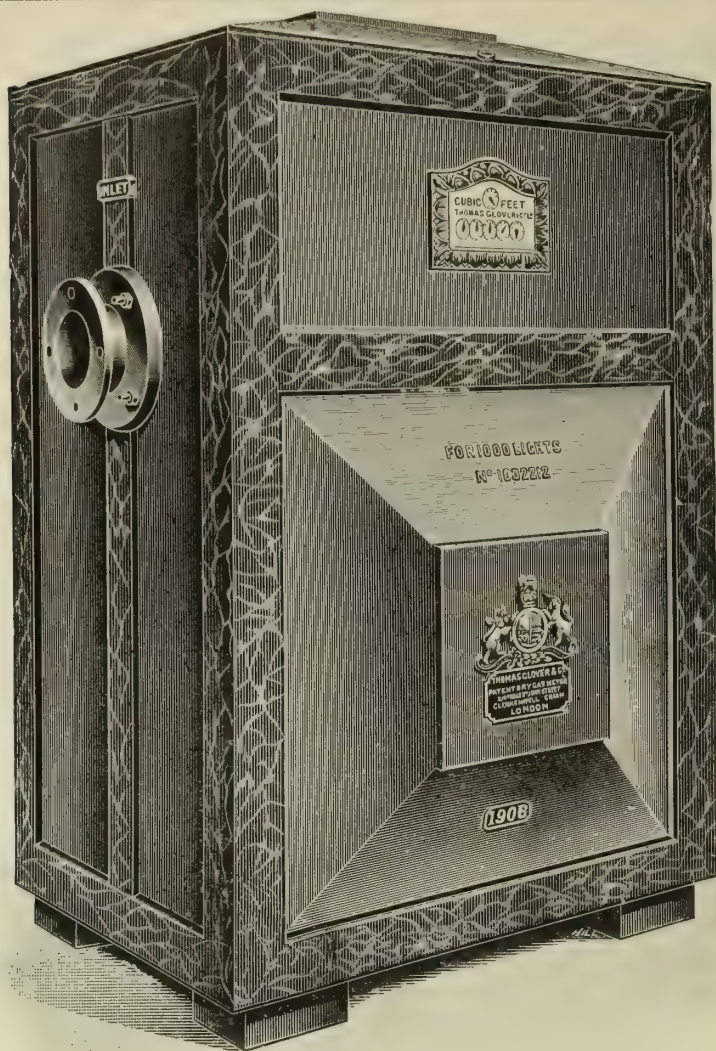
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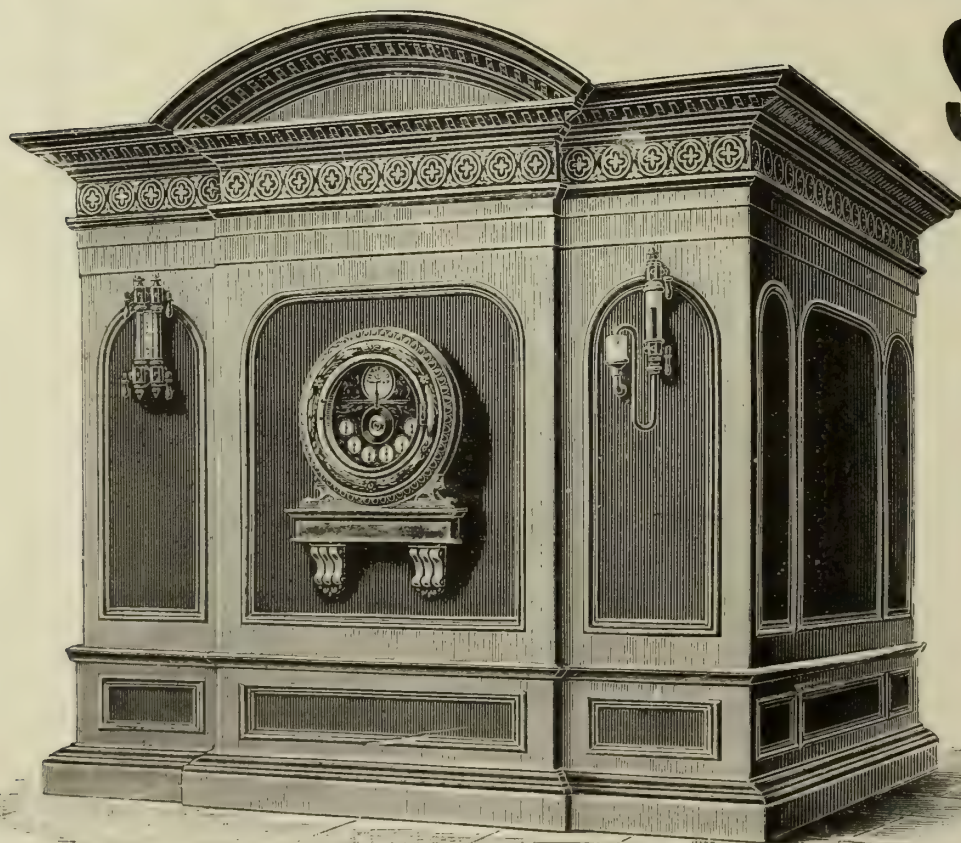
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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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KING, EMPEROR, AND PEACEMAKER.

THE whole nation and the whole civilized world to-day unite in a common sorrow. After an all too short but beneficent reign, the august presence, the power for good that was concentrated in the person, of King Edward the Seventh have been removed, with tragic suddenness, from our midst; and, whatever our station and condition in life, whatever our personal interests, there is not one among us who does not feel, and that keenly, an individual loss. In His Majesty we had a man of many parts, which, in their entirety and in their wise exercise, made him stand with due prominence and sovereignty among the heads and rulers of great nations, and gained for him cosmopolitan reverence. His interests and work in human and material affairs, and in the world's affairs generally, reached from the knitting together of nations and the ensuring of universal peace, to the Arts and Sciences of the mighty British Empire, to the well-being of his people in all parts of the world, and to the amelioration of the conditions of the lowliest of those over whom, by God's grace, he was called to rule. He loved his people, and was beloved by them; and the work that he did, and did well, will remain in the nation's and world's history an immortal monument, and an example to his successors and to all men. The promotion of Peace and Goodwill among men and nations was his dominating ambition. He goes from us, from the scene of his great, high, and glorious activities and influences, into the, to the human mind, mysterious Eternal Peace. But the tide of life and of national affairs continues to flow without interruption; and monarch succeeds monarch. King George the Fifth ascends the throne with the loyalty and goodwill of his subjects, the trustee and the instrument of a magnificent power. The times demand from the ruler of the British Empire the exercise of that wisdom, that broad-minded toleration, that aplomb, and that judicial interpretation that were the characteristics of him whose sceptre has now been laid aside. The devotion of King George to Country and Empire was well attested while he was Prince of Wales; and the responsibilities of his high office are recognized by him as a sacred duty. During his reign, which all pray may be long and happy, there is every confidence that, within the latitude of his power, nothing will be left undone by him that will tend to the maintenance of the prestige, the prosperity, and the progress of the British Empire and people.

EDITORIAL NOTES—GAS, &c.

Burner Maintenance.

Why is it that so much attention is at the present time being directed to the question of the maintenance by gas suppliers of the efficiency of consumers' incandescent gas-burners? There is only one answer; and it is that it is recognized that more real activity in this direction is necessary if the part of the lighting business is to be retained that is represented by those consumers who can afford to have electric light. Nothing is to be gained by blinking the fact. We have, in household lighting, every advantage on our side, but one; and the exception is that incandescent gas-burners do require, to maintain their highest efficiency, more attention than the newer forms of electric lamp, though these are fragile, and have an increasing tendency to blacken. Only occasional attention is required for the purpose of maintaining the efficiency of incandescent gas-lamps; but there are many

people—people who will not be bothered, or who are negligent—who will not give to them even the small amount of attention that is essential. That is a plain truth; and it supplies the problem that the gas industry has to face, as to the most effectual means of reducing the disadvantage. The electrical industry have in comparison with gas several disadvantages on their side to meet. But that is their business; and it is the business of the gas industry to see that their gain, through the one disadvantage that gas admits, is kept down to the lowest possible point. There are some gas managers who orally profess that greater activity, or any expenditure on the part of gas suppliers in this direction, is not necessary; but it is abundantly clear that even they have been driven by some power to make a close examination of the question, though not always (it is equally clear) on the broadest lines.

If we grant this one disadvantage, it has to be recognized that among the majority of gas consumers it is enormously outweighed by the pecuniary and other merits that gas possesses; and that it is only the class of consumers who

will not bestir themselves to give the small amount of attention that is required by the incandescent gas burner, and at the same time are able to afford the cost of electrical installation, of lamp renewals, and of current, whose custom is in any way in jeopardy. This is one of the facts that have to be grasped in considering the position. And, in passing, it may be said that there has not yet been, in examining this question, any well-ordered presentment of fundamental points on which to seriously debate it in its various bearings. There is another consideration that arises from the matter of nomenclature. The wisest among us have developed as a panacea for the single disadvantage what is called "free maintenance;" and those who engage in what is so named at once proceed to falsify the title by giving free labour and charging for the upkeep of mantles and glassware the ordinary retail prices—the profit being set against the cost of labour. By no stretch of the imagination can we bring ourselves to call this sort of thing "free maintenance;" it hardly comes within (more appropriate though it be) the term "free supervision"—a term that was frequently used at the recent meeting of the Eastern Counties Gas Managers' Association, when Mr. F. J. Wimhurst read his paper on the general subject. Let us make our nominal expressions as nearly as possible fit, and be descriptive of, what they are intended to cover; and "free supervision" where labour only is "free" is certainly a more appropriate title than "free maintenance."

This brings us to a further point for consideration; and it is that, while most gas managers agree that there is protective work to be done in this direction, there is little or no agreement as to what should be done. There is much confusion in opinion and practice, which perhaps might be largely composed by comparing the position of electricity with that of gas. Some gas managers are for giving free the labour expended in maintenance and making a charge for mantles and glassware, the profit on which (as already stated) is employed to wipe off some of the expense of the labour. Others prefer a special covering quarterly charge, to include everything. And still others urge that the consumer should be charged nothing, but that the whole expense should be included in the price of gas. The last-named proposal would be unfair as between consumer and consumer; and there are so many considerations affecting it, that for the moment we will not discuss any such extreme measure. As to the other points, the inclusive charge per burner per quarter is the most rational system (in that the consumer knows precisely what he has to pay), did it not make a rather bulky-looking and permanent item in the account of the consumer, and that is a substantial objection. The system of "free supervision" and charging for mantles and glassware at a price that produces a profit, has the objection that many consumers are of opinion that the gas supplier makes "a fine thing" out of it.

In medio tutissimus ibis. Why not let the price of gas bear the cost of supervision; and the material be furnished at absolutely cost prices? This seems to us to be the most prudent course, if gas suppliers are really anxious to do some protecting work in this direction at their most vulnerable point in the composition of their lighting custom. If the consumers are supplied with mantles and glassware at prices below those at which they can purchase elsewhere, then they will at once feel that there is something genuine about the interest of the gas supplier, and that that interest does not resolve itself (as many think now) into a mere profit-making device. This might bring some gas suppliers—more particularly municipal gas departments—into conflict with local tradesmen; but necessity in such a matter as this must override private interests. The maintenance of the lighting efficiency of consumers' incandescent gas-burners is as necessary to-day to the success of the lighting business of the gas industry as is a gas of a fairly good calorific power; and, this being so, the best means to the end must not on any account be allowed to be overridden by outside hostility. In regard to the charging for mantles and glassware (providing the drawback of profit-making is eliminated), that is not a disadvantage in comparison with electric lighting. Actually, mantles and glassware for properly maintained gas-burners of an illuminating power equivalent to any specified metallic filament lamps, work out cheaper than the renewal costs of the latter; and until the electricity industry gives its patrons their lamps free, there is no call upon the gas industry to contemplate any such action as secreting the cost of these in the charge for gas. Besides this, the expense of lighting by incandescent gas-

burners—including installation, mantles, and glassware—is, in the end, much cheaper than was lighting by gas in the days of the flat-flame burner. Not only was the consumption then heavy, but the prices of gas (generally speaking) ruled at much higher levels than they do to-day. With properly maintained incandescent burners, too, we can run them and waste the gas for a long time before the cost reaches that of electric lighting by the metallic filament lamp for a shorter period—illumination being equal during the time of use.

There are other points to be dealt with in connection with this very live and controversial question; but we will reserve them for another article.

British Enterprise in Continental Gas Supply.

It must be a matter of some difficulty for those proprietors of the Imperial Continental Gas Association who have not taken anything more than a superficial interest in its affairs, and have had their concern chiefly centred upon the half-yearly dividend, to understand the numerous organic and financial changes—particularly in the latter respect in the items of the balance-sheet—that have occurred in the big undertaking, albeit no one could be more explicit and practical in his explanations than is the Chairman (Mr. J. Horsley Palmer) in his addresses to the proprietors. On the occasion of the meeting last week, the proprietors were met with what looked much like a decline in the profits, and with some remarkable variations in certain of the items in the balance-sheet. The former was due entirely to the merging of the Frankfort business in that of the Frankfort Gas Company, and to the practice of that concern, in common with most other Continental undertakings, of only paying dividends annually. By this change the Imperial Continental Association have become the predominant partners in the concern composed of what were formerly separate undertakings; and the Association's Frankfort capital is now entered up in the balance-sheet as an investment. This is the simple explanation; and much the same would apply to the French part of the Association's business, which, it will be remembered, was converted into an entity apart from the Association, and is now to all intents and purposes (where the major part of the capital comes from does not matter) a French concern, managed and conducted on French soil, and complying with the French law. The Association have in the past, purely for protective purposes, entered into a good many other investment and purchase transactions. Diplomacy and protection are inseparable concomitants in the administration of the concern; and the trend of events on the Continent makes the diplomatic part a greater essential than ever. In carrying out enterprise abroad, British capital has ever been in the forefront; and the success has had the double effect, in regard to the near Continental countries, of creating both envy and imitation. The latter may be the sincerest form of flattery; but the former requires very gentle handling, having regard particularly to the situation of the enterprise. The result is that British enterprise in Continental countries has—we are not referring more to gas than to anything else—to, as it were, nationalize itself as much as possible at the seat of active operations. British gas suppliers on the Continent have done this. They have not abused their privileges; they have laboured under rigorous conditions and heavy local financial obligations; they have had regard for national sentiment; and they have shown their sympathy—and in material manner—at all times and on all occasions when there has been national distress. All this has been fully recognized and appreciated; but gas suppliers, like others engaged in enterprise abroad, have to bow to the common will and law.

But with such change, the prosperity of the Association is not impaired. It cannot be expected that high-water mark will be reached year after year without intermission. That would be neither precedent nor natural. Last half year the increase in consumption was at the rate of 5 per cent. over the whole of the Company's operations. With the great advance in the business in recent years, the reduced rate of increase in a half year is not a matter that should even draw comment. A fine, warm autumn, the Chairman says, had a brake effect upon the progress of the increase; and we have no doubt, too, that the continued rapid advance in the use of the more economical inverted gas-burner has had some effect in stripping off some of the top part of individual consumption. We should like

Mr. Palmer to look at this matter of percentage increases another way; and tell us what 5 per cent. increase in the gas business represented in volume on the consumption of ten and twenty years ago, as compared with that of to-day, making allowance, of course, for the stations that have been severed from the main body. The proprietors we rather think would be very gratified with the result of the exercise. Apart from the reduced rate of increase, the connections of the Company continue to multiply in most luxuriant fashion. Another feature of the half-year's working was the poorness of the coke market; but the Chairman is too old a gas administrator, and has had such a large experience of the peculiar characteristics of this market—knowing full well, too, that the same conditions that govern the coal market rule that for coke—to feel any alarm at drooping prices and mountainous stocks. Of domestic and personal interest at the meeting was the reference to official jubilees in the service. There has been one this year; making up to six the list of retired officials who have served the Association half-a-century. There will be another jubilee to celebrate next year—that of Mr. Salamons, the Association's Chief Engineer at Brussels; and so well known and so well esteemed is he in professional ranks at home that many (we feel sure) will, in due season, be the congratulations that will pass from this country to the scene of long years of faithful labour in the capital city of Belgium.

Resistance Justified.

THE report that Viscount St. Aldwyn has made to the President of the Board of Trade (the Right Hon. Sydney Buxton) on the result of his inquiry into the schedule of maximum (London) port rates on goods, fully exonerates from any obstructionist or vexatious action those objectors who appeared before his Lordship. Not in all cases, but in several, objection was laid on public grounds, as well as advanced in the name of industrial interests. It is quite clear that his Lordship is of opinion that the Port Authority took a very expansive view of their powers in framing the schedule of maximum rates; for he deliberately says that he is satisfied that the maximum rates submitted to the Board of Trade were, in very many cases, unnecessarily high. Although the greatest care was taken to get together an authority fairly well representing in its composition the numerous interests concerned, at the very outset the members took the greatest liberty with the powers conferred upon them. Of course, the answer will be that, in view of the fact that they were (so to speak) exploring new ground, they wanted to have ample resources; and that there would have been no countenancing of hardship on their part that would have worked any ill on the trade of the port. On the other hand it is necessary for traders—such as the gas companies—to know as nearly as possible where they are, and not be perpetually labouring under depressing uncertainty as to whether or not port dues are going up. Early in the inquiry, Lord St. Aldwyn expressed his dislike of too large a margin between actual and maximum rates, inasmuch as the greater that margin the greater the uncertainty. The issue of the investigation makes it quite plain that in some respects the Port Authority made a false start in framing their maximum rates schedule; and this may have some effect in undermining future confidence.

Among the numerous objectors and bodies representative of commerce and shipping were the Gaslight and Coke Company, the South Metropolitan Gas Company, the Commercial Gas Company, and the Brentford and Wandsworth Companies. The oil industry and trade, as well as the users of the residuals of gas manufacture—such as tar distillers, chemical manufacturers, and cement makers—were also influentially represented as objectors at the inquiry. But attention may here be confined to coal. When it was originally seen in the schedule of maximum rates submitted by the Port Authority to the Board of Trade that the proposed rate on coal, culm, patent fuel, and coke was 6d. per ton, and on coal dust and cinders 3d. per ton, this naturally created widespread alarm. But it was not observed that the coastwise maxima were to be half of the maxima in the schedule; so that the 6d. and the 3d. would, on the coastwise trade, have been 3d. and 1½d. It is to the interests not only of London but of the trade of the port itself, that coal should not have a heavy rate imposed upon it; and Lord St. Aldwyn has recognized this by reducing the maximum rate to 2d. per ton. During the inquiry it was repeatedly asserted by representatives of the Port Authority that, generally speaking, the actual

rate charged would not exceed half the maximum. If this applies in practice to the reduced maximum, then it means that the actual rate will be 1d. per ton. It is estimated that, at 1d. per ton, the yield of coal alone passing through the port would be £33,000 to £35,000. Last year the five Gas Companies who appeared as objectors carbonized no less than 3,236,646 tons of coal, excluding oil. If this coal is all brought into London *via* the Thames, the port rate at one-half the new maximum will amount to £13,486 a year; and, if the maximum rate be charged, to close upon £27,000. This may not mean much per 1000 cubic feet of gas sold; but these increments of rate imposition make larger the already heavy burden upon the commodity, and so are not conducive to lower selling prices.

The Technical Attraction of Sunderland.

ONLY formal business, with a single exception, occupied the members of the North of England Gas Managers' Association at their meeting at Sunderland on Saturday. The exception was the consideration of the question of the formation of a Special Purposes Section in connection with the Association, to deal with such matters as may be deemed desirable by the members. This is a project the President (Mr. T. H. Duxbury) put forward in the luminous address with which he inaugurated his year of office. The indifferent and the drones of the gas industry (and there are such) may be quite content to let mutation have its own way without taking any steps to change their own course, and to continue to apply the methods and prescripts of the past to altogether new conditions of things. That will not do. It is a losing game; and there is disaster at the end of it. We are with those who look the circumstances of modern development fairly and squarely in the face, and see in them sufficient not only for individual mastery to the uttermost point, but for collective consideration and action. Changed condition in the industry is presented to us in so many forms that it cannot be expected that any one person is, unaided, capable of encountering and becoming master of it all; and therefore any action in combination, such as this Special Purposes Section as proposed by Mr. Duxbury, is welcome. As the result of their brief deliberation over the matter, the members assented to the proposed extension of the Association's activity and usefulness.

There was no prepared technical matter before the members; but all they required in the technical line was, in more concrete form than could have been offered by the most carefully written paper and the most fluent oratory, found at the Ayres Quay Gas-Works of the Sunderland Gas Company, invitation to which was extended to the members by the Directors and their Engineer (Mr. Chas. Dru Drury). As our pages have shown by illustrated description, the Ayres Quay Gas-Works have been entirely rebuilt to the plans of Mr. Drury; and there are several novel features about them, which are partly due to the peculiar character of the site. But the most pronounced novelty is comprised in the bench of six settings of ten vertical retorts on the Dessau system—the first erected in England—and we opine that Sunderland will in consequence, for some time to come, be a sort of Mecca for British gas engineers. The members were heartily complimentary to the Directors and Mr. Drury not only for the privilege of being allowed to inspect the new plant, but on account of their enterprise in making this complete departure, in the case of one entire works, from old style to new style carbonization. A new plant of the kind could not require any more favourable quarters than these in which to have its capabilities proved; for with no other carbonizing plant about the place, and all the auxiliary apparatus being on the ordinary working scale, there cannot be any question as to the accuracy of production results. That the visitors on Saturday were favourably impressed with the working of the new carbonizing plant was obvious, as was also the fact that the interest afforded them by it, and the constructional work of Mr. Drury generally, was of the kind which is much to the liking of all professional men enamoured of their work.

Livesey Memorial Fund.

We are coming to the end of the final arrangements for the establishment, in fulfilment of the objects of the Livesey Memorial Fund, of the Gas Engineering Professorship at the Leeds University. To consider this matter and receive their report, the Committee of the Memorial Fund have called a meeting of subscribers

for the 18th inst. at the hall of the Institution of Mechanical Engineers. From the statement accompanying the notice of meeting, it is seen that the total contribution to the fund (including interest) is £10,736 19s. 9d.; while the deductions in the way of expense amount to only £48 5s. 1d. So that £10,688 14s. 8d. remains for investment. There were 605 subscribers altogether, made up as follows: 14 Subscribers, Institution (Birmingham Medal Fund), District and Junior District Gas Associations, £342 1s. 6d.; 228 Members of the Institution of Gas Engineers, £946 10s. 7d.; 160 Gas Companies, £7102 3s.; 24 Gas Committees of Corporations, £540 16s.; 55 Members of the Society of British Gas Industries, £538 1s.; 29 Other Manufacturers, Coal Owners, &c., £308 13s.; and 95 Other Subscribers, £745 3s. 6d. The two largest subscribers were the South Metropolitan Gas Company (£2000) and the Gaslight and Coke Company (£1000).

The Coalite Patents and Position.

Confidence seems to be absolutely shattered in the Coalite Syndicate and the British Coalite Company. The shares continue to shed fresh parts of their market value; and the claims of the promoters have their foundations rendered more and more insecure as time passes. It was a significant piece of news that the "Iron and Coal Trades Review" published recently (and which was reproduced in our news columns last week), to the effect that the Coalite Company had been unsuccessful in defending what they are pleased to regard as their master-patent by opposing the application of a Glasgow Syndicate for a patent for producing—presumably by a low-temperature process of carbonization—a smokeless fuel. The stupid pretensions of the Coalite people in respect of a monopoly for the production of a sort of half-carbonized coal are thus knocked on the head. Before any claim to monopoly could be maintained for the degree to which carbonization is carried out, all the governing parts of our patent laws would have to be relinquished. There were rumours, too, in the City last week as to a number of men having been discharged from the Barking works. But according to Sir William H. Preece, the Chairman of the British Coalite Company, the men have only been temporarily suspended while the gas-producer plant is being coupled up to the new batteries there. The men, it is learned from the same source of information, are engaged in the installation of electrical plant at the works, from which plant, we are told, the various districts for miles around are waiting to be supplied with electricity as soon as the Coalite Company can meet the demand. We have been taught by a very large experience to considerably discount Coalite statements; and as we look at the statistics as to existing electricity plants and supply in the districts for miles around Barking, the question naturally arises, Is the statement true as to this demand for electricity actually waiting for the Coalite Company to be in a position to meet it? The information on this point is published by the "Financial Times;" and it occurs to us that perhaps the reporter did not correctly catch what Sir William Preece said at the interview with him.

The Weekly Rest-Day.

The very good principle of "one day's rest in seven," as bearing on their own employees, has been receiving a considerable amount of attention at the hands of the Nottingham City Council. Some months ago, a resolution was passed in favour of the adoption of a scheme which would embody the idea of a weekly rest-day; and the Committees were instructed to make arrangements accordingly. At a meeting of the Council last week, three of the Committees presented reports on the matter; and from these it was seen that the passing of the resolution by the Council in favour of the scheme was not by any means the only thing required to bring it into successful action. It was stated that the scavengers and lamplighters had presented memorials against the new arrangement, and asking that the previously existing conditions of work and pay should be reverted to; while the Gas Committee intimated that they found themselves unable to carry out the resolution, "unless the Council were prepared to take the risk of voting in opposition to the wishes of the general body of gas workers," who were opposed to any system which would entail their rest-day being any other than Sunday. A joint motion of the three Committees referred to (the Gas, the General Works and Highways, and the Lighting Committees) rescinding the resolution of the Council in favour of the scheme was moved; and it was pointed out that a great number of the

men worked only part of Sunday (and received only part of a day's wage); and the compulsory rest on a week-day meant a greater loss to them than when it fell on a Sunday. The men did not want the scheme, urged the mover of the resolution; all they asked was to be "severely left alone." An amendment was then moved to the effect that a Special Committee should be appointed for the purpose of ascertaining the best means of carrying out the Council's original resolution respecting one day's rest in seven for employees, without involving any reduction of wages to those who at present receive less than 6d. per hour; and that the various Committees should be directed to see that no employee suffers loss of wages pending the report of the Special Committee. One member said the scheme was introduced for the benefit of the men, both from the spiritual and the physical standpoint, and to solve to some extent the question of unemployment in the city; and he instanced the carbonizing department of the gas-works to show how under the scheme sixty additional men would be required during the winter months, or thirty throughout the year. From all this, it seems that the Council are desirous of looking after the spiritual and physical welfare of the men, but that the men are unwilling to bear the cost of the treatment. The question thus apparently resolves itself into one of whether the Corporation themselves are prepared, on behalf of the ratepayers, to bear the expense of putting into practice the principle with which they have already expressed agreement. More will doubtless be heard of the matter, as the amendment for the appointment of a Special Committee was carried—without, however, the portion referring to the question of wages.

The Birmingham Appointment.

The Gas Committee of the Birmingham Corporation decided yesterday to recommend for appointment as Secretary and Manager of the Gas Department, at a salary of £1000 a year, Mr. R. S. Hilton, at present Manager of the Clay Cross Coal and Iron Works, near Chesterfield.

A Libel on the Gas-Cooker.

Mr. W. Shaw Sparrow—we do not know the gentleman—has written a book entitled "Hints on House Furnishing," and extracts have been appearing in a magazine called "The Household." We have not Mr. Sparrow's book by us, so we cannot form any opinion as to his general knowledge on the subject on which he poses as an authority. But there is one respect in which an assertion is so faulty and, in fact, without foundation, that we can only declare that, concerning this particular point, he knows nothing whatever—assuming, of course, the sentence referred to in "The Household" is an extract from his book. It reads: "Then, as regards the use of gas for cooking, most families have tried it in towns, but not with encouraging results." The statement, it is general knowledge, is so untrue that it does not require the material evidence of statistics as to the continuing popularity of the gas-cooker to disprove it.

Reference has already been made in the "JOURNAL" to the Engineering and Machinery Exhibition which the proprietors of "Engineering Review" are making arrangements to hold in Manchester from Oct. 14 to Nov. 5 next. Among the numerous patrons of the Exhibition are several whose names are familiar to our readers—Sir Alexander Binnie, M.Inst.C.E.; Mr. J. A. F. Aspinall, President of the Institution of Mechanical Engineers; Dr. Gisbert Kapp, President of the Institution of Electrical Engineers; Mr. James Swinburne, F.R.S., Past-President of the Junior Institution of Engineers; Mr. W. H. Prescott, Assoc.M.Inst.C.E., President of the Institution of Sanitary Engineers; and Captain H. Riall Sankey, Mr. Michael Longridge, Dr. Edward Hopkinson, and Mr. Dugald Clerk, who are well known for their work in connection with the gas-engine.

Dr. J. B. Readman, of Edinburgh, communicated to the Royal Scottish Society of Arts, at a recent meeting, some results obtained by him on a motor-car with different liquid fuels. In order to render the trials as closely comparative as possible, he selected the high road leading from Penrith to Appleby, a portion of which was believed to be one of the best roads in England. The trials were always from the same place and proceeding in the same direction; and the series of experiments were all carried out on one day. In every case one-fifth of a gallon was introduced into the experimental tank. The unmixed fuels used were: (1) Shell petrol, as a standard well-known fuel; (2) 90 per cent. benzol, sp. gr. .880 (engine very difficult to start when cold); (3) shale motor spirit, sp. gr. .704 (engine started readily); and (4) shale naphtha, sp. gr. .740 (repeated trials proved that the engine started fairly readily with this spirit, even when all was cold). The fifth fuel was a mixture of 50 per cent. benzol, sp. gr. .785. The results showed that the miles per gallon from each of the fuels were respectively 18.3, 20.7, 18.1, 18.8, and 18.7. There was no smoky exhaust from any of the fuels; and the engine pulled well with all except the naphtha. The author pointed out that benzol gave the best results; but the difference was not so great as he expected.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 387.)

THE Stock Exchange was closed on Monday—as usual on the first working day in May. Re-opening on Tuesday, the dominant feature was the considerable fall in the Rubber Share Market. This was in part the result of reaction from the previous boom, but more largely from the unexpected line taken by the market for the article produced. Other speculative lines were depressed to some extent; but the leading departments were not affected. Indeed, Government securities were strong; Consols rising $\frac{1}{4}$ for money and $\frac{1}{2}$ for the account. Wednesday was more cheerful—being much relieved by the cessation (even though it might be no more than a postponement) of collapse in Rubber. Consols advanced another $\frac{1}{16}$. Railways were firm, and all the big markets were more or less improved. The brighter tone was confirmed on Thursday; the special settlement in the Rubber Companies shaping satisfactorily. But Consols were dullish on the Bank returns; and buyers lowered their price $\frac{1}{8}$. The other leading departments, however, were quite good. On Friday, the opening was clouded by fears engendered by the bulletin of the King's health. In a state of uncertainty and apprehension aroused by the wholly unexpected intelligence, dealers could only lower prices, and, indeed, in some line dealings at all were hardly to be done. The alarm abated somewhat before the close, in the absence of a further bulletin, upon which fact the best construction was put. On Saturday, the Stock Exchange was closed, in mourning for our dead King—a Ruler of rare sagacity and that sense which transcends genius—hereafter in all hearts Edward the Wise! The Money Market was placed in a position of extreme ease at the beginning of the week by a great influx of gold; but it subsequently became firmer. Business in the Gas Market was only moderate, and quite devoid of interest. The universal characteristic was steadiness free from any motive power to change. In the whole list of quotations—whether in London or in the Provinces—there was only one variation, and that was an *ex div.* adjustment. In Gaslight and Coke issues, the ordinary realized the same prices as in the week before—viz., 103 $\frac{1}{4}$ to 104 $\frac{1}{4}$. In the secured issues, the maximum made 89 $\frac{3}{4}$, the preference from 104 $\frac{1}{2}$ to 105 $\frac{1}{2}$, and the debenture from 81 $\frac{3}{4}$ to 82 $\frac{1}{2}$. South Metropolitan was quiet at from 120 $\frac{1}{2}$ to 121 $\frac{1}{2}$, and ditto debenture made 81 $\frac{1}{2}$ and 82. Commercial 3 $\frac{1}{2}$ per cent. changed hands at 103. Among the Suburban and Provincial group, Alliance and Dublin was done at from 82 $\frac{3}{4}$ to 83 $\frac{1}{2}$, Brentford new at 188, Brighton original at 215 $\frac{1}{2}$, British at 44, South Suburban at 121 $\frac{1}{4}$, Wandsworth "B" at 139 $\frac{3}{4}$, Liverpool "B" at 104 $\frac{1}{2}$, and Sheffield "C" at 234. In the Continental companies, Imperial marked from 181 $\frac{1}{4}$ to 182 $\frac{1}{2}$, Union from 98 $\frac{1}{2}$ to 99 $\frac{1}{4}$, European 24 $\frac{1}{4}$, and Tuscan debenture 100 $\frac{1}{4}$ and 100 $\frac{3}{4}$. Among the undertakings of the remoter world, Hong Kong made 17 $\frac{3}{8}$, Monte Video 12 $\frac{1}{2}$ and 13 $\frac{1}{16}$, Primitiva 7 $\frac{1}{2}$, ditto preference from 5 $\frac{3}{8}$ to 5 $\frac{5}{8}$, and San Paulo 15 $\frac{3}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Unrest in the Electrical Industry—The Influence of Possession—Flame Arc Street Lighting—Company Finance—The Burden of Faversham—A Truly Rural Venture.

THE question of public street lighting has waxed in strength; and all through the Westminster lighting contract having been won by the Gaslight and Coke Company. Our friends of the electrical press are torturing themselves needlessly in trying to mend the injury that they confessedly feel has thereby been done to the electrical industry. The mass of flabby assumption that has been presented to the readers of these papers is wonderfully amusing; the sympathy one minute for the Gaslight Company and the abuse that, the next minute, is showered upon them is distinctly of the same order; the mixture of sympathy with, and abuse of, the St. James' and Pall Mall Electric Supply Company is in character with the rest; and so are the things that are said about the Westminster City Council. The electrical defeat fairly haunts those whose duty it is to speak for the electricity supply industry; and the result is the wordy exhibition that has been witnessed. The presumption of our journalistic friends in believing that they know more about the Gaslight and Coke Company's business than that Company know themselves, has been a matter upon which there has been previous remark in these columns; and there has also been in these columns a suggestion that there should be fair and square contemplation of current facts, and not misleading constructions placed upon historical figures that have no application to the latest accomplishments of high-pressure gas lighting. But nothing that has been said has altered the electrical method of dealing with this question. The Gas Company are still accused of "taking a leap in the dark, and trusting to luck to pull them through." The prices and photometrical tests of the Kingsway lamps (which have no relationship whatever with the latest high-pressure achievements) are taken as the impassable zenith in economy and efficiency of gas lighting. But when the candle power obtainable from a cubic foot of gas is doubled, when a single inverted burner and mantle can be made to give a constant 1500-candle power, and when by the inverted mantle greater illuminating efficiency can be obtained in the directions wanted, it must be apparent to the simplest mind that the bases of past

comparison no longer hold good. Mr. J. W. Bradley, the City Engineer of Westminster, would be the first to acknowledge that, when his latest photometrical tests were published, he had not tested photometrically (as he has since done) the high-pressure lamps in Fleet Street. It is also clear our friends of the electrical press have yet much to learn as to the principles of photometry, and as to the question of effective illumination from different lights at given heights and measured at certain points. But why not let the matter rest now? If all they say is true, there is a day of reckoning coming for the Gas Company. Let the electricians go along confidently and complacently in the belief that the Gas Company have done something at much below cost price (a thing that, of course, an electrical undertaking never did). The elation now will swell to magnificent triumph later on; for do they not see that the illumination contracted for is going to be tested photometrically at certain points, and there is a heavy penalty attaching to deficiency. Electricians are fully persuaded that gas cannot be kept up to any definite standard of illumination; and so they may contemplate with the pleasure of anticipation, which will be nothing to the ecstasy of realization, the Gaslight and Coke Company receiving nothing for the lighting of Westminster after the penalty deductions have been made. Happy ratepayers! happier electricians!! Now do rest peacefully for a time.

Possession has no doubt a big influence in the matter of decision, though the decision may not be the best thing that could happen in the interests of the greater number. The remark applies to this street-lighting question. There is little reason to ask why it is that in the areas where the electricity undertaking is under municipal control, electric lighting should bulk so largely in the streets; while in those areas where gas and electricity are both under the direction of companies, gas succeeds in retaining its pre-eminent position. The City of Westminster contract shows that gas economy and merit can win where there is not the prejudice born of possession; and the same may be said in connection with the frank and independent report of the deputation that the City Corporation commissioned to investigate the matter of modern public lighting. In those boroughs of South and North London where electricity is supplied by companies, gas also holds its own. That is an answer to the growl in one quarter (provoked solely by the Westminster street lighting contract) that "the time has gone by when street-lighting contracts are settled by a sort of independent competitive examination; they are being settled now by the methods of unscrupulous rivalry, and it behoves the electric supply companies to make the fact apparent." In the gas industry municipal electricity supply tactics have long since made that "unscrupulous rivalry" felt, and felt seriously. In another source of electrical information, we read in a notice of a meeting of the Hampstead Borough Council (who are the owners of the electricity undertaking) that "the Lighting Committee have had under consideration an amended offer from the Gaslight and Coke Company for the improvement of the lighting of the street lamps. A motion that the work of converting the gas-lamps into electric lamps, as already decided upon, be deferred until the amended offer is considered was negatived." This may be left to speak for itself. The interests of the ratepayers may go to the wall, so long as those of the electricity undertaking are served. So men placed in positions of trust by the ratepayers are influenced by possession; and economy and efficiency of service are considerations that are now shelved and forgotten.

Street lighting by flame arc lamps is not progressing; and it is not surprising owing alone to their inconstancy. Illumination authorities, assembled in the hall of the Society of Arts, under the auspices of the Illuminating Engineering Society, have told the lighting world that they have the greatest possible difficulty in getting an illuminating curve for arc lamps owing to the fluctuations of the light. Mr. Bradley, the City Engineer of Westminster, has likewise found some difficulty with the measurement of the arc lights in the area under his control. Another cause for the want of progress of flame arcs is the (unless the lamps are placed close together, and this is costly) big variation between light and shadow on the surfaces of the roads; and still another is the advent of the high-power metallic filament lamp. Now the makers of carbons for flame arcs appear to be putting another obstacle in the way of the lamps by raising the prices of the carbons. The Hackney Borough Council have learned from their Electricity Committee that they have examined eleven tenders for 80,000 yellow flame arc lamp carbons; and the prices range from £5 15s. to £4 5s. per 1000 pairs. The highest price in the past has been £3 12s. 6d. It appears to the Committee that an attempt is being made to force up the price of flame lamp carbons; and they have therefore decided for the present to buy in the open market as current requirements demand.

From time to time at Local Government Board inquiries, loud have been the complaints made of the crooked accountancy of councils in connection with their electricity concerns; and we know, from an examination of the accounts of certain electric light companies, that their financial methods cannot be held up as spotless. This matter so far as companies are concerned is of vital importance to local authorities, in view of their purchase powers under the General Acts. At the instance of the Camberwell Borough Council, Messrs. Deloitte, Plender, Griffiths, and Co., have been making an investigation of the accounts of the London Electric Supply Company; and their report is not altogether satisfactory, intimating as it does that the accounts are kept with a greater regard for the present than for the future. And it is the future with which the Borough Council are most

concerned. It is alleged that the accounts do not conform with Board of Trade requirements. The Auditors are not satisfied that certain outlay charged to capital account is expenditure within the meaning of the Acts. The question of the advisability or otherwise of salaries and wages being charged to capital has frequently been raised in relation to municipal electricity supply; and here we have the Auditors suggesting that the method employed by the Company in charging certain portions of salaries to capital account is questionable, inasmuch as its application may have resulted in amounts which are materially disproportionate to the cost of the time occupied in connection with the expenditure upon particular assets. In view of the ultimate transfer of the undertaking, the question of proper provision for depreciation, repairs, and renewals is of considerable importance; and the Auditors do not consider the Company have taken a sufficiently broad view in this matter. But the General Manager of the Company, in answer to this, says that, "having regard to the existing conditions affecting electrical enterprise generally, and the present circumstances of the undertaking, considered in conjunction with the Company's proposed policy in relation to the future as regards the question of providing for depreciation," he regards the provision made to the date of the Auditor's examination as "reasonably sufficient." Among the recommendations of the Auditors is one suggesting that the revenue account should be divided so as to show separately the receipts in respect of power; and this requirement, it is submitted, is reasonable, having regard to the powers of the local authority under the special purchase clause of the Camberwell Provisional Order. The London Electric Supply Company's accounts are not worse, but much better, than many other electricity companies can show; and we have only referred to them here as an illustration, in view of the comments upon them of a firm of Auditors of high repute. It is clear that not only the accounts of municipal electricity concerns, but those of companies, require overhauling, and placing beyond suspicion on a sound foundation.

Representative of numerous other electricity undertakings operating in provincial towns is that of the Faversham Borough Council, whose accounts are before us from the date of formation to March 31, 1909. It is a sorry tale that the accounts present. From the outset, with a revenue making snail-like progression, things have been going from bad to worse in the final annual result; and we fancy the ratepayers must be heartily sick of the white elephant which their ill-advised representatives provided for them a few years ago. If we take the accounts for the year ending March, 1906, and compare them with the year ending March, 1909, it is seen that the capital account has grown, by £3789, to £24,179. The revenue from private consumers of electricity has only in the four years advanced by £377, to £1058; and public lighting (with a total of £712) has put on £55. Whereas the total revenue (£1860) only exhibits an increase of £576, the total expenditure on revenue account (£1821) has risen by £945. Strange as it may seem, it would have been far better for the undertaking and the ratepayers if the conditions of 1905-6 could have been stereotyped; for then an amount of £508 was transferred to the net revenue account, but since then 1906-7 has yielded only £197, 1907-8 £223, and 1908-9 £39. It is hard that the ratepayers of a town like Faversham cannot be protected against the prophetic representations, which time proves to be misrepresentations, and against the speculative propensities of a gullible Council. Since the concern started five years or so ago, the ratepayers have had to provide (only £90 short of) £5000, to meet the financial obligations of the concern—that is to say, the ratepayers have actually provided in support of the undertaking upwards of £800 more than the total receipts for electricity from private consumers, and have during the same period paid £3300 for public electric lighting. Therefore altogether the ratepayers have up to March, 1909, financed the electric light undertaking to the extent of £8300. And, to make matters still worse, under the heads of sinking fund account and reserve fund account, the word "nil" appears; and depreciation is going on day by day. If it is any consolation to the ratepayers of Faversham, it may interest them to know that they do not stand alone among communities that have been electrically deluded.

This Faversham experience reminds us of a recent announcement regarding the formation of a Company to carry on the business of rural electricity suppliers. Notwithstanding the fact that the Company propose to use gas or oil engines for generating purposes, we shall not feel inclined to participate in the scheme as investors, or to advise anyone else to do so. It is stated that the Company intend to operate without parliamentary powers, and to use overhead distributing mains. This sort of thing may seem enterprising to some people; to others it may seem something else. We can quite understand that while a writer in the "Industrial Supplement" of the "Electrician" wishes the venture every success, he prays that the promoters may order their steps carefully at first (we take it that afterwards care will not matter), and to choose with discrimination the areas in which they open their first stations. The advice is timely, and should be seriously taken to heart. By the way, talking of new electrical ventures, how is the "Fixed Price Per Light Company" going along in South London?

NOTES FROM WESTMINSTER.

THE long-promised spring holiday is now with us—the Budget having been passed and the "Parliament Bill" having seen the light of day. Both Houses have a respite from their labours until Thursday, the 26th inst. Thereafter, we ought not to be long in learning the fate of the Standard Burner Bills, and in seeing through the remaining Gas Bills that are to be opposed in the second House. There are not many of them. To clear up the record of the noticeable work done in the Committee rooms, there are a few notes to be made on some important water schemes.

Aberdeen Water.

The Aberdeen Water Bill has been very unfortunate from the time it reached the Committee stage; and it has in the event failed to convince—notwithstanding all the care of Mr. Balfour Browne, K.C., Mr. Honoratus Lloyd, K.C., other Counsel, and a noble army of engineering and chemical experts—a House of Lords Committee as to the soundness of its *raison d'être*. It was a big water scheme that the Bill adumbrated, involving an expenditure of no less than £1,400,000, and proposing a supply from the River Avon—a tributary of the River Spey. The Bill first came before a Committee, with Lord Gorell as Chairman; but when there had been a partial hearing, his Lordship was taken ill, which left the Bill in suspension for some time. Then compassion was shown it; and the Earl of Camperdown, ever compliant in such matters, was induced to take Lord Gorell's place. Matters then proceeded without further hitch, until the end of the Committee proceedings came; and they marked the final disposal of the measure by the simple process of absolute rejection. The Bill was at one time opposed by the Duke of Richmond and Gordon and other riparian owners; but with them terms were arranged. There was, however, an influential section of the ratepayers and manufacturers of the city whose antagonism was unappeasable. They saw no good in the scheme, either from the financial standpoint or in respect of the character of the water; and their advisers were of opinion that an additional supply could be obtained more economically from a source nearer home. No amount of pleading as to the present supply being inadequate or liable to pollution would shift the opposition a single inch from the position that they had taken up. The grandeur of the whole scheme—the possession of a mammoth reservoir capable of yielding 20 million gallons of water a day, and an aqueduct running a distance of 48½ miles—had no softening influence. Opponents were steadfast in their declaration and view that the Council in this matter were not representing the opinions of the ratepayers, and that the scheme was not reasonably necessary. It was a tough fight; and each side was strong in its contentions. But the Bill has sunk, and the scheme has gone with it, by a unanimous decision of the Committee. Whether it will, in some similar form, be revived again remains to be seen. For such a course the great Loch Katrine scheme will perhaps stand before the Aberdeen Council as a precedent encouraging to revival. One point in connection with the decision. The successful opponents asked for costs; but these the Committee refused. The request for costs is of more frequent occurrence nowadays than it was in the past. But, before they will grant them, a Committee require very definite satisfaction that those against whom costs are desired have acted in a vexatious manner.

Domestic Supply.

There has been a great deal of difficulty, and more especially of late, as to what of the thousand-and-one uses to which water is applied may fairly come within the definition of "domestic supply." There was the case recently in which the South Suburban Gas Company were concerned in placing the views of the Metropolitan Water Board on a rational basis; and the London, Brighton, and South Coast Railway Company have also experienced difficulty with regard to the supply of water to the lavatories at their West Norwood station. What is chargeable, and what is not fairly chargeable, within the term "domestic supply," has become an extremely serious matter for water authorities. The Bradford Corporation Water Department are among those who have suffered through the absence of a proper definition; and so they determined to put an end to the trouble in the Bill that they have in Parliament this session. A clause was inserted for the purpose, which, to please the Local Government Board, was framed in this way: "No supply of water other than a supply to, or for, the purpose of a dwelling-house, shall be deemed to be a supply of water for domestic purposes." At first the section of the Local Legislation Committee presided over by Mr. Nicholson seemed to think this was more a matter for the general law than anything else; and that the granting of the clause would be looked upon as a precedent. But a clause sufficient to serve as a precedent, and bearing a great weight of years and proved usefulness, exists. After Mr. James Watson, the Corporation Water Engineer had illustrated the experienced difficulties, Mr. W. Terry, General Manager of the Water Department of the Sheffield Corporation, came along, and stated that they have a clause in their Act of 1853 which to some extent defines the line between domestic and non-domestic supply; and it has been a great convenience. The clause defines the supply of water for domestic use to be to the occupier or occupiers of any dwelling-house, or for the purposes of his or their own families' consumption. The Committee were undoubtedly impressed by Mr. Terry's

The spring meeting of the Midland Association of Gas Managers will be held at Smethwick, on Thursday, June 2—the President (Mr. Vincent Hughes) in the chair.

evidence; and they soon got over the difficulty of creating a precedent (for which they appear to have a great abhorrence) by giving Bradford the Sheffield clause, simply altering in it the word "shall" to "may." Bradford was satisfied; and so were the Committee. It may be expected there will be many other water authorities seeking to become possessed of the same defining clause.

A Joint Water Board. The Rhondda and Pontypridd District Councils are in Parliament with a Bill for the formation of a Joint Water Board, who propose to commence their career by purchasing, for £335,000, the undertaking of the Pontypridd Water Company. Sir Luke White's Committee quickly passed the preamble of the measure, as there was no opposition to it—the fighting all taking place on clauses, when some important decisions were given by the Committee. In the first place, in the Pontypridd Water Act of 1908, the Cardiff Corporation obtained a protective clause in regard to the supply of water within a prescribed area outside the borough boundaries. Now this protection, unless repealed, would have prevented the Llandaff and Dinas Powis Council negotiating with the Water Board for water on the termination of their contract with the Cardiff Corporation. Therefore there was a proposal in the Bill that the 1908 clause should be repealed, in which event the Cardiff Corporation in the outer area would be open to competition. A corresponding case has never been heard of before; and, much to the annoyance of Cardiff, the Committee consented to the 1908 clause being repealed. That was one surprise. Also in opposition were the Llantrisant and Llantwit Fardre District Council; and, at their instance, the Committee agreed to the insertion of a clause enabling them, without coming to Parliament, to purchase, upon giving notice, the distributing portion of the Water Board's undertaking that was in their district—purchase to be by agreement or arbitration. The Committee rather wanted conditions of purchase and supply in bulk to be inserted in the Bill. The parties, however, could not come to any arrangement; so that the clause will remain open for a future tussle, should the Council determine to become their own water distributors.

PERSONAL.

Mr. F. W. RAPKIN, the Engineer and Manager of the Dartford Gas Company, on the occasion of his having completed 23 years' service, and in recognition of his interest in the welfare of the workmen, has been the recipient of a beautiful illuminated address, which emphasizes the value of his services in the introduction of the co-partnership scheme adopted last year. The opportunity was also taken to present Mr. W. H. BENNETT, the Assistant-Manager, with a smoker's cabinet, suitably inscribed, in view of his approaching departure for Redhill, where he has been appointed Engineer and Manager of the Gas Company. The presentations were made by Mr. J. James, on behalf of the men; and the recipients appropriately acknowledged the gifts.

On a proposal to increase the salary of their Gas Manager, Mr. A. BROMLEY, from £300 to £350, Alderman Ward, the Chairman of the Gas Committee, pointed out to the Batley Town Council that he was a most efficient official, and for many years there had been handsome profits handed over in relief of the rates; and he said that if Mr. Bromley continued to manage the works as he had done up to the present, the Committee contemplated giving him a further increase of £50, to make his salary equal with that of his predecessor. Alderman Turner moved, as an amendment, that the increase be only £25, in view of the remarks of Alderman Ward. Had it been intended to let the increase stop at £50, he would not have objected; but he did not agree with any proposal to give such a substantial increase as £100 in so short a period. Eventually, however, the proposition was carried.

After twenty-three years of continuous service with the Omaha (Neb.) Gas Company, and after fifty-three years' work with various gas companies, Mr. ISAAC BATTIN has retired, and he and Mrs. Battin will reside in Philadelphia. On account of his long service with the Company, the Directors have given him an indefinite leave of absence; but he will retain the office of Treasurer and Engineer. The Directors passed resolutions testifying their appreciation of his services, and recording that the Company's increased business had been largely due to his energy and integrity. They recognized that by his retirement they were losing a loyal and faithful officer; and they tendered to him their best wishes for a long life, "filled with a knowledge of duty well done." Mr. Battin is the oldest member of the American Gaslight Association, and has a record of service in the gas business probably longer than that of any other man in America.

Mr. A. CANNING WILLIAMS, the Secretary and Accountant of the Reading Gas Company, was on Monday of last week appointed Treasurer and Collector to the Edinburgh and Leith Gas Commission. The vote was between Mr. Williams and another, and it resulted in favour of Mr. Williams by twelve votes to ten. In nominating Mr. Williams, Lord Provost Brown said they quite recognized that it was consistent with their duty that they should promote someone in their own employment; but they were face to face with this fact—that to the best of their lights they must nominate the best man before them. While they needed a man with good business experience, a man with gas experience was also felt to be desirable. The Sub-Committee came to be of opinion that, in the best interests of the Commission, they had to

go outside Edinburgh; and they nominated Mr. Williams, at a salary of £700, which was not a maximum. The impression that got abroad, that £500 was to be the maximum salary, probably prevented some of the best men from applying. Mr. Williams, who has been appointed, began his career in the Gas Department of the Blackpool Corporation (under Mr. John Chew), where he was rental clerk 1882 to 1888. He was then, till 1895, Assistant Accountant to the Scarborough Gas Company; and from 1895 till 1904 Accountant and Office Superintendent of the Scarborough Gas Company. In 1904 he was appointed Secretary and Accountant of the Reading Gas Company. During his tenure of office at Reading, the percentage of arrears has fallen considerably; there has been a reduction in the amount of bad debts; the price of gas has been reduced three times; the reserve fund has been built up from £15,000 to £37,000; and about £81,000 of capital has been raised.

OBITUARY.

We regret to record the death of Mr. MARTIN PEIRCE, eldest son of Mr. W. G. Peirce, the Water Engineer to the Corporation of Richmond. Deceased was articulated to his father, and was for some years his Assistant. In this capacity he prepared the plans and superintended the work connected with the sinking of the Terrace Gardens well, and was clerk of the works for all the constructional work, well sinking, and adit driving undertaken by the Vestry and their successors the Corporation. He remained in their service till 1902, when arrangements were made with the Southwark and Vauxhall Water Company for furnishing an auxiliary supply of water to the town. Mr. Peirce was subsequently engaged on works in various parts of the country; and finally obtained the position of Resident Engineer of the Bexhill Water and Gas Company, which he filled at the time of his death at the early age of forty-five. Deceased leaves a widow and five children.

The Dutch gas journal, "Het Gas," contains an obituary notice of Heer J. J. PRINS VAN DOESBURGH, the Manager of the Gas and Electricity Works at Gouda, who died on April 8, in his 49th year. Deceased received his training as a gas engineer at The Hague and the Rotterdam Gas-Works, then under the management respectively of Heeren J. E. M. Kros and Dr. Th. van Doesburgh, and later at English gas-works. In 1879, when at Newcastle-on-Tyne, he was elected a Member of the Gas Institute. From 1882 to 1884 he was at the Lochem Gas-Works, and then for three years at Dordrecht. In 1887, he was appointed Manager of the Gouda Gas-Works, and when, later, an electricity works was constructed in the same town, he was placed in charge of this also. He took an active part in 1898 in the formation of the South Holland Club of Gas Managers, which was represented, as well as the Association of Dutch Gas Engineers, at the funeral on April 11.

The death occurred recently, at the advanced age of 96, of Mr. JAMES EATON ROBENS, J.P., the Chairman of the Weymouth Consumers' Gas Company. The deceased, in association with a few fellow-townsmen, formed the Company now many years ago, and acquired the then existing undertaking; and from the outset till his death his interest in it never abated. He held the chairmanship for a long time; and, notwithstanding his great age, he regularly presided at the half-yearly meetings, at which his statements were always remarkable for their lucidity and for the revelation of the commercial instincts and business qualities with which he had been so liberally endowed. Under his régime, the price of gas was reduced from 5s. 9d. per 1000 cubic feet to little more than half this figure. As evidence of his keen interest in the Company, it may be mentioned that though he was unable, owing to ill-health, to be present at the last half-yearly meeting, he sent some observations upon the working of the concern which were read by the Vice-Chairman, who presided. Mr. Robens had had remarkably good health until towards the close of the past year, when he had a severe attack of bronchitis. A few weeks ago he became seriously ill, and died on the 22nd ult. The funeral took place the following Wednesday; and was attended, with other gentlemen representing the Gas Company, by Mr. D. F. Coulson, the Engineer and Manager, and Mr. James Lowe, his predecessor in this office.

Use of Tar on Roads.—At the meeting of the Surveyors' Institution on Monday last week, papers on the construction and maintenance of roads were read by Mr. Richard F. Grantham, M.Inst.C.E., and Mr. W. Menzies. In the course of his communication, Mr. Grantham stated that the cost of tar-spraying, including brushing the road and the sand sprinkled on the tar, varied from about ½d. to 2d. per square yard. Taking the average width of the carriage-way at 8 yards, this worked out at from £44 to £117 per mile. The cost in some districts was said to have been reduced to from £30 to £40 per mile. Mr. Menzies said the life of a road is greatly prolonged when tarred. He carefully watched two lengths of his roads, one having a granite and the other a flint service, both of which were tarred in 1907; the process being repeated annually. These surfaces were subjected to heavy traffic; and he had come to the conclusion that between 1907 and the present time a saving of something like 9d. per yard super. on the granite and 6d. per yard super. on the flint road had been effected.

THE HAMBURG GASHOLDER DISASTER.

THE accident which befel the two gasholders at the Grasbrook works at Hamburg on Dec. 7 last, with its terrible consequences, is recalled by the official account of it given by the Fire Brigade Committee of the Hamburg Corporation, of which a translation appears below. This account forms part of the annual report of the work of the Brigade, and does not essay to explain why the initial failure of the substructure of the large new gasholder occurred. For an official explanation of the real cause of the disaster, we must apparently continue to wait until the Court of Inquiry which five months ago was commissioned to investigate the matter issues its official judgment or report. We cannot help, however, expressing surprise at the length of time which that Court appears to consider necessary for conducting its investigation and formulating its report.

The Fire Brigade report does not add much to the knowledge of the disaster gleaned from unofficial sources immediately after its occurrence. The number of persons injured, however, is now definitely stated to have been 72, of whom 20 lost their lives. We do not know if there has been any inquiry on the deceased corresponding to the English inquest, and, if so, what was the finding in regard to the responsibility for such terrible loss of life. Probably, however, the result of the technical investigation of the Court of Inquiry already referred to would incidentally carry with it apportionment of responsibility, if any, for the deaths. The Fire Brigade's report also definitely indicates that the ceiling of the chamber inside the tank of the large new holder cracked owing to the steel structure by which it was supported giving way. The ceiling is now also definitely said to have been of riveted sheet iron, whereas it was not clear from the early reports of the accident whether ferro-concrete had not been largely used in the ceiling and its framework. Now we know that it was a steel framework which failed; and assuming there was no culpable scamping of the work of construction, it is pretty clear that the strains on this framework must have been underestimated, or the margin of safety cut too low. It is eminently desirable, in view of the failure of this framework, that the details of its construction, if not even the working drawings, should be published for the guidance of engineers engaged in similar construction work. One failure teaches more than many successful structures.

We have not yet heard whether the Hamburg Corporation have decided to reconstruct the large gasholder in accordance with the original design—merely using a stronger steel framework for the ceiling of the tank-chamber—or whether the elevated tank will be abandoned altogether for gasholders at the Grasbrook works. It may be said without fear of contradiction that though the number of persons injured on the gas-works was large, the damage done to property in the vicinity was smaller than might have been expected from two such enormous conflagrations. We doubt whether the adjoining wharves and the shipping will again be allowed to be exposed to the danger which is involved in the presence on this gas-works of a large holder sealed in an elevated annular tank. Almost the only gratifying feature of the disaster is that it has served to convince the people of Hamburg that the collapse of gasholders and the sudden combustion of their contents are not attended by any explosion. We have it on the authority of a naval engineer who was only some 150 yards from the large gasholder when the accident occurred, that there was nothing in the nature of an explosion or detonation—only the rushing or roaring noise of flames of immense volume.

The Fire Brigade's Report on the Catastrophe.

The Grasbrook Gas-Works are the oldest of the three large works owned by the City of Hamburg; and the storage plant consisted of two holders—one of $1\frac{1}{2}$ million, and the other (a new telescopic one) of about 7 million cubic feet capacity. The former was enclosed in a building covered by a wooden roof, and having large windows in the walls; the latter was in an unfinished condition. As the erection of this holder upon the ground level would have interfered too much with the transport of materials and other matters incidental to working, it had to be built upon a massive raised foundation, so that the bottom stood at a height of about 60 feet. It was formed of a saucer made of riveted sheet iron, covered by water to a depth of about $5\frac{1}{2}$ inches. This saucer was carried on a steel structure resting on the concrete circular wall, and also upon a strong concrete pillar in the centre. On the day of the accident (Dec. 7), the filling of the holder was in progress. When it was about half full, the steelwork carrying the saucer gave way, cracking the saucer, and letting out the water it contained. The pressure of the holder forced the gas through the opening, and it was ignited at the half-open retorts close by. In the course of a few minutes, more than $3\frac{1}{4}$ million cubic feet of gas were consumed, and the flames set fire to several structures in the works. Altogether 72 persons were injured, 20 fatally.

On the arrival of the Fire Brigade with two steamers and five floats, a number of large fires had to be dealt with close to the new holder, and a few smaller ones as far distant as 300 feet. The scaffolding and portions of the wooden framework of a new coal-store in course of erection in ferro-concrete, a large wooden shed containing inflammable matter, and also the roof over the old gas-

holder, only about 26 feet away, caught fire. The holder contained at the time nearly $1\frac{1}{2}$ million cubic feet of gas ready for distribution. If it had been possible to extinguish the burning parts of the roof, the holder could have been saved from destruction; but the great size of the building—the wall being 206 feet in diameter and 75 high, and the roof rising to 116 feet—rendered it impossible to cope with the fire from the ground. On the other hand, to attack it from long mechanical fire escapes, or to attempt to scale the holder with hose-pipes from within the wall, seemed too dangerous for the firemen; for the heating of the bell by the fire raging in the neighbouring wooden shed, and the consequent expansion of the gas, would probably cause large quantities to escape at the bottom of the holder, and bring about the collapse of the building at any moment. Subsequently the roof fell in; and the crown of the holder was damaged by the falling steel girders to such an extent that the whole of the gas was burnt in from ten to, at the outside, fifteen seconds, with an enormous circular flame nearly 200 feet in diameter, producing a heat of about 200 million calories. Owing to the great precautions taken, it is gratifying to record that this second catastrophe did not lead to further injury or loss of life.

STATISTICS OF DUTCH GAS-WORKS.*

WE have received a copy of the compilation of statistics of the working results of gas-works of Holland for the year 1908, prepared by Heer P. Bolsius, the Manager of the Bois-le-Duc Gas-Works, and Heer M. van der Horst, of the Amsterdam Gas-Works. In the "JOURNAL" for Dec. 28 last (p. 876), we noticed the similar volume of statistics relating to the year 1907; and we will therefore now merely point out some of the changes which have been introduced in the present issue.

The particulars now given relate to 129 gas undertakings, in place of 121 in 1907. These include all the municipal gas-works of Holland and the majority of those owned privately. Some further particulars are given in the present issue under the heading of each town, in addition to those hitherto given—viz., the population of the town and of any suburbs which are supplied from the town gas-works; the largest and smallest numbers of retorts in action in the course of the year; additional details as to the disposal of the coke, and as to the strength of the liquor produced; and fuller information in regard to public lighting. The information afforded is most complete, as has been indicated in our reviews of the previous issues of this volume of statistics, the compilation of which must involve an immense amount of labour on the part of Heeren Bolsius and Van der Horst. The volume is, as before, issued privately, because the information collected is regarded as of a confidential character. Nevertheless, those interested in obtaining the fullest particulars in regard to the working results of a number of gas-works will probably find in it more complete details than are published in regard to the gas undertakings of any other country; and we believe that no difficulty would be experienced in obtaining copies of the volume by persons who wish to use the invaluable information it contains in a friendly manner.

* Statistiek Overzicht der Bedrijfsresultaten van de Gemeentegasfabrieken en eenige Particuliere Gasfabrieken in Nederland, in 1908, bewerkt door P. Bolsius, 's-Hertogenbosch en M. van der Horst, Amsterdam. Vertrouwelijke Mededeeling. C. N. Teulings, 's-Hertogenbosch; 1910.

The Census of Production.

A Blue-book was issued on Friday containing the third of a series of tables summarizing for the more important trades of the country the preliminary results of the returns under the Census of Production Act, 1906, together with a report on the subject by the Director of the Census. Mr. G. R. Askwith, K.C., Comptroller-General of the Commercial and Statistical Department of the Board of Trade, states in a prefatory note that about 14,000 schedules were issued to firms engaged in 22 industries or groups of industries, which employed in 1907 an average of more than 650,000 persons, exclusive of outworkers, and produced a total output which represented a net addition of nearly £60,000,000 to the value of the materials used. A summarized statement of the results of the returns comprises figures in which the net output is arrived at by deducting from the gross output the cost of materials used and the amount paid to other firms for any work given out. Among the figures are the following: Chemicals, coal-tar products, &c.—net output, £9,464,000; persons employed, 51,088. Brick and fire-clay factories—net output, £5,060,000; persons employed, 63,287.

At the meeting of the Royal Society last Thursday, Professor Bertram Hopkinson, whose name is known in connection with gas-engine research, was elected a Fellow.

The annual general meeting of the Illuminating Engineering Society will be held at the Society of Arts rooms (John Street, Adelphi), on Monday, the 23rd inst., when a report of the session's progress will be presented by the Council. The chair will be taken by the President, Professor Sylvanus P. Thompson.

THE WORKS OF THE GREAT YARMOUTH GAS COMPANY.

With a Few Technical Experiences.



A General View of the Great Yarmouth Gas Company's Works.

DURING the meeting of the Eastern Counties Gas Managers' Association at Great Yarmouth, several of the members inspected the works of the Gas Company, and were made heartily welcome by their colleague, the Engineer (Mr. W. J. Carpenter), and his assistants. Mr. Carpenter, in the paper that he read before the Association a year ago, gave the members a considerable amount of information concerning the business and trading practices of the undertaking for whose technical and commercial operations he is so largely responsible; and it may now be of interest to supplement the information that was then given with the following notes on the works.

Situated at the South end of the town, adjacent to the Fish Wharf, the works occupy a site of 4 acres; and the buildings and plant (as was seen by the visitors) are substantially constructed and well-maintained. The design, arrangement, and general details are all in the style of the late Mr. R. P. Spice; and this was of interest to those younger engineers who have not been brought largely into contact with the work of this leader among gas engineers of a past generation. Following the incorporation of the Company in 1863, the works were inaugurated in 1869; the whole of the constructional work entailed in the building of the gasholders, retort-house, purifying-house, and necessary details being carried out by Messrs. Cutler and Sons, of Millwall, who have since been responsible for the whole of the extensions required from time to time. The confidence of the Board of Directors and of their Engineer has not been misplaced.

The coal used by the Company is derived from the Durham coal-field; "Londonderry" being used at the time of the visit of members of the Association. This coal is found to produce an excellent coke, which is a matter of great importance in connection with its local disposal. The steamers bringing the coal to the works are unloaded by a hydraulic crane, supplied by Messrs. Armstrong, Whitworth, and Co. It is interesting to note that the discharging-quay being also used for the unloading of salt and fish, no tipping of coal skips or tubs is allowed on account of the nuisance by dust that would be occasioned. For this reason, it was necessary to devise a special vehicle for conveying the coal to the works. There it is weighed and tipped into a hopper to be elevated, crushed, and delivered mechanically to a conveyor-belt running along the whole length of the coal-stores.

The retort-house, as now arranged, provides for a daily make of 1½ million cubic feet of gas. The greatest output recorded does not exceed 750,000 cubic feet; so that, as seen, there is an appreciable reserve in the way of available producing plant to meet future needs. The system of heating the retorts is the regenerative principle; but no special type of setting is employed—that in use being to the designs of the Company's Engineer, and constructed by their own men. The charging and drawing of the retorts is effected by West's compressed-air machinery; but the form of scoop used is one patented by Mr. W. J. Carpenter with the object of securing a better and more even distribution of coal on the floor of the retort. The retorts are filled to their utmost capacity; and the charges are of eight hours' duration. From the books and working returns, it is seen that excellent results are obtained; the recently recorded make being, on the average, between 11,500 and 12,000 cubic feet per ton. No trouble, it was learned, is experienced with stopped ascension-pipes, as in the case of the six or five hour charges. The coke, too, is of excellent quality and of good size. A liquor seal is secured by the employment of tar-towers. The tar-mains under the hydraulic mains are all provided with a plunger, by which means the tar-pipes are cleared of any thick tarry accumulations requiring, from time to time, assistance on the way to the tar-towers.

Retort-house governors are in use; but Mr. Carpenter's experience is that no particular benefit is found by their adoption. On the contrary—in the cold weather more particularly—notwithstanding that the governors are kept hot, or in a warm room, the gas in passing through them is robbed of its thin tars and solvents, the naphthalene is carried forward, and a very objectionable deposit is found at the condensers, seals, and syphons—thus causing much anxiety in the working of this part of the plant.

Before leaving the retort-house, it is interesting to note that both the machine and sectionally made retorts used, have the bolt-holes so arranged that the hole for the oblong nut is to be found inside the retort, instead of outside the mouthpiece end as is usual. This method was adopted to facilitate the replacing of a burnt bolt when necessary; and the idea has turned out very economical.

Passing from the retort-house, the gas enters a condenser of the Morris and Cutler water-tube type; and thence to the exhaustor house, where two exhaustors (each of 60,000 cubic feet per hour) are provided. The exhaustor-house contains the air-compressor required in furnishing power for the drawing and charging machines, as well as the hydraulic pumps in connection with the crane used for unloading the coal on the quay.

The boiler-house immediately adjacent to the exhaustor-house contains two Lancashire boilers for providing the steam required in the pump-room contiguous thereto, and for all other purposes on the works. A third boiler is to be added to secure more effective conditions of working and cleansing.

At the outlet of the exhaustors, the gas is dealt with by a Pelouze and Audouin tar-extractor, and then travels onwards through two tower scrubbers, fitted with boards, finishing with an oil-washer, for the extraction of naphthalene, before passing through a "Standard" washer.

On leaving the washer, the gas flows to the purifying-house, in which there are six purifiers. The first four are worked in a cycle, and lime is employed; the last two purifiers being charged with oxide and lime. Cutler's patent hydraulic valves are used throughout the system, and are spoken of as being excellent in all respects. From the outlet of the purifiers to the station meter, and thence to the controlling room (which also contains the safety and district governors), the gas passes to the gasholders.

Plant and systems for dealing with the naphthalene difficulty are found near the governor-room; and it is observed that paraffin is vaporized by a small carburettor, through which a proportion of the gas is passed on its way to the town mains.

Sulphate of ammonia is manufactured on the premises; while the tar is dealt with at the Company's tar and chemical works.

The Company's stables and horses and the various vehicles form quite a feature in the details of the work of the concern.

[Photographic views of interesting parts of the works appeared in the "JOURNAL" for April 27, 1909; and illustrations of the coal-handling plant were published on Oct. 8, 1901.]

The Gas-Turbine.—We have received from Messrs. Charles Griffin and Co., Limited, of Exeter Street, Strand, a work bearing this title, by Mr. H. Harrison Supplee, B.Sc. The author is a member of the American Society of Mechanical Engineers and of the Franklin Institute; and his work is a record of progress in the design and construction of turbines operated by gases of combustion, intended to place in the hands of engineers and experimenters such theoretical and practical data as are now available for the solution of the problem of the gas-turbine. It may be mentioned that the text, which is fully illustrated, occupies about 250 ordinary octavo pages; and that the price is 12s. 6d. net.

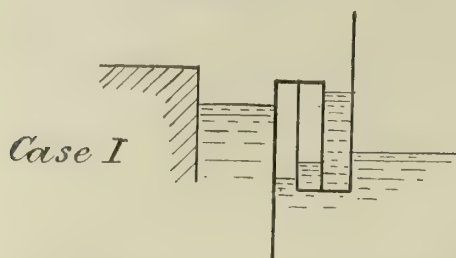
GASHOLDER CUPS.

By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.

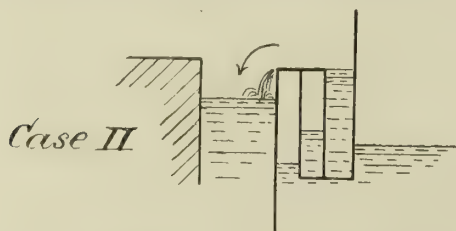
[SECOND ARTICLE.]

IN a previous article (*ante*, p. 27) it was shown graphically how gasholder cups behave during the process of uncupping, under various conditions—how to determine whether they will blow when in action and the remedy for such defect. We will now give formulæ for solving the various cases already treated, as well as a few others.

ORDINARY CUPS.



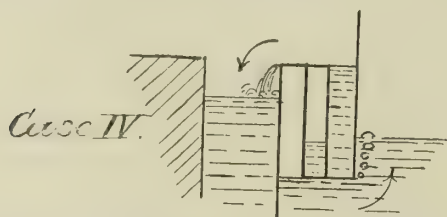
CASE I.—In which water does not overflow the top of grip from cup, nor does gas blow under cup into holder, during process of uncupping. (See Case I. in first article.)



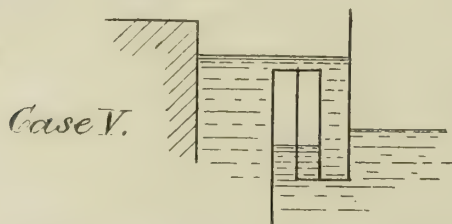
CASE II.—Water overflows top of grip from cup, but gas does not blow under cup. (See Case II. in first article.)



CASE III.—Water does not overflow grip, but gas blows under cup. (See Case III. in first article.)

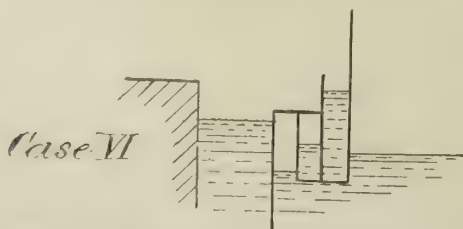


CASE IV.—Water overflows top of grip and gas blows under cup. (This is a combination of II. and III.; very unusual, and therefore not given in first article.)



CASE V.—Water floods cup over top of grip before landing outer lift weight, but not after.*

SHALLOW CUPS, WITH RAISED GRIP PLATES.

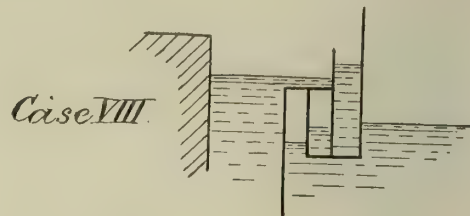


CASE VI.—Water does not rise above grip table, and gas does not blow under cup. (See Case V. in first article.)

* NOTE.—If the grip is entirely under water after landing, the cup will not blow; so no formula is necessary. (See Case IV. in first article.)



CASE VII.—Water does not rise above grip table, but gas blows under cup.



CASE VIII.—Water rises above grip table, but gas does not blow under cup.

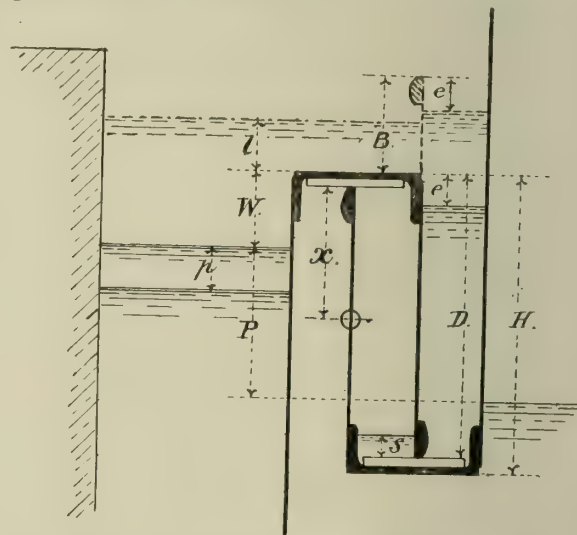


CASE IX.—Water rises above grip table and gas blows under cup.

NOTE.—The cases of water overflowing grip plate need not be considered in this type of cup, as the grip plate would always be made high enough to prevent it.

A different formula is required for each of the above cases.

Before we can proceed, then, it is necessary to find which formula is applicable, or, in other words, which Case does the example we wish to test come under.



In the accompanying diagram, and in the formulæ which follow, Let P = Total pressure of all lifts up to and including one whose grip is treated.

" H = Total depth over cup and dip when cupped.

" e = Amount water level is reduced in cup by evaporation or otherwise, before lowering into tank—i.e., distance from top of grip plate to water in cup.

" S = Margin of safety allowed before blowing can occur.

" D = Effective depth of cup.

" W = Depth to water in tank below top of grip, at instant before landing lift whose grip is treated.

" p = Pressure given by lift whose grip is being treated.

" l = Height of water overflow above top of grip just before landing weight.

" B = Projection of grip-plate (if any).

" x = Distance below lip of cup where flooding holes are required to avoid blowing.

All dimensions and pressures are in inches.

NOTES.—In designing a gasholder, many of these factors can be varied so that any desired result may be obtained—such as the depth of the cup D and H , the level of overflow W , and to some extent the pressures of the several lifts P and p .

There are, however, one or two factors which have to be fixed somewhat arbitrarily—viz., e and S .

e is the depth the water level stands in the cup below top of grip. In fixing this, we have to allow for irregularity in level of grip; reduction by evaporation (this varies according to the time the holder has been inflated)

less rainfall; and by the difference in pressure due to outer lift landing, in cases of inner lift cups.

If we allow $\frac{1}{2}$ inch for irregular level, $\frac{1}{2}$ inch for evaporation, and $\frac{1}{2}$ inch for wind licking water out of cup and other causes, we have a total not exceeding 2 inches, which would suffice for the outer lift.

In the case of a multi-lift gasholder, half the pressure of the landed lifts has to be added to e , and the evaporation would be greater, as it is longer out of the water before it is replenished from the tank. In the case of an outer lift giving 3 inches pressure, e is increased by $1\frac{1}{2}$ inches; but in that case, the 1 inch allowed above for wind effects, &c., need not be considered. We should therefore have e equal to $2\frac{1}{2}$ inches, or supposing still another lift landed, it may be as much as $4\frac{1}{2}$ inches, due to its half weight and extra evaporation, &c.

The rainfall is a great restorer of water levels, inasmuch as the rain falling on the entire crown of the holder can only run away *via* the cups. The inner lift cup is first filled. It then overflows into the next cup, and so on until it flows over the grip of the outer lift into the tank. We cannot, however, depend upon this in times of draught, and therefore it is wise to allow for e , as suggested above.

There is an allowance for the grip plate edge not being absolutely level, and may be taken at not more than $\frac{1}{2}$ inch in a well-balanced holder. Some holders, however, are not so true; and a greater margin must be allowed to suit.

ORDINARY CUPS.

Then,

If e is greater than, or equal to, $\frac{1}{3}(H - W - P)$ and p is less than, or equal to $\frac{1}{3}(H - W - P)$ = Case I.

If e is less than $\frac{1}{3}(H - W - P)$ and p is less than, or equal to $\frac{1}{3}(H - W - P)$ = Case II.

If e is greater than, or equal to, $\frac{1}{3}(H - W - P)$ and p is greater than $\frac{1}{3}(H - W - P)$ = Case III.

If e is less than $\frac{1}{3}(H - W - P)$ and p is greater than $\frac{1}{3}(H - W - P)$ = Case IV.

If l is less than, or equal to p = Case V.

SHALLOW CUPS (WITH RAISED GRIP PLATE).

If p is less than, or equal to $H - W - P$ = Case VI.

If p is greater than $H - W - P$ = Case VII.

If p is less than, or equal to $H + l - P$ = Case VIII.

If p is greater than $H + l - P$ = Case IX.

NOTE.—In "shallow cups" e should never be less than $\frac{1}{3}(H - W - P)$ or $\frac{1}{3}(H + l - P)$.

FORMULÆ FOR ORDINARY CUPS.

$$\text{Case I. } x = \frac{4P + H + 5e + 5S - 3D - W - p}{2}$$

$$\text{Case II. } x = \frac{7P + 3H + 7e + 10S - 6D - 3W - 2p}{4}$$

$$\text{Case III. } x = \frac{5P + 5H + 10e + 10S - 6D - 5W - 5p}{4}$$

$$\text{Case IV. } x = \frac{5P + 15H + 5e + 20S - 12D - 15W - 10p}{8}$$

$$\text{Case V. } x = \frac{7P + 3H + 7e + 10S + 2l - 6D - 2p}{4}$$

FORMULÆ FOR SHALLOW CUPS (RAISED GRIP PLATE).

$$\text{Case VI. } x = \frac{4P + H + 5e + 5S - 3D - W - p - 5B}{2}$$

$$\text{Case VII. } x = \frac{5P + 5H + 10e + 10S - 6D - 5W - 5p - 10B}{4}$$

$$\text{Case VIII. } x = \frac{4P + H + 5e + 5S + l - 3D - p - 5B}{2}$$

$$\text{Case IX. } x = \frac{5P + 5H + 10e + 10S + 5l - 6D - 5p - 10B}{4}$$

Formula VI. is the same as Case I., with the addition of $-5B$ to the numerator; B being the projection of grip plate.

Formula VII. corresponds with Case III., with the addition of $-10B$ to the numerator.

Formula VIII. agrees with Case VI., except that $+l$ is substituted for $-W$ in the numerator.

Formula IX. is the same as Case VII., except that $+5l$ is substituted for $-5W$ in the numerator.

It will be seen that in each case the formula determines x , the exact distance below lip of cup where flooding holes are required in cup plate to prevent it blowing.

If x is a *minus* quantity, the cup would not blow; and therefore no precautions against blowing are necessary.

It is desirable to put the flooding holes (say) 1 inch below the exact depth x , to be on the safe side.

The holes can be $1\frac{1}{2}$ inches diameter, two in each bay round the holder, or 2 inch by 1 inch elongated holes.

NOTE.—All cups should be tested, not simply those on outer lifts.

The following examples should make the process clear.

ORDINARY CUPS.

Example 1.—Let $P = 10''$, $H = 16''$, $e = 2''$, $S = 1''$, $D = 15''$, $W = 4''$, $p = 3''$, $l = 0$,

then determine to which case it belongs; thus:

$$e = 3'' \text{ and } \frac{H - W - P}{3} = \frac{16 - 4 - 10}{3} = \frac{2}{3}$$

$$p = 3'' \text{ and } H - W - P = 2.$$

Therefore e is greater than $\frac{H - W - P}{3}$ and p is greater than $H - W - P$.

Referring to the tests above, we see this accords with Case III. Hence, formula III. must be applied. We then have

$$x = \frac{5 \times 10 + 5 \times 16 + 10 \times 2 + 10 \times 1 - 6 \times 15 - 5 \times 4 - 5 \times 3}{4} = \frac{50 + 80 + 20 + 10 - 90 - 20 - 15}{4} = \frac{160 - 125}{4} = \frac{35}{4} = 8\frac{3}{4}''.$$

That is, x , the distance of flooding holes from top of cup plate, must be $8\frac{3}{4}''$ at least, to avoid blowing when uncupping.

Example 2.—Now let $P = 7''$, $H = 19''$, $e = 1\frac{1}{2}''$, $S = \frac{1}{2}''$, $D = 18''$, $W = 6''$, $p = 1\frac{1}{2}''$, $l = 0$,

$$\frac{H - W - P}{3} = \frac{19 - 6 - 7}{3} = \frac{6}{3} = 2, \text{ and } e = 1\frac{1}{2}''.$$

$$H - W - P = 6, \text{ and } p \text{ is } 1\frac{1}{2}''.$$

Therefore e and p are both less than $\frac{H - W - P}{3}$ and $H - W - P$ respectively.

Hence Case II. formula is required. Filling in values without repeating the formula, we have

$$x = \frac{7 \times 7 + 3 \times 19 + 7 \times 1\frac{1}{2} + 10 \times \frac{1}{2} - 6 \times 18 - 3 \times 6 - 2 \times 1\frac{1}{2}}{4} = \frac{49 + 57 + 10\frac{1}{2} + 5 - 108 - 18 - 3}{4} = \frac{121\frac{1}{2} - 129}{4} = \frac{-7\frac{1}{2}}{4} = -1\frac{7}{8}''.$$

This being a *minus* quantity, the cup would not blow, and so no flooding holes would be required through cup plate.

Example 3.—Let $P = 10''$, $H = 21''$, $e = 2\frac{1}{2}''$, $S = \frac{1}{2}''$, $D = 20''$, $W = 5''$, $p = 3''$, $l = 0$.

Then, as e is $2\frac{1}{2}$ inches, it is greater than $\frac{H - W - P}{3}$ or 2.

And as p is 3 inches, it is less than $H - W - P$ or 6.

Therefore by the above tests, Case I. formula is required. Applying this formula, we have

$$x = \frac{40 + 21 + 12\frac{1}{2} + 2\frac{1}{2} - 60 - 5 - 3}{2} = \frac{76 - 68}{2} = \frac{8}{2} = 4''.$$

Hence, flooding holes would be required not less than 4 inches down from lip of cup.

Example 4.—Let $P = 8''$, $H = 18''$, $e = \frac{1}{2}''$, $S = \frac{1}{2}''$, $D = 17''$, $W = 7\frac{1}{2}''$, $p = 3''$, $l = 0$.

Applying tests, we find that

$$e \text{ being } \frac{1}{2} \text{ inch, it is less than } \frac{H - W - P}{3} \text{ which is } \frac{5}{6},$$

and p being 3 inches, is greater than $H - W - P$ which is $2\frac{1}{2}''$.

It therefore comes under Case IV.; and applying formula for same, we have

$$x = \frac{40 + 270 + 2\frac{1}{2} + 10 - 204 - 112\frac{1}{2} - 30}{8} = \frac{322\frac{1}{2} - 346\frac{1}{2}}{8} = \frac{-24}{8} = -3''.$$

As x , in this instance, is a *minus* quantity, the cup will not blow.

Example 5.—Let $P = 7''$, $H = 17''$, $e = 1''$, $S = \frac{1}{2}''$, $D = 16''$, $W = 0$, $p = 3''$, $l = 2''$.

From the fact that the water floods over the grip into the cup before it lands the outer lift, and that l is less than p , we know that it is a case for formula V. Applying which we get

$$x = \frac{49 + 51 + 7 + 5 + 4 - 96 - 6}{4} = \frac{116 - 102}{4} = \frac{14}{4} = 3\frac{1}{2}''.$$

That is, flooding holes must be provided not less than $3\frac{1}{2}$ inches from top of cup plate, to avoid blowing.

SHALLOW CUPS.

Example 6.—Let $P = 9''$, $H = 12''$, $e = 2''$, $S = \frac{1}{2}''$, $D = 11''$, $W = 0$, $p = 2\frac{1}{4}''$, $B = 6''$.

Applying test we find

$p = 2\frac{1}{4}$ inches, which is less than $H - W - P$, or $12 - 0 - 9 = 3$. Hence we require formula for Case VI.

Filling in values, we have

$$x = \frac{36 + 12 + 10 + 2\frac{1}{2} - 33 - 0 - 2\frac{1}{4} - 30}{2} = \frac{60\frac{1}{2} - 65\frac{1}{4}}{2} = -2\frac{3}{8}''.$$

Therefore, as x is a *minus* quantity, the cup will not blow gas to waste, and no flooding holes are needed. This is the same example as No. 5, in the first article.

Example 7.—Let $P = 9"$, $H = 12"$, $e = 2"$, $S = \frac{1}{2}"$, $D = 11"$, $W = 2"$, $p = 3"$, $B = 6"$.

Then $p = 3$ inches, is greater than $H - W - P$, or $12 - 2 - 9 = 1$. Therefore formula for Case VII. is required, applying which,

$$x = \frac{45 + 60 + 20 + 5 - 66 - 10 - 15 - 60}{4} = \frac{130 - 151}{4} = -5\frac{1}{4}."$$

Hence, as x is a minus quantity, the cup will not blow.

Example 8.—Let $P = 9"$, $H = 12"$, $e = 2"$, $S = \frac{1}{2}"$, $D = 11"$, $l = 1"$, $p = 2\frac{1}{4}"$, $B = 6"$.

Then $p = 2\frac{1}{4}$ inches, which is less than $H + l - P$, or $12 + 1 - 9 = 4"$.

Formula for Case VIII. is therefore required.

$$x = \frac{36 + 12 + 10 + 2\frac{1}{4} + 1 - 33 - 2\frac{1}{4} - 30}{2} = \frac{61\frac{1}{2} - 65\frac{1}{4}}{2} = -1\frac{3}{8}."$$

Therefore the cup will not blow.

Example 9.—Let $P = 10"$, $H = 12"$, $e = 2"$, $S = \frac{1}{2}"$, $D = 11"$, $l = 1"$, $p = 4"$, $B = 6"$.

Then $p = 4$ inches, which is greater than $H + l - P$, or $12 + 1 - 10 = 3"$.

Formula for Case IX. is therefore required.

$$x = \frac{50 + 60 + 20 + 5 + 5 - 66 - 20 - 60}{4} = \frac{140 - 146}{4} = -1\frac{1}{2}."$$

So that the cup would not blow.

We have now had examples in all cases, including those solved graphically in the previous article. The formulæ give precisely the same results as are obtained by the more tedious process of following out the uncupping step by step.

There is no doubt that the arithmetical method is less troublesome than the graphical for obtaining the results quickly; but it should be worked both ways as a check. The formulæ, as they stand alone, carry no conviction of accuracy with them. It may therefore be desirable to note their evolution from the graphical treatment previously given. It would be found to be an interesting study in the construction of formulæ, and may therefore form the subject of another article.

THE MODERN "PALATINE" COOKER.

Conveniences and Maintenance Facilities.

In a gas cooking-stove the householder looks for the maximum of convenience and efficiency, and the gas supplier who lets the stove out on hire has regard for, in addition to the features that will please the user, the facilities afforded by the manufacturer for maintenance and transport. With the ever-increasing cooker connections, the question of the maintenance of such goods becomes for any undertaking of greater and greater importance. It is a matter that has a not insignificant bearing on the economics of the distribution department. The gas consumer and the gas supplier have their requirements well satisfied in the latest development in ranges of the well-known firm of Fletcher, Russell, and Co., Limited. This "latest development" is embodied in the series of "Palatine" cookers, which, in their approach to perfection as household conveniences, and as meeting the requirements of gas undertakings, are both attractive and pleasing.

Those who have to export cookers will find the stoves appeal to them with considerable insistence, as being the *ne plus ultra* in simplicity of construction and efficiency. This simplicity of construction finds demonstration in the ease with which the whole of the details are taken apart for packing, and with as great readiness restored to a usable condition. In this, there is economy in time; and through the simplicity of the work of assembling the parts, the skilled man is not a necessity. In regard to the expense of maintenance, the facilities that the design gives for the lessening of labour, for the replacement of parts *in situ*, and for the saving of time (to say nothing of the reduction of inconvenience to the consumer to a minimum), must effect considerable economy. But all these points will be immediately apparent upon inspection by any gas manager.

Running generally over the components of the stove (all in the series are on corresponding lines), and specially marking some of the features, it is noticed that the oven is fitted with steel, swinging, hinged-gate, shelf-runners. The advantage, too, of the powerful grill is obvious; this having a patented arrangement by which each deflector-plate can be worked independently. It is also learned that, though the doors of the stock patterns are fitted with hinges on the left-hand side, and flue-outlets on the right, if preferred there can be a complete reversal of this order of things—the hinges being placed on the right-hand side, and the flue-outlets on the left. Then it is observed that all the burners—hot-plate and oven alike—are removable, and are fitted with gas and air adjusters, so that there can be regulation to secure the greatest temperature efficiency. The burners are scientifically proportioned, and made with the accuracy one is accustomed to expect from the firm. The usual fittings, consisting of two grid shelves, one solid shelf, a cake-plate, a meat-hook, a toaster, a grill-tin, and grid, are supplied with each cooker.

The "Palatine" cooker pleases not only in respect of its range

of conveniences, and maintenance facilities, but in its appearance. It has a body of green porcelain enamel, effectively setting off the dead-black of the cast-iron parts, which are further relieved by the ground and polished mould round the front and two sides of the hot-plate frame, the outer top of the oven, the hinge bands latch, and all door mouldings.

THE PARKINSON "HOLBORN" CIRCULATOR.

IN addition to their "Hydrotherm," of which an illustrated description appeared in last week's "JOURNAL," there is another circulator that has been introduced by the Parkinson Stove Company, Limited, to notice in our pages. In calling attention to this appliance, it is unnecessary to refer again to the importance to the gas man of apparatus of this character; for the "hot-water" problem is one that is fully recognized and actively dealt with by progressive undertakings.



The "Holborn" Circulator.

The "Holborn" circulator should find a large sphere of usefulness; being compact and substantial, and attachable to the existing circulating pipes—thus providing the same service of hot water through the house as would be secured by the undesirable alternative (in the warm weather) of lighting the kitchen fire. As to the construction of the apparatus, interior chambers and connecting tubes are entirely dispensed with. The few joints are riveted or seamed, and not dependent on solder, so that leakage is practically impossible; while the water-chamber being vertical, without any cross tubes, and giving wide water-space, is not likely to be affected by lime deposit. For "hard-water" districts, too, the apparatus can, at a slight extra cost, be made to take to pieces by the unscrewing of four bolts, in which condition every part of the interior can be readily cleaned. Two burners are provided, with separate taps, giving a total consumption of 40 cubic feet per hour; but, as soon as the water is hot, the large burner may be turned off, and the small one, consuming 6 to 8 cubic feet per hour, is usually sufficient to maintain the heat and enable enough hot water to be obtained for the ordinary daily requirements and a hot bath at night. If the circulator should be reserved for providing large quantities of hot water only, a bath may be had in about 45 minutes from lighting the gas, at a cost of something like a penny. As to the working of the apparatus, it may be pointed out that the heated gases pass up into the interior, and then descend to the vent outlet, which is at the bottom. This arrangement, it is claimed, effects a saving of 20 to 40 per cent. in gas consumption as compared with the usual method of allowing the waste heat to escape at the top. The cost of fixing is small; for it is said that there is no smell from the gas, even when first lighted, and so no flue is necessary. Also, the installation of the apparatus does not interfere with the use of the coal-heated boiler; it being possible to employ the two alternately or concurrently.

ASSOCIATION OF DUTCH GAS ENGINEERS.

Annual General Meeting Arrangements.

THE Thirty-Eighth Annual General Meeting of the Association will be held on Wednesday and Thursday, the 6th and 7th of July, in the Congress Chamber of the Palais des Fêtes at Brussels, under the presidency of Heer J. van Rossum du Chattel, the Manager of the Amsterdam Gas-Works. The programme for the meeting, in addition to the private business, includes the reception and discussion of the reports of the Committees of the Association on Photometry, on Coals, on Gas Oils, and on the Archives and Library of the Association, and the voting of the necessary sums for the continuation of the work of these Committees.

Communications will be made to the meeting as follows: (1) "Storage and Regulation of Pressure of Gas in Gasholders without Water Seal," by J. Bauduin; (2) "Euphos Glass," by J. D. J. Bresser; (3) "The Representation of the Association of Dutch Gas Engineers at the Exhibition of Municipal Operations at Scheveningen," by N. W. van Doesburgh; (4) "Separation of Tar from Carburetted Water Gas," by P. H. Hendriks; (5) "Dangers Connected with the Use of Volatile Combustible Liquids," by Dr. A. Steger; and (6) "Automatic Ignition and Extinction of Street-Lamps," by Dr. L. J. Ternerden. In addition to the foregoing, a number of technical points are suggested for general discussion. The meeting will open with a reception on the evening of Tuesday, July 5, and the afternoon of the following day will be devoted to a visit to the Brussels Exhibition, and the afternoon of July 7 to an Inspection of the Forest Gas-Works at Brussels, of which Mr. H. H. Salomons is the Engineer. On Friday, July 8, those attending the meeting will, at the invitation of the Imperial Continental Gas Association, pay a visit to the new gas-works at Hoboken (Antwerp) of which Mr. W. J. Brender à Brandis is Engineer.

THE EXTENSION OF THE ZÜRICH GAS-WORKS.



A View of the Gas-Works and the Surrounding Country.

A DESCRIPTION of the Schlieren Gas-Works of the Corporation of Zürich was given in the "JOURNAL" in 1901, and shortly afterwards reprinted as a *brochure*, of which a few copies are still on hand at the office of the "JOURNAL." This description referred to the works as constructed in 1897 and 1898, and brought into use in November, 1898. It was believed when the construction was put in hand that new plant for a make of at least 25,000 cubic metres (882,500 cubic feet) per diem would be required by the autumn of 1897, and that the new works would have to be extended at successive intervals of ten years until a daily production of 100,000 cubic metres (about 3½ million cubic feet) had been attained.

As a fact, the increase in the demand for gas in Zürich has far exceeded the anticipations of that date; and by 1904, or six years after the new works had been constructed, the foreshadowed maximum, which is equivalent to an annual make of 20 million cubic metres (about 706 million cubic feet), had already been reached. For the year 1909, the make of gas exceeded 30 million cubic metres (1060 million cubic feet). It will thus be seen that the extensions which have been required have exceeded, both in regard to their extent and frequency, the anticipations of the programme which was laid down in 1896. The rapidity of the growth of gas consumption is clear from the annexed diagram (fig. 1), showing the consumption for the different years from 1898 to 1908 inclusive and the growth of population of the town in the same period. The population in the last ten years has shown an annual increase of 3·5 per cent.; while in the same time the consumption of gas for lighting purposes has increased on the average by 2·8 per cent. per annum, and that for cooking and heating purposes by 36·27 per cent. per annum. The consumption of gas for motors has fallen off, owing to the convenience of electro-motors and their relative cheapness in Swiss conditions. The annual consumption of gas per head of the population, exclusive of public lighting and the suburbs, amounted in 1897 to 1688 cubic feet, and in 1908 to 4686 cubic feet. Thus in twelve years the consumption per head has risen by 178 per cent. These figures are an eloquent testimony to the general spread of the use of gas, not merely for lighting and industrial purposes, but in the household, both of the well-to-do citizen and of the workman. There are in the town of Zürich about 11,000 houses, comprising 39,000 tenements, and of these about 9000, comprising 30,000 tenements, are already provided with gas.

The Corporation of Zürich, at the end of 1904, decided, in order to cope with the rapid increase in gas consumption, to extend the gas-works to a daily productive capacity of 120,000 cubic metres (4,238,000 cubic feet). The programme of extensions comprised : (1) A coal-storage house of 7000 to 8000 tons capacity, with coal-handling machinery; (2) coal-conveying plant in the coal-store and to the retort-house; (3) a retort-house with plant for a make of 50,000 cubic metres (1,766,000 cubic feet) per diem; (4) coke-conveying and sorting plant; (5) water-gas plant

of 15,000 to 20,000 cubic metres (530,000 to 706,000 cubic feet) productive capacity per diem; (6) an apparatus house and a purifier-house for a make of 120,000 cubic metres (4,238,000 cubic feet) provided provisionally with plant for a make of 60,000 cubic metres (2,119,000 cubic feet) per diem; (7) new wells or tanks for tar, liquor, and anthracene oil, with the necessary pumps; (8) a gasholder of 50,000 cubic metres (1,766,000 cubic feet) capacity;

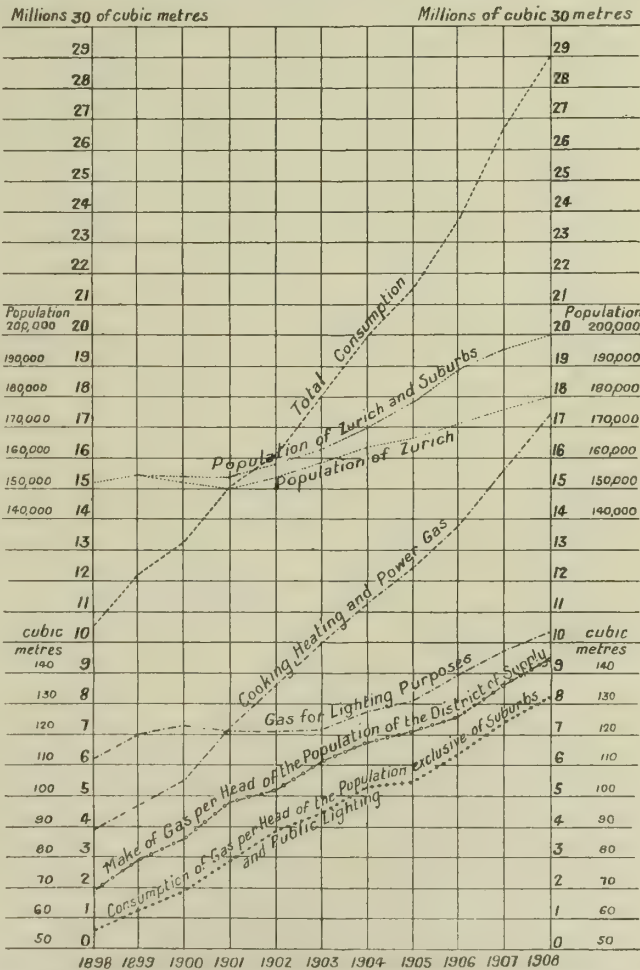
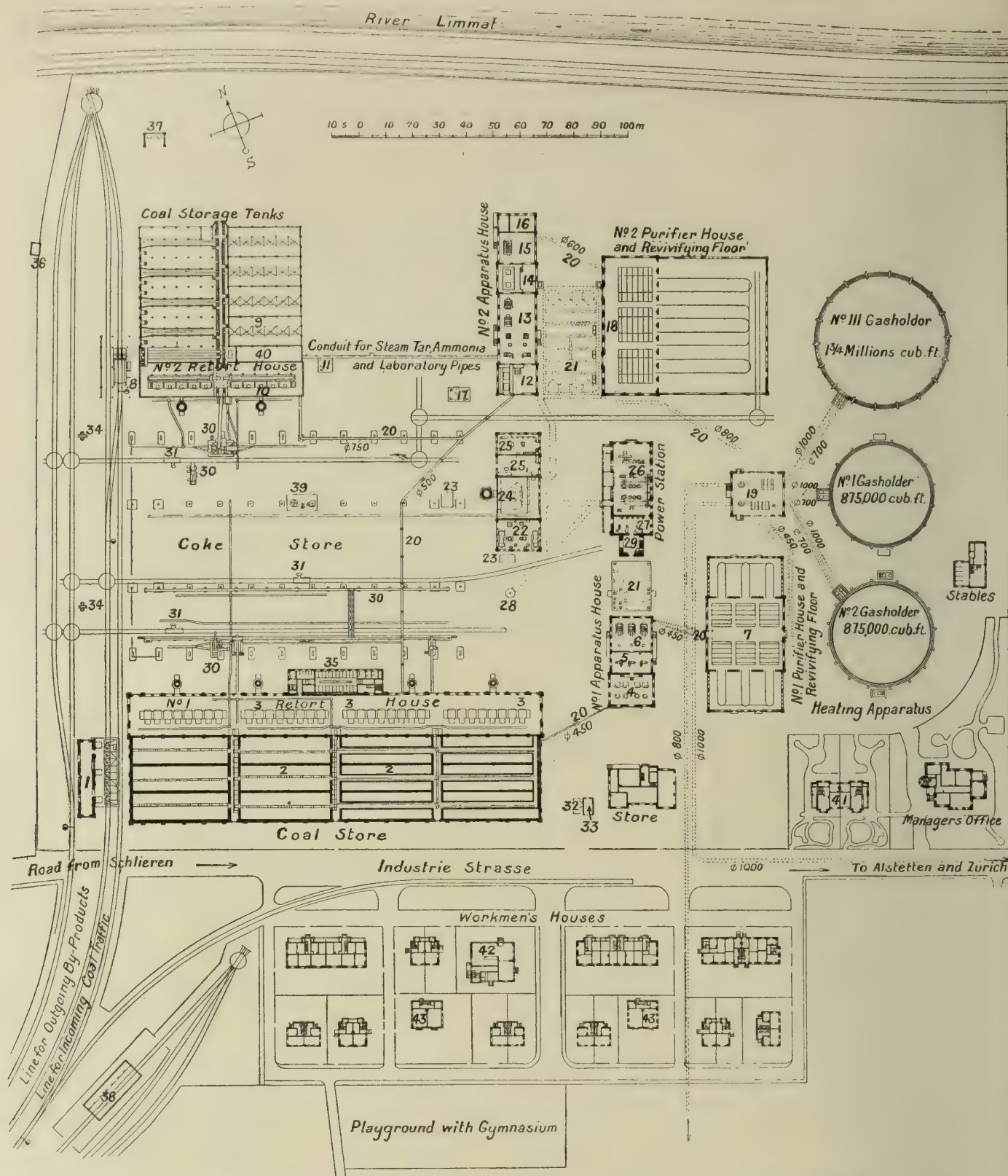


Fig. 1.—Diagram showing the Annual Consumption of Gas in Zurich for the Years 1898-1908.
[1 cubic metre = 35·316 cubic feet.]



REFERENCES—I. Coal Hoppers and Elevators. 2. No. 1 Coal-Store (14,000 metric tons capacity). 3. No. 1 Retort-House, with 32 Settings of Inclined Retorts. 4. Atmospheric and Water Condensers. 5. Exhausters. 6. Tar and Liquor Washers. 7. No. 1 Purifying Plant. 8. Railway Wagon Tips. 9. No. II. Coal-Store (13,000 metric tons capacity). 10. No. II. Retort-House, with 10 Beds of Vertical Retorts. 11. Hydraulic Main Tar Well. 12. Water-Cooled Condenser. 13. Exhausters, Tar, Naphthalene, and Cyanogen Washers. 14. Secondary Condensers. 15. Liquor Washers. 16. Laboratory. 17. Anthracene Oil Well. 18. Purifying Plant. 19. Station Meters and District Governors. 20. Works' Gas-Mains. 21. Tar and Liquor Wells. 22. Liquor Distillation Plant. 23. Lime Pits. 24. Boiler-House. 25. Shops. 26. Power Station. 27. Pumps for Works' Water, Tar, and Liquor. 28. Pump Well. 29. Water Tower. 30. Coke Breaking and Handling Plant. 31. Weighbridges for Railway Waggons. 32. Weighbridge for Carts. 33. Porter's Lodge. 34. Switches. 35. Workmen's Rooms. 36. Sewage Pump Station. 37. Tar and Pitch Distilling Plant. 38. Locomotive Shed. 39. Fire-Clay Mill. 40. Experimental Gas-Works. 41. Officers' Houses. 42. Recreation and Reading Room. 43. Lavatories and Baths.

Fig. 2.—GENERAL PLAN OF THE GAS-WORKS AT SCHLIEREN, WITH THE EXTENSIONS.

(9) the necessary gas and water mains and electricity conductors and pumping stations; (10) roadways and railways; (11) experimental gas-works, with laboratory; (12) stores.

Further, a certain amount of additions were necessary in order that the output of gas might be carried on without a hitch during the period of the erection of the new buildings and plant on the works. Thus a fourth boiler, a steam dynamo of 250 H.P., new grids on the Jäger and "Bamag" systems for the existing purifiers, a station meter of 210,000 cubic feet capacity per 24 hours, and new liquor plant were required. Also, as the four benches of inclined retort settings in the first retort-house were of greater productive capacity than was contemplated in the original design, the apparatus for washing and purifying the gas from them was inadequate; and it was therefore imperative to start on the erec-

tion of the new apparatus and purifying plant, and the construction of the new tar and ammonia wells at the earliest possible moment. An account of the extensions has been given by Herr A. Weiss, the Engineer and Manager of the Zürich gas undertaking, in recent numbers of the "Schweizerische Bauzeitung," from which paper the particulars given here are taken, and the accompanying illustrations reproduced.

GENERAL PLAN OF THE EXTENSIONS.

The above plan (fig. 2) of the gas-works shows the additions which have been made to the original plant of the 1896 scheme. The new coal-store adjoining the new retort-house has approximately the same capacity as the old coal-store, though it covers a much smaller area. It has been found quite possible, from the

experience gained with the first coal-store, to store coal to a greater depth; and the adoption of reinforced concrete for the construction of the new building has also reduced the space occupied by the building itself. The new retort-house also is of smaller dimensions than the former one, yet it has 30 per cent. greater productive capacity. The position chosen for the new coal-store and retort-house is such that they can be extended when necessary in two directions—viz., on the north towards the river, and on the east towards the town. The new exhauster and washer house is located near the boiler-house and power station, while to the east lie the new purifier-house and revivifying floor, which, of course, covers a considerable area. When necessary, the purifier-house can be extended towards the river. The tar and liquor wells are between the scrubber-house and the purifier-house. The new gasholder of $1\frac{3}{4}$ million cubic feet capacity is to the east of the revivifying floor, and in a line with the two older gasholders. The descriptive references appended to the plan will suffice to show the disposition of the rest of the buildings and plant.

NEW COAL-STORE.

The new coal-store is separated from the retort-house by a passage only 18 feet wide; so that the distance over which the coal has to be conveyed from the store to the retort-house is as small as possible. It was originally intended to construct the coal-store in ordinary concrete; but it was decided to invite tenders also for reinforced concrete construction, and ultimately it was agreed to adopt the latter, both on the score of lower cost and of the smaller space required. The coal-store resembles the

grain silos which are in use at the wharves in Hamburg and elsewhere. The capacity is from 12,000 to 13,000 tons. The store comprises eight equal sections, four on each side of a central passage, 18 ft. 6 in. wide, in which the conveying plant is placed. The superstructure of the store rests on 102 principal columns, which support the outer division walls. There are 80 intermediate columns, which support the horizontal and inclined girders of the floors of the silos.

The length of each section of the store is 87 feet, and the width 36 feet. The floors of the silos are at an angle of 41° , which is a greater inclination than the floors in the first coal-store, in which it was found that coals stored in a wet state on a floor inclined at 20° were not discharged automatically. The greater inclination given to the floors of the new coal-store has since been found to be entirely satisfactory. Beneath the different sections of the coal-store there are large spaces, well lighted and readily accessible, which serve as store-rooms and workshops. A general view of the coal-store showing the spaces beneath the inclined floors is given in fig. 3. The height of the underlying spaces is 7 feet at the sides and 16 ft. 6 in. in the middle, and the length of each is 85 feet. It will thus be seen that the area occupied by the coal-store is utilized both for that purpose and for general storage and workshop space. The method of construction followed is obviously advantageous wherever land is costly. The store is lighted by means of iron-framed windows, many of which open to afford ventilation. A concrete staircase is built out on the north side of the store; and there are iron staircases within the building. The roof of the store is of reinforced concrete, with roofing felt and fibre. The whole of the reinforced concrete

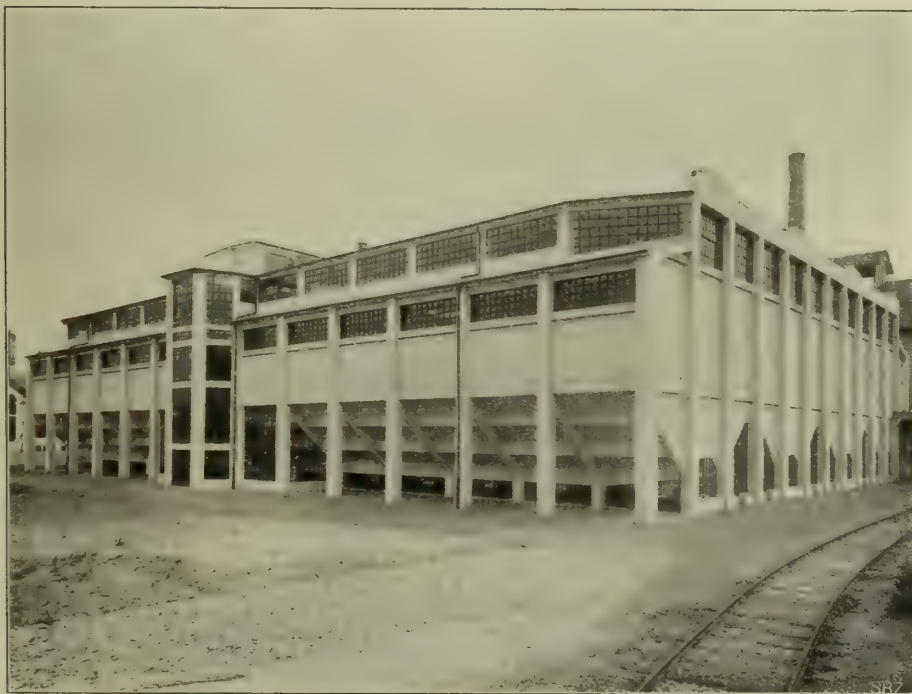


Fig. 3.—No. II. Coal-Store of Reinforced Concrete—North Side—of 13,000 Metric Tons Capacity.

surfaces have been left rough, and only limewashed where desirable for the sake of appearance.

CARRYING AND STORING OF THE COAL.

The coal arrives by the pre-existing railway lines, and so reaches the line adjoining the coke-store. If the train consists of ten or fewer waggons, it is run direct on to the line between the waggon tip and the turn-table; but if there are more than ten waggons, the train is broken up into two portions, one of which waits alongside the coke-store until the waggons in the first portion have been discharged. The waggons are brought in turn by rope traction on to the platform of the waggon tip, where they are discharged and run out on to a second line. The empty waggons are re-assembled and taken on to the sidings adjoining the gas-works either by means of locomotives or rope traction. The coal conveying arrangements for the first section of the works had the disadvantage that no provision was made for taking coal direct from the railway waggons to the retort-house without passing through the coal-store. Since it is well known that there is an advantage in carbonizing the coal as soon as it is received from the pits, the new conveying plant has been designed to provide for the coal being taken either direct into the retort-house or into the coal-store and thence to the retort-house. The coal-waggons are discharged by an electrically worked tip, loading up to 30 tons, which tips them to an angle of about 40° , so that the contents run out into an underlying funnel-shaped receiver.

The motor and gear for turning and raising the waggons are placed on a platform about 30 feet above the waggon-tip. The whole is carried by a strong girder framing, and automatic band brakes are provided on the machinery by which the waggons are tipped. The capacity of the tip is about 60 tons per hour; and

the power required is from 15 to 20 H.P., according as the waggons dealt with are of 10 or 15 tons capacity. The total weight of the installation is about 37 tons. Only waggons which open at the ends can be handled with it. Two men are required to operate the tip. The coal is conveyed from the funnel-shaped receiver by two inclined band conveyors to the coal-breakers, or, in the case of small coal, direct to a Bradley bucket elevator and conveyor, which takes it either to the coal-store or to the retort-house. The coal in the store is removed by shuttle conveyors to the bucket elevators, and so conveyed to the retort-house.

Some details of the conveying arrangements may be mentioned. The coal from the receiver under the waggon-tip is discharged through an opening provided with a self-regulating counterpoised slide. The extent to which the slide is opened is automatically regulated according as the coal is large or small. The coal is fed uniformly into the band conveyors. But for the high level of the underground water on the site of the works, the coal-breakers would have been placed alongside the receiver, so that the inclined band conveyors would carry only broken coal. Since this arrangement was impossible, however, the coal-breakers have been erected between the store and the retort-house, and the broken coal passes down a shoot to the elevators. The conveyor by which large coal is taken from the receiver to the breakers is of the band type, and set at an angle of 26° . The band conveyors are 30 inches wide, and have an effective length of 118 feet. They are shown in fig. 4. The capacity of the large coal conveying band is 30 tons per hour. It travels at the rate of 20 inches per second, and requires 5.6 H.P. to drive it. The coal-breaker can be set according to the size of the coal to be broken, and is operated by a separate electromotor requiring 15 to 20 H.P. Two coal-breakers were originally provided; but as the coal received

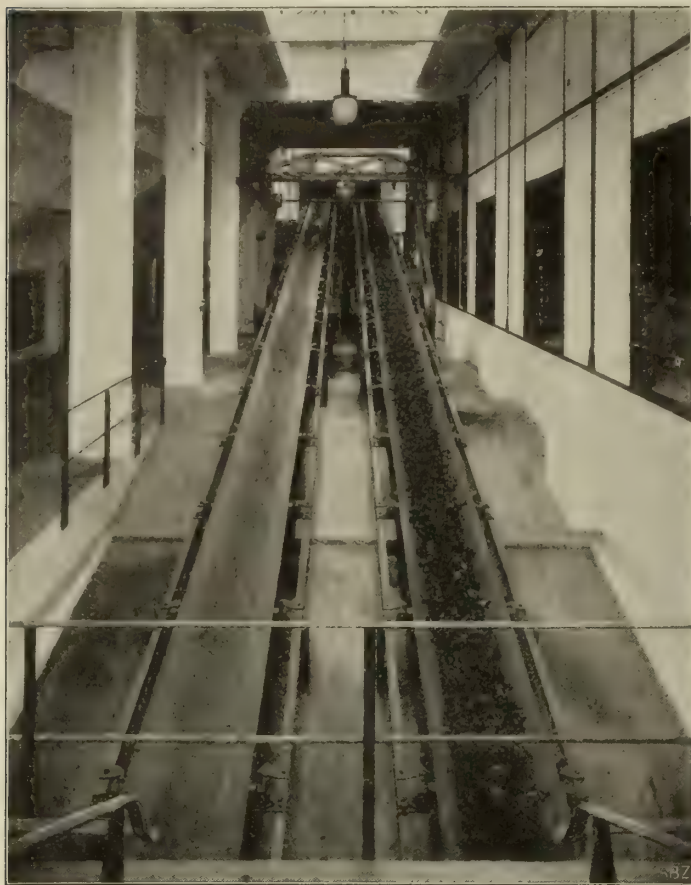


Fig. 4.—The Passage between the Coal-Store and the Retort-House for the Inclined Band Coal Conveyors—Showing at Back the Two Right-Angled Openings Discharging into the Coal-Breakers.

has to a large extent consisted of nuts, one breaker has hitherto sufficed. The broken coal can be diverted to either of two Bradley elevator-conveyors.

The Bradley apparatus is intended to serve three different purposes, and has a total length of 495 feet. It consists of 391 buckets with their rollers and bearings. The buckets and parts are connected by a four-ply rope of cast steel wire with annealed core, instead of by a chain. The length of the sections of wire varies from 16 ft. 6 in. to 26 feet. Very powerful chain driving gear is arranged where the bucket conveyor runs overhead. The chains and driving pinions are of cast steel. A band brake is provided on the chain gearing, which automatically throws the motor out of action if the Bradley apparatus is overloaded or broken. The whole bucket conveyor runs on steel rollers supported by a strong iron framing. At one of the lower angles of the train of the bucket conveyor a tensioning device with counterpoises has been provided, and thus the fluctuations in speed, which are inevitable owing to the great length of the conveyor, are easily met. The total weight of the two bucket conveyors, including the driving machinery and the supporting structure in the coal-store and retort-house, is about 90 tons. The capacity is about 30 tons of coal per hour, and the power required 6 to 7 H.P. Relatively to the large weight and the great length of the conveyor, the power required appears extremely small. This is due to the fact that the weights of the two vertical stretches of the conveyor are nearly balanced, and the friction on the horizontal stretches is not great. The conveyor makes a complete circuit in 9 minutes.

The different sections of the coal-store are filled by means of band conveyors running at right angles to the bucket conveyors. The bands are 18 inches wide, and have a working length of 102 feet. They are supplied by one or other of the bucket conveyors by means of an arrangement (which can be thrown in or out of action), by which the buckets are tipped and discharged on to the bands. The bands convey the coal to the small waggons which travel in either direction on a narrow gauge line over the sections of the coal-store, so that the coal may be tipped from them wherever desired. The bands travel at the rate of about 5 feet per second; and their capacity is 30 tons of coal per hour—the power required being about 2 H.P.

The coal is removed from the sections of the store for conveyance to the retort-house through funnel-shaped openings in the lowest part of the inclined bottom of the sections of the store. The openings are 15 feet apart, and are 10 in. by 14 in. in cross section. The coal falls on to the table of a distributor; and when the distributor is not in use, the openings are closed by the coal itself resting on this table. The distributors resemble those adopted in the earlier installation of 1898, though some improvements have been introduced. From the distributors, the coal is discharged on to shuttle conveyors such as were used in the No. 1 retort-house. The troughs, however, in which the new conveyors work, have been constructed on concrete base-plates instead of on wooden sleepers, as in the earlier installation. Six distributors supply each conveyor, and are put in and out of action by

the starting and stopping of the conveyor. One of the conveyors—beneath the openings in the bottom of the coal-store—is shown in fig. 5.

The conveying troughs are about 98 feet long and consist of sheet steel one-fifth of an inch thick. They have a capacity of 15 tons per hour, and require 2.5 H.P. to drive them. The coal travels in them at a speed of 28 feet per minute. In order to avoid the deposition of dust in the chambers under the coal-tanks, the conveyor channels have glass covers. The coal is discharged from the shuttle conveyors into either of the bucket conveyors. As a rule, two shuttle conveyors are worked simultaneously, so as to utilize the bucket conveyor to its full capacity. It is thus possible to bring two different kinds of coal at the same time on to the bucket conveyor, which is often useful when, as is frequently the case, it is desired to carbonize a mixture of two different coals. The coal is delivered into the retort-house by the Bradley conveyor, the buckets of which are tipped and discharged at its highest point on to scraper conveyors, which traverse the coal-tanks into which the coal is discharged through ports closed by sliding doors. There are twenty such ports for each scraper conveyor. The scraper conveyors are 92 feet in length, and are driven by means of chain-gearing and an electromotor of 5 H.P. They can convey 30 tons of coal per hour, and travel at the rate of 20 inches per second. The top of the coal tanks in the retort-house, and the scraper conveyor by which the tanks are filled are shown in fig. 6.

The coal-store comprises four floors connected by staircases. On the ground floor are the two bucket conveyors and the eight shuttle conveyors; on the first floor is the 115 feet long band conveyor with sixteen drums; on the second floor the guiding and driving machinery for the eight band conveyors and the motors for the same. The third floor contains the return-way of the two bucket conveyors, with their driving machinery. The experience gained in the first part of the works led to preference being given to the same transmission being used for the power for the shuttle conveyors and the band conveyors. It had been found that when several conveyors of each type were provided, a continuity of work could be ensured, while the erection and working of the plant was considerably cheaper than they would have been if separate motors were used for each conveyor. The two Bradley conveyors only have separate direct driving power. There are two motors for the main power transmission, one of which is kept as a reserve. They are placed near the motors for the Bradley conveyors; so that they do not require any separate supervision. This small power station, containing four 15-H.P. motors, is situated in a well-lighted room, shut off from the storage space, constructed in reinforced concrete. Each motor has a separate ampere meter, so that the power used can be exactly ascertained. This arrangement makes for reliability in working and facility of supervision and control. It has worked very satisfactorily, and without any breakdown, during the two years which have elapsed since it was installed.

The coal-conveying arrangements described have a maximum



Fig. 5.—The Shuttle Conveying Trough, with the Distributors for Automatically Removing the Coal from the Storage-Tanks.



Fig. 6.—Coal Tanks and Scraper Conveyor above the Settings, with, in the Background, the Arc-Shaped Topmost Point of the Bradley Bucket Elevator Delivering into the Scraper Conveyor.

capacity of 60 tons per hour, which, with ten hours' work, means a daily capacity of 600 tons. Though the prime cost of the installation, especially of the two Bradley conveyors, is high, its working has proved both trustworthy and economical. The whole conveying plant from the railway waggon-tip to the coal-tanks over the retort-settings is looked after by one man (a mechanic), who is not fully occupied therewith. More than 100,000 tons of coal have been conveyed by the plant in two years; and no repairs whatsoever have been necessary. The wear and tear on the band conveyors, as well as on the bucket conveyors, has so far been practically *nil*. The wages, on the basis of 600 tons of coal being conveyed daily, amount, from the discharging place

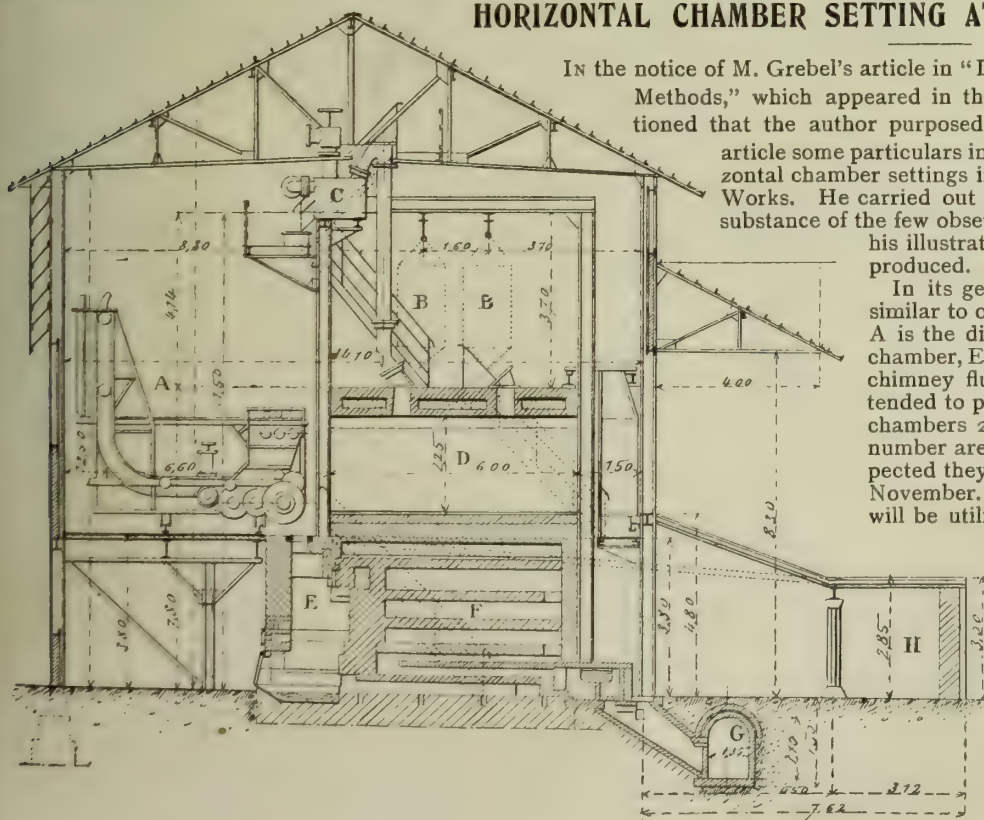
to the store or to the overhead tanks, to 0'34d. per ton, and from the store to the retort-house to 0'05d. per ton. These figures indicate the great economy of the working. A less complete, but perhaps somewhat simpler, conveying plant of the same capacity would have entailed considerably greater working charges. The conveying charges with the earlier installation on the works are about twenty times as great, though these show considerable economy as compared with the hand working previously prevailing. A great advantage of the new plant is its almost complete independence of the working staff, as only one man is required to look after it.

(To be continued.)

HORIZONTAL CHAMBER SETTING AT VERSAILLES GAS-WORKS.

IN the notice of M. Grebel's article in "Le Génie Civil," on "New Carbonizing Methods," which appeared in the "JOURNAL" last week, it was mentioned that the author purposed giving in the second portion of the article some particulars in regard to the first installation of horizontal chamber settings in France—that at the Versailles Gas-Works. He carried out his intention, and we give below the substance of the few observations that he makes to accompany his illustrations of the setting, one of which is reproduced.

In its general arrangement, the installation is similar to others of the kind. B are the chargers, A is the discharger, C the hydraulic main, D the chamber, E the generator, F the regenerator, G the chimney flue, and H the coke-hopper. It is intended to put up six settings, each containing four chambers 20 feet long; but only one-third of the number are being erected this year, and it is expected they will be ready for use by the end of November. The existing retort-house chimney will be utilized provisionally. The transport of the 2-ton coal-skips for the filling of the chambers will be effected by electric waggons. The coke that comes from the setting will be quenched in the open air, and will first of all be filled into hoppers under which will pass a line of trucks. An interesting feature of the installation is that the gas produced in it, instead of being immediately mixed with the ordinary make, can, if desired, be condensed, washed, and purified by independent plant, and stored separately.



NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Sunderland.

The Sixty-Sixth Half-Yearly Meeting of the North of England Gas Managers' Association was held on Saturday, in the Lecture Theatre of the Subscription Library in Fawcett Street, Sunderland—the PRESIDENT (Mr. T. H. Duxbury, of South Shields) in the chair. The meeting was exceedingly well attended.

THE DEATH OF KING EDWARD.

The PRESIDENT said they had met under most painful circumstances, owing to the death of their much respected King. It was a national calamity, and one which all sections of the people, irrespective of creed, politics, or vocation, were deeply mourning, throughout the world, because King Edward VII. stood pre-eminent as the most tactful and the most popular Monarch that ever sat on the Throne. If it had been possible to have cancelled the day's meeting, the Committee would have arranged for it to be done; but, as they knew, the members came from all over the Northern Counties, and there was no time to communicate with them. Therefore, though the position was a very difficult one, the Committee had decided that the meeting should proceed, but that the essential features only of the day's proceedings should be carried out. This would include the formal business of the meeting, the visit to the Ayres Quay Gas-Works, and a bare meal—the whole of the toast list at the dinner being eliminated. He hoped that this would meet with the approval of the meeting. It was the best the Committee could do under the circumstances. He had another painful reference to make—he alluded to the death of Alderman Allan, the Chairman of the Walker and Wallsend Gas Company, who was one of the original members of the Association, having joined in 1877. He thought they would wish that a letter of condolence should be sent to his family. He would like also to mention that a familiar face was absent that morning, in the person of Mr. Thomas Bower, of West Hartlepool, who, they knew, had been passing through a serious and critical illness. It would be fitting that a letter of sympathy with him should be sent from the Association, expressing their regret at his absence, and hoping for a speedy recovery for him.

Both proposals were agreed to.

CORRESPONDENCE.

The HON. SECRETARY (Mr. Herbert Lees, of Hexham) read letters from the families of the late Mr. J. H. Cox, of Sunderland, and Mr. M. Leaf, of York, in response to votes of condolence with them in their bereavement. He also read a letter from the Chairman of the Sunderland Gas Company, regretting his inability to be present, on account of his being from home.

ANNUAL ACCOUNTS.

The PRESIDENT said that copies of the accounts had been sent out to members of the Association; and he only needed to mention that there was a deficit on the year of £16, which was due to their donation to the Sir George Livesey Memorial Fund. The balance of £79 from the revenue account, plus £191 of investment, gave the total means of the Association at £270. So they might safely consider they were in a very satisfactory financial position. He formally moved the adoption of the accounts.

This was seconded by Mr. J. LEWIS (Newcastle), and agreed to.

NEW MEMBERS.

On the motion of Mr. W. FORD (Stockton), seconded by Mr. JAMES WHYTE (Seaham Harbour), the following gentlemen were admitted to the Association.

Members.—Mr. John Demain, Manager and Secretary of the Garforth Gas-Works, near Leeds; Mr. Edward Geo. Hutchinson, Engineer and Manager of the Workington Corporation Gas-Works; Mr. Ernest Dodd Wootton, Manager and Secretary of the Cockermouth Gas-Works; Mr. Frank Newcombe Oakley, Manager of the Berwick Gas-Works.

Associates.—Mr. Henry Towsley, Distribution Superintendent, South Shields Gas Company; Mr. T. N. Ritson, Consulting Engineer, Gateshead; Mr. Geo. Scott Coburn, Draughtsman, Gas Engineer's Office, Newcastle.

THE BENEVOLENT FUND OF THE GAS INSTITUTION.

The HON. SECRETARY read a circular letter from the President of the Institution of Gas Engineers, asking that a special effort be made to increase the contributions to the Benevolent Fund of the Institution. The letter, the Secretary said, had been before the Committee of the Association; and, as they would observe on the agenda, they recommended the meeting to vote a donation of five guineas to the fund. He might say that, in accordance with recent legislation, the Secretaries of all the District Associations were now *ex-officio* members of the Committee of Management of the fund; so that every District Association was in touch with the fund. He could assure them that the cases which had come before them during the past year were all necessitous, and that the money was being devoted to a very laudable object, and one which ought to command their interest and support. They had in their Association about 45 members of the Institution; and of

this number 14 were subscribers directly to the Benevolent Fund. It would perhaps not be amiss here to suggest that others might become subscribers to the fund, and thus help to support it. Further than this, there were many who were not members of the Institution who might perhaps like to contribute something; and it had been suggested in committee that if the five guineas could be supplemented by donations from members or associates of the Association, such donations would be sent on in addition to the five guineas which it was proposed to pay from the funds of the Association. He proposed that the recommendation of the Committee be adopted.

Mr. C. H. ARMSTRONG (Wallsend) seconded, and the motion was cordially agreed to.

A SPECIAL PURPOSES SECTION.

The following proposals had been circulated among the members previous to the meeting.

REPORT ON THE FORMATION OF A SPECIAL PURPOSES SECTION.

Your Committee have given careful consideration to the suggestion made by the President in his address at the last meeting of the Association, with reference to the formation of a sub-organization somewhat on the lines of the Commercial Sections at work in other districts.

The title generally applied to these sub-organizations does not, in the opinion of your Committee, correspond to the work undertaken by them; and they would suggest that, in the event of such a section being formed by this Association, the title should be "Special Purposes Section."

The advantages of such sub-organizations are acknowledged by all who have had experience of them in other districts; and your Committee have no hesitation in recommending the formation of one for this district. They beg to submit the following code of rules for your consideration.

Special Purposes Section of the North of England Gas Managers' Association.

RULES.

1.—The objects of the section shall be to deal with such matters relating to the interests of the gas industry as shall from time to time be deemed desirable by the members of the section.

2.—Membership of the section shall be open to gas undertakings whose chief officers are members of the Association, on payment of an annual subscription of £1 *rs.* for undertakings having a make of gas not exceeding 200 million cubic feet per annum; of £1 *rs.* 6d. for undertakings having a make of gas above 200 million, and not exceeding 2000 million, cubic feet per annum; and of £2 *zs.* for undertakings having a make of gas exceeding 2000 million cubic feet per annum. Undertakings on the lowest scale to be entitled to one representative; on the intermediate scale, to two representatives; and on the highest scale, to three representatives. The representatives to be thus elected shall be restricted to the engineer, secretary, or manager for the lowest and intermediate scale undertakings; and for undertakings on the highest scale the distribution engineer shall also be eligible for election. In addition, to representatives so elected, the section may, on the recommendation of the committee of the section, co-opt persons who, by reason of their professional knowledge and experience, are qualified to assist in advancing the objects of the section. Such persons must be members of the Association. Provided, further, that such co-opted members shall not exceed three in number.

3.—The management of the section shall be entrusted to a committee of its members, consisting of a chairman, vice-chairman, secretary and treasurer, and three members to be elected annually by ballot.

4.—The section shall hold monthly meetings, and report annually to the committee of the Association.

5.—The committee of the section may invite the attendance of any person or persons who may be able to give useful information on the subject under discussion at any particular meeting.

6.—The Association shall be competent to discontinue and wind-up the section at the annual general meeting in any year, after notice given at the preceding autumn general meeting, if its continued existence should be found incompatible with the best interests of the Association.

7.—Notice of any proposition for amending these rules must be given at a general meeting of the Association; and such notice shall appear on the agenda issued to the members for the following general meeting.

On behalf of the Committee,

T. H. DUXBURY, President.

The PRESIDENT said he had pleasure in submitting the Committee's report on the formation of a Special Purposes Section, copies of which, along with draft rules, had been forwarded to the members. The Committee had obtained a mass of information from other sections in the country, relative to the working of those sections, and representatives had also attended meetings in the various districts; and they unanimously recommended that such a section be formed in connection with the North of England Association, which now, as a matter of fact, was the only district that had not such a section. An important point to remember was that the rules did not tie down the section as to the lines on which it should be run, but left it to formulate its own procedure. He proposed that the report of the Committee be adopted, and they be instructed to proceed with the formation of a section.

Mr. W. HARDIE (Tynemouth), in seconding, said he thought the Committee had done wisely in taking into consideration the formation of such a section. They had done a good thing in making the name somewhat different from what was usual—that was to put it as a Special Purposes Section, and not as a Commercial Section—because, while a commercial section was useful, there were other purposes which were equally important. He had noticed that at their ordinary meetings the most valuable part of the proceedings was that which took place after the meeting was over, or before it began, in having something of the nature of an informal discussion on subjects in which they were all interested. Such a section as was proposed would be very valuable.

The motion was adopted.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT intimated that, to save time, the Committee appointed the Auditor, along with Mr. Armstrong, to act as Scrutineers in the election of office-bearers; and the result was as follows:

President.—Mr. J. Lewis, of Newcastle.

Vice-President.—Mr. H. Tobey, of Malton.

Auditor.—Mr. W. Garbutt, of Newcastle.

Hon. Secretary.—Mr. Herbert Lees, of Hexham.

Members of Committee.—Mr. Matt. Dunn, of Stockton; and Mr. T. Hardie, of Newcastle.

The PRESIDENT expressed pleasure at the election of Mr. Lewis,

who was an old personal friend of his. They were, he said, both born in the same Lancashire town, and received their initial gas-works training in adjoining places. He was sure they would all be glad to see that Mr. Tobey had allowed his name to go forward for a second time as President.

PLACE OF NEXT MEETING.

Mr. LEWIS proposed that their next half-yearly meeting be held in Newcastle. He thanked them for having elected him as President, and said he was glad indeed to be able to inform them that the Directors of the Newcastle and Gateshead Gas Company would be pleased to see the Association in Newcastle. He proposed a vote of thanks to the Directors and the Engineer of the Sunderland Gas Company for their courtesy in allowing them to go down to their works at Ayres Quay, to inspect the installation of vertical retorts.

Mr. FORD seconded, and the vote was agreed to.

Mr. H. TOBEY proposed a vote of thanks to the President, the Hon. Secretary, and the Committee for their services during the past year.

Mr. T. HARDIE seconded, and the motion was cordially agreed to; the PRESIDENT returning thanks.

VISIT TO AYRES QUAY GAS-WORKS.

At the close of the meeting, the members drove to the Ayres Quay Gas-Works, recently reconstructed, and into which



GENERAL VIEW OF THE AYRES QUAY GAS-WORKS, SUNDERLAND.

there has been introduced an installation of Dessau vertical retorts.

THE AYRES QUAY GAS-WORKS.

In connection with the visit of the members to the above-named works, some illustrated descriptive particulars had been prepared in pamphlet form by Mr. C. Dru Drury. Our readers may remember that a plan of the works was given in the "JOURNAL" for July 2 last year (p. 22); and the special feature of attraction on Saturday—the setting of Dessau vertical retorts—was illustrated in the number for the 23rd of November (p. 531).

Description of the Works.

The Ayres Quay works are the smaller of the two gas-works owned by the Sunderland Gas Company, and were first erected in 1847. The plant having become worn out, the old works were shut down two years ago; and, with the exception of one gasholder, they have since been completely reconstructed. The Directors took the opportunity thus afforded them of introducing the Dessau vertical retort system for carbonizing purposes, and care was taken that the remainder of the plant should also be up-to-date. The works thus reconstructed were brought into use on the 4th of December, 1909.

The site of the works is irregular, both in shape and levels, and only about two-thirds of the total area of the ground is available for building purposes; the level of the railway sidings being fully 50 feet above that of the yard. The sidings are in communication with the North-Eastern Railway, and the coal-waggons

deliver their contents direct into the ferro-concrete receiving bunker, from which the coal is discharged either through a bottom door into a breaker and elevated into the continuous hoppers over the bench, or through side doors into skips, travelled by hand, suspended from overhead runways in the coal-store, by which means the store is filled. The coal thus stored is unbroken, and when required can be drawn off and passed through an independent breaker feeding into the elevator which is common to both breakers. An emergency arrangement is provided for handling the coal in case either of the breakers or the elevator should at any time fail.

The coal-handling arrangements and those for elevating coke and breeze to the overhead hoppers are so designed that the whole of the work when the retort-house is fully equipped can be done by yard men in an ordinary day. The retorts are 4 metres (13 ft. 1½ in.) in length, capable of carbonizing 58 tons of coal per day on the basis of twelve-hour charges, and of producing about 750,000 cubic feet of gas. With the exception of the lower portion of the retorts, the brickwork in the combustion chambers, and a few special fittings, the whole of the bench consists of British materials and workmanship.

The purifiers have been left uncovered; the revivifying floors on each side alone being provided with roofs. The first four boxes are worked in rotation by means of a Weck valve; and the fifth box acts as a catch purifier, and is worked by three separate slide-valves.

Of the gasholders, No. 1 was previously a three-lift holder with the top lift rope-guided on Pease's principle. Last year, a new fourth lift, also rope-guided, was added, and the sides of the

bottom lift were resheeted; the addition of a row of intermediate girders with diagonal bracing being at the same time made to the framing. The tank is of masonry, backed with puddle, with a flat puddled bottom. No. 2 gasholder was erected in the year 1881 on the site of an older holder of the same diameter. The tank is of cast iron.

The tar and liquor produced are collected in underground storage-tanks, and then pumped up into overhead loading-tanks erected alongside the railway sidings; the contents of the latter tanks being filled into railway tank-waggon. The liquor is sent to the Company's Hendon works, and there converted into sulphate of ammonia; the tar being dispatched to distillers.

A feature of these works is that all valves of all sizes, whether gas, water, tar, liquor, or steam, close with the sun.

In the case of the retorts, condensing, and washing plant, the first only of two units has at present been provided. In other respects the plant is capable of dealing with a maximum make of $1\frac{1}{2}$ million cubic feet of gas per day.

Particulars of the Buildings, Plant, &c.

COAL-RECEIVING BUNKER.—Ferro-concrete (Hennibiquessystem) with corrugated steel house and direct communication on top with railway sidings. Capacity, 200 tons.

COAL-STORE.—Fitted with overhead runways and skips for filling and emptying. Capacity, 1600 tons.

RETORT-HOUSE.—181 ft. 6 in. long by 64 ft. wide inside and 41 ft. 8 in. high to the eaves. Chimney 130 feet high.

RETORTS (FIRST SECTION).—One bench of six beds of ten Dessau vertical retorts, each 13 ft. $1\frac{1}{2}$ in. long, 9 in. by 22 $\frac{1}{2}$ in. oval section at the top, tapering to 13 $\frac{1}{2}$ in. by 27 in. at the bottom. Capacity of each retort, 9 $\frac{3}{4}$ cwt. of coal per charge. Overhead continuous coal-hoppers, capacity 100 tons, with additional hoppers for coke and breeze.

COAL-HANDLING PLANT.—Two coal-breakers, capacity of each 20 tons per hour, conveyor, elevator, and rotary screen, all electrically driven.

COKE-HANDLING PLANT.—De Brouwer hot-coke conveyor, rotary screen, and coke-boist, all electrically driven. Also storage hoppers.

ELECTRICAL PLANT.—Two 40 Kw. dynamos, each driven direct by a 68 B.H.P. gas-engine; one 11 B.H.P. and three 20 B.H.P. motors, 220 voltage.

RETORT-HOUSE GOVERNOR.—Cowan type, 10 inches diameter.

CONDENSERS (FIRST SECTION).—One Morris and Cutler water-tube condenser. Capacity, a million cubic feet per day.

BOILERS.—Two Cornish boilers, each 5 ft. 6 in. diameter by 22 feet long, fitted with Wilton's breeze furnaces. Boiler pressure 80 lbs. per square inch.

EXHAUSTERS.—Two four-blade exhausters and steam-engines, each of 80,000 cubic feet per hour capacity.

WASHERS (FIRST SECTION).—One Livesey washer. Capacity, a million cubic feet per day. One Kirkham washer-scrubber. Capacity, a million cubic feet per day.

PURIFIERS.—Five boxes, each 25 ft. by 20 ft. by 5 ft. 8 in. deep inside, with dry-lute covers, 18-inch connections, Weck's centre-valve, and Hovey's patent cover crane, fitted with Spencer's hurdle grids. Covered revivifying floor on each side of the line of purifiers.

STATION-METER.—Capacity, 80,000 cubic feet per hour.

STATION GOVERNORS.—One 12-inch and one 18-inch double-cone governor, each water loading.

GASHOLDERS.—No. 1, four lifts. Capacity, 580,000 cubic feet. Diameter of tank, 103 feet. Two top lifts rope-guided on Pease's principle; fourth lift added at reconstruction. No. 2, three lifts. Capacity, 130,000 cubic feet. Diameter of tank, 61 ft. 6 in. Erected 1881.

WORKS' MAINS.—Gas-mains chiefly 18 inches diameter. Holmes's valves, double-faced pattern.

TAR AND LIQUOR TANKS.—Two underground tanks, combined capacity 21 days' maximum production.

OFFICES.—Containing manager's, clerks', and foremen's offices, laboratory, and photometer-room.

WORKSHOPS, &c.—Comprising fitters', blacksmiths', and joiners' shops, and general stores.

MESSROOMS.—Stokers' room, with lavatory, shower baths, &c., yard men's room, with lavatory, cooker, &c.

On returning to the town, the members and friends, to the number of considerably over a hundred, dined together in the Palatine Hotel—Mr. Duxbury in the chair. At the conclusion of the meal, a few complimentary remarks were made by Mr. W. Doig Gibb, of London, and Alderman Gillies, of Gateshead, after which the party dispersed.

A recent number of the "Comptes Rendus" of the French Academy of Sciences contained a description by M. Gernez of a method of restoring the phosphorescence of the sulphides of the alkaline earths. The sulphides of calcium and strontium, and probably that of barium also, slowly lose their phosphorescence under the action of air and water. The author thought this loss was due to the conversion of the sulphide into non-phosphorescent sulphate; and he deduced that the phosphorescence should be restored when the sulphate was reduced to sulphide. On heating the non-phosphorescent substance in hydrogen, he found that it again acquired its phosphorescence. The same effect is produced by the action of heat without hydrogen.

JUNIORS AT BURNLEY GAS-WORKS.

Joint Visit of the Manchester and District and the Yorkshire Junior Gas Associations.

The annual joint visit of the above-named Junior Gas Associations took place on Saturday last, when the Burnley Corporation Gas-Works were inspected. The occasion had been anticipated with exceptional interest, partly on account of its being the first opportunity that many of the members had had of seeing vertical retorts in operation, and partly from the intrinsic attractiveness of the works themselves. Not a few of the visitors were fully aware of how much pioneer work in gas practice and how much valuable scientific research had been carried out at Burnley by Mr. J. Petty Leather, the Engineer and Manager, and his colleague, Mr. Raymond Ross, F.I.C., F.C.S., the Works Chemist and Borough Analyst; and the opportunity of meeting them on the scene of their investigations was one which appealed powerfully to those in touch with this branch of gas practice. Consequently, few were surprised to see a record number of visitors—between 130 and 140—especially as the town is fairly easy of access from both Lancashire and Yorkshire.

The visitors were welcomed by Mr. Leather, and were taken at once to the new retort-house, where the vertical retorts are installed. Here two large diagrams, lent by Messrs. Woodall and Duckham, were hung up, and by their aid Mr. Leather described the main features of the system. He called attention to the construction of the house, which was erected before any decision was arrived at as to whether vertical or inclined retorts were to be erected, and was of such proportions as to be suitable for either. The two main lines of steel stanchions supporting the roof were placed at such a distance apart as would correspond to the depth of a bench of inclined retorts, and also take a double row of verticals with their producers and regenerators.

As it was obviously impossible, in the limited spaces on the bench, to keep in large parties personally conducted, Mr. Leather invited the visitors to inspect the setting for themselves, throwing the whole works also open to them. Naturally the verticals were first assailed, and questions fell thick and fast on Mr. Leather, Mr. Ross, the Assistant-Chemist, the works foreman, Messrs. Woodall and Duckham's representatives, the workmen engaged, and any of the visitors who had had previous acquaintance with the plant. No description of this is necessary here, as it has recently been given in full detail in the "JOURNAL" (Vol. CVIII., p. 22). The compactness and smooth working of a plant of about a million cubic feet daily capacity was much commented upon, and the absence of heat and smoke, compared with an equivalent installation of the older methods of carbonization, was specially noticeable. Attention was perforce mainly devoted to the charging and discharging arrangements and the gas and tar take-offs. With the greatest heat at the top portion of the retort, there is a possibility of a crust forming and remaining fixed in its place, letting the charge fall away below it, but preventing the introduction of fresh coal; and close examination was given to the ingenious method by which a rod can be thrust down through the upper portion of the charge at frequent intervals without undue loss of gas.

From the vertical retorts visitors naturally turned to the adjoining new coal-stores, accommodating easily some 5000 tons of coal. In this is fitted coal-handling plant recently installed by West's Gas Improvement Company, Limited, of more than usual completeness and variety of ways of dealing with the raw material. Coal is screened and broken as soon as received, and then by a bucket elevator put into store, or else delivered to the elevator for the vertical retorts, while the floor is so arranged that coal can be taken from the store through hoppers with duplex valves, delivered into the conveyor or in its lower track in a tunnel 7 feet wide and 6 feet deep, re-elevated, and delivered down a shoot to the retort-house elevator.

The Burnley Gas-Works led the way with inclined retorts; and these were also inspected. A double bench, each of thirteen settings of sixes with a common charging-stage, provides the bulk of the make of coal gas; as much as 2 million cubic feet per day having been made here at times of special stress. Its differences from later custom in inclined settings were at once detected, such as the common charging-stage, instead of a common drawing-stage, 15-feet instead of 20-feet retorts, and especially the ascension-pipes at the top end only of the retorts.

The carburetted water-gas plant (the "Economical" type) of 2 million cubic feet capacity next came under inspection, though not actually in operation; one set being cold, and the other having its gas-making suspended for the week-end. Here, too, the gas industry is indebted to Burnley for valuable pioneer work and investigation—particularly on the suitability for gas making of the various oils on the market, and the factors that determine their suitability.

Time permitted of only a hurried inspection of the rest of the works, though most of the visitors devoted at least some attention to the complete laboratories. Anything like a real inspection of these was obviously impossible for so large a party, though the laboratory workers among the company would gladly have lingered long here with Mr. Ross, who, as already mentioned, holds the two positions of Borough Analyst and Gas-Works Chemist, and who is keenly interested in all departments of research work. Only a few weeks ago, a notable paper in connection with "The Purification of Gas from Sulphur" was read to the Manchester

Section of the Society of Chemical Industry by Mr. Ross and his Assistant, Mr. J. Race, A.I.C. (See *ante*, p. 41.) Among other items, it announced the discovery by them in carburetted water gas of a hydrocarbon—cyclopentadiene—previously only known in crude benzene from coal tar. In all these researches Mr. Leather is keenly interested; and his part in their inception and development is by no means small. It is fortunate for the future of carbonization in vertical retorts that one of the largest installations likely to be erected for some time is in the hands of an Engineer and of Chemists so competent to investigate its possibilities and to develop the conditions of its best working. New methods of gas-works practice, and especially of gas making, can only be fully examined and perfected by large-scale working; and the whole industry, especially those who in later years adopt these new methods, enter into the fruits of the labours of these earlier venturers who thus make the industry their debtors. An honoured position in this roll-call is filled by the name of Mr. Leather.

The visitors afterwards assembled at tea as guests of Alderman Emmott and Councillor Clough, the Chairman and Vice-Chairman respectively of the Gas Committee of the Corporation, who were unfortunately both unable to be present.

At the conclusion of the repast,

Mr. G. W. SHEPHERD, the President of the Yorkshire Association, proposed a vote of thanks to the Chairman and the Vice-Chairman of the Gas Committee for their hospitality, to the whole Committee and to Mr. Leather for permission to visit the works, and to all who had assisted Mr. Leather in receiving and guiding the visitors. He said that the general interest in the visit had been most marked, and that it had been a great privilege to inspect what was the latest development of gas making—viz., continuous carbonization in vertical retorts. They were patriotically proud that, though to foreign gas engineers they might owe some recognition of precedence as regards vertical retorts, yet to Englishmen had been reserved the accomplishment of successful continuous carbonization, which had been a long-cherished ideal seemingly almost impossible of realization.

Mr. F. THORP, the President of the Manchester and District Association, seconded the vote. In referring to the fact that the Burnley Gas-Works had in several matters been pioneers, he gave other examples of the optimism and enterprise that Burnley and Burnley men had shown in past years. He said he was sure he was acting as spokesman for all present in wishing that Mr. Leather and his Committee might find the present installation an unqualified success, and an ample justification and reward for their courageous enterprise.

After the vote had been enthusiastically accorded,

Mr. LEATHER returned thanks on behalf of all concerned, who had, he said, been pleased to receive and help the visitors. With regard to his vertical retorts, he was not in a position to give any figures as to the working results. When approached nearly twelve months ago for permission for the visit, he hoped the plant might be working independently by the time the visitors came. Partly, however, from it being still in the contractors' hands, and partly owing to the gratifying fact that they were selling 10 per cent. more gas than at the corresponding period last year, they had not yet been able to shut-down the inclined retorts; and as all the gas from inclines and verticals mixed at the exhauster, and was purified and measured together, they had as yet nothing more than inferential data as to the results of the new plant. He agreed that continuous carbonization was an ideal, and more than twenty years ago he had pored over the illustrations of a suggested plant in "King's Treatise," made fresh diagrams, and tried to work out a practicable plant. The risks and expense always seemed too great for him to dare to recommend his Committee to experiment in this direction. When Messrs. Woodall and Duckham, in experimenting at Bournemouth, began to get satisfactory results, he went there to see their work, and came to the conclusion that they were approaching success. He laid the matter before his Chairman and Vice-Chairman, other inquiries followed, and finally the whole matter came before the Committee. He was then instructed to erect a new retort-house, which, as he had before explained, was to be constructed so as to be equally suitable for inclines and verticals. Meanwhile, they continued to watch the Bournemouth experiments with interest; and finally, when he saw the risk was not too great, he advised the erection of the bench the visitors had seen in operation. He was conscious that he had incurred a great responsibility; but he believed they would be able to make a great success of it. Large-scale working was much more difficult than small and experimental working. Here the main difficulty was the need, if he might be permitted so to express it, of curing an evil before the evil came. They must be continually on the watch. With any kind of intermittent working, a small defect could be set right the next time of charging. But with continuous carbonization the next time was the next minute; and if the defect was not at once remedied, working became less easy and successful, until soon a standstill might result. Their men had to be trained, and had to gradually acquire such familiarity with the plant as would enable them to see promptly, and even anticipate, any weakness in working. Then, too, even if they did not need a different type of man, the men would have a very different type of work. With horizontal or inclined retorts, when a charge was once in a tier of retorts, but little supervision was needed; and for about 1½ hours they might not have to think of what was going on. With continuous carbonization in vertical retorts, no such periods of rest were possible, and alert supervision must be uninterrupted; then success would be possible.

SUITABLE ROAD TAR.

Following the paper on "Up-to-Date Roads," read by Mr. R. O. WYNNE-ROBERTS, M.Inst.C.E., at the meeting of the Society of Engineers yesterday week, there was an animated discussion. Portions of the paper referring to the use of tar on, and in the construction of, roads were given last week; and only the parts of the discussion bearing on this question are now reported.

Mr. H. P. MAYBURY, M.Inst.C.E. (Kent County Surveyor), in his remarks, said that last year the Kent County Council spent £13,000 in dust abatement and incidental improvement. The great alteration that had taken place in road traffic since 1903 must not be overlooked. Until that year, the motor-car was not legalized to go at a greater speed than 12 miles an hour; and he believed then there were not 1000 motor-cars in England; while at the end of last year, 190,000 motor vehicles were registered for use on the roads of this country. Mr. Wynne-Roberts suggested it would not be an impolitic thing to have a tar-still upon the side of the highway. He (Mr. Maybury) did not know whether the author of the paper had had charge of highways lately, and had been using tar on the roads. If he had, he would know that the very sight of a tar-boiler was almost to the neighbours like a red rag to a bull. He had had to deal with numerous claims made in consequence of a tar-boiler being upon the road. Only last year he had to defend an action for (so it was alleged) poisoning a cow. The County Court Judge believed it; and his Council actually had costs cast against them. He had had claims for damaging damson trees, hops, and a thousand-and-one other things. He did not know where he would land himself if he now put a tar distillery on the road. There was no doubt that tarring had a very beneficial effect upon the life of macadamized roads. He went so far as to say that, without tar treatment, with all the heavy motor traffic they now had on the main trunk roads, it would be impossible to hold them together. At the same time he did not think that tar painting was the last word on the maintenance of roadways; still it did go a long way to meet the requirements of the present traffic, and to reduce the road bill. In his own county, they had some 750 miles of road; and last year he treated 303 miles with tar. And he was glad to say they had not so far got up to the expenditure that obtained in 1902. In that year the main roads of the county cost £162 per mile; last year (he thought he was right in saying), including tar painting and improvements, they cost £137 per mile. The reduction in cost was due to the fact that they had bought material—granite, and so on—on more favourable terms than prior to 1902. A great part of the outlay for tar painting (£13,000) was therefore saved by the reduced cost of other material. With Mr. Butterfield, they had been making various experiments in the endeavour to get a proper and suitable bituminous binder, which should to some extent supersede the crude tar in tar painting, or at all events would have the effect of giving them a road with elasticity to withstand high-speed traffic. Speed must not be ignored. If they had a motor-car or traction-engine going at the rate of 2 miles an hour, the strain on the roadway was nothing like so great as if a vehicle was travelling at the rate of 40 miles an hour.

Mr. W. J. A. BUTTERFIELD, F.I.C., remarked that, though he was not responsible for the maintenance of roads, he had had some experience of the manufacture of tar, and of specifying tar of a suitable character for the painting of roads. However interesting it might be to know all about coal tar, he was not quite sure that he agreed with Mr. Wynne-Roberts that it was very helpful to the road engineer that he should understand how it was manufactured. As a matter of fact, a little knowledge of its manufacture might lead to very dangerous errors. Passing on to the relation between the specific gravity of tar and its applicability to roads, as a matter of fact, he believed the specific gravity had very little bearing indeed on the suitability of a tar as a binder. It did not, so far as his (Mr. Butterfield's) knowledge went, as Mr. Wynne-Roberts would imply, connote that a tar contained a certain proportion of free carbon, or that a tar would have a certain viscosity. The properties of coal tar depended almost entirely upon the temperature at which the coal had been carbonized, and the character of the coal was of practically no account provided the temperature of carbonization exceeded a certain minimum. Then as to the free carbon, it certainly had no binding value. He thought, too, that Mr. Wynne-Roberts's permissible maximum of 25 per cent. was much too high. In specifications he (Mr. Butterfield) had drawn up, he had usually put it at 16 per cent. Again, as to the density—the specific gravity—of refined tar, the author put it at 1.25. This was higher than he (the speaker) thought practicable for the average tar distiller to produce; and 1.20 to 1.22 was practically the average density of tar that was suitable for road painting. For manufacturing a grouting material, a different tar altogether was required. He was rather struck by the author dealing with loads on roads as though they were static or slowly rolling loads; and he did not notice that Mr. Wynne-Roberts took any account of the speed of rotation of the wheels. It seemed to him (Mr. Butterfield) that the necessity for the tar treatment of roads had come in with the increased speed of traffic. The wheel of the motor-car might be regarded as a grindstone; and the road the article that was being ground. If the grindstone was revolved fast enough, the road surface would be worn away very quickly; if the surface was one

that was easily ground up or disintegrated, the wear and tear on the roads would be very great. To avoid this wear and tear being excessive, the surface of the road had to be bound together with very viscous or colloidal material, which was tenacious and was not easily torn apart by the revolving wheel. He conceived this was somewhat the condition with which they had to deal. The rapidly rotating wheels that passed over the roads to-day were the *raison d'être* of the application of tar to the surface of roads. Tar was not easily pulled apart once it was set; and it incidentally prevented the lumps of road material being separated. It also prevented the pieces being ground one upon the other, and thus broken up, and the whole road surface disintegrated. In regard to many points in connection with the analyses of tars, the paper was necessarily very general; and there must be points of disagreement. But there was one upon which he should like to warn engineers who made their own tests of tar, upon which the author had not been sufficiently explicit—that was, with respect to viscosity. Viscosity of a liquid such as tar was very largely a function of temperature. It all depended upon the temperature at which the test was made. A tar highly viscous at 40° Fahr. would be a relatively fluid tar at 70° Fahr. There was no reference, in the author's description of testing for viscosity, to the fact that temperature was an extremely important factor; and obviously a tar that was suitable for road use must be one that was of fairly uniform viscosity over a wide range of temperature.

Mr. REGINALD BROWN said there were no doubt varying qualities of tar; but he did not entirely agree with the author that they as road engineers need trouble themselves much as to how varying qualities of tar could be produced. This was a matter that could be left to experts like Mr. Butterfield. There was no doubt that, owing to the use of carburetted water gas and oil gas, there were tremendous differences in the quality of tar from gas-works. There was great difficulty in getting out the water from the tar by simple deposition. He knew for a fact that they could get oil tar of as low a specific gravity as 1.08, which was slightly above water. For the past three years he had been using only oil tar on the surfaces of the roadways; the advantage being that they obtained a low percentage of pitch in it. They got 58 per cent. of pitch in ordinary coal tar, and about 14 or 15 per cent. in oil tar. The pitch in the latter was in such a liquid condition that it permeated the whole of the road surface much quicker than ordinary coal tar; and the more they could get the pitch (as it were) into the interstices of the road material, the better bound road would be the result. He had found that oil tar would permeate 2 inches with a cold dressing. Ordinary refined coal tar dressing would cost 1d. per yard super.; while oil tar dressing could be done at less than ½d. per yard, or five dressings for 1d. With five dressings (which few roads would require) in the course of an ordinary season, an equally efficient road could be obtained as by the use of coal tar. By using, too, the finer material, with the smaller amount of pitch and in a more liquid state, so as to allow it to percolate well into the road, sand or chippings were not required on the surface, because in two or three hours the surface of the road was fit to walk upon. He preferred hand painting; but the use of machinery was necessitated for rapidity.

Mr. WYNNE-ROBERTS, in the course of his reply, admitted at once that viscosity could not be ascertained with anything like reliability unless the temperature was taken into account. He also agreed that vehicular speed should be taken into consideration in relation to the questions raised in the paper. Also that the introduction of a tar-distillery on the roads was not an ideal thing. But his point in this connection was that it facilitated work. Many authorities might not have distilling plant anywhere near the work that was being done, or at an economical distance. Therefore they had to rely upon the use of crude tar. To meet these conditions, the alternative was the portable distillery; and experience would teach where in a roadway the boiler could be put so as to avoid nuisance. Mr. Butterfield had mentioned that specific gravity did not connote the percentage of free carbon in the tar. But other eminent chemists and tar distillers agreed that specific gravity did connote the presence of free carbon.

Mr. BUTTERFIELD asked permission to say that, within a limited area where the gas-works were using the same descriptions of coal, and the same methods of carbonization, the specific gravity of the tar probably did indicate roughly the proportion of free carbon in it. But taking a wide area—gas-works scattered all over the country, using different coals and heats—it could not be said that the specific gravity of tar had any definite relation to the proportion of free carbon in it.

Mr. WYNNE-ROBERTS said that the information he had pointed to the formula given in his paper being more or less accurate for all tars. He did not say it was entirely accurate for Metropolitan tars. Mr. Butterfield had said he stipulated that free carbon should not exceed 16 per cent.; and that would eliminate the Metropolitan tars, which contained more than that. In fact, he thought it would be found, from the free carbon returns of the country, that 16 per cent. was too low; hence his (Mr. Wynne-Roberts's) reason for adopting 25 per cent. From the analyses he had, it might be concluded at once that many tars in this country could not be used for road purposes. The specific gravity of 1.25 might be a little high; but still he thought some of the tars sold to-day reached this point. A slight modification, however, might be necessary.

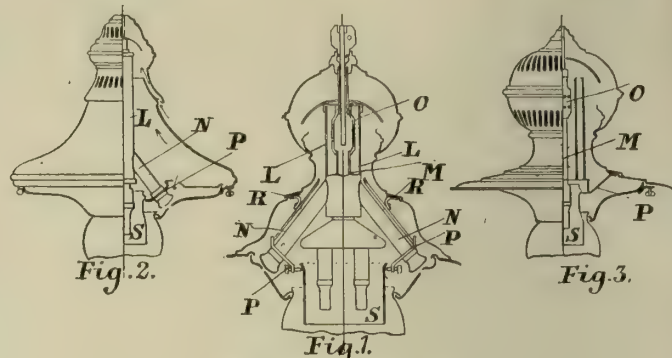
REGISTER OF PATENTS.

Inverted Gas Lamps and Burners.

HELPS, GEORGE, of Nuneaton.

No. 2651; Feb. 4, 1909.

By this invention, the air casing of a lamp may be in several parts supported without bolts or nuts—"a considerable advantage where enamelled iron casings are used"—and ready access obtained to all parts of the burner.



Helps' Inverted Gas-Lamp.

Fig. 1 shows one form of the lamp. L is the air casing, M the burner-tube, N tubes supplying air to the nipple through an air-chamber O, and supporting a flanged ring P, holding up the lamp casing by means of a second flanged ring or chimney having brackets or flanges R. The first-named flanged ring carries the chimney or draught inducer S.

Fig. 2 shows in part section and part elevation another form of the invention. Here the lamp referred to in patent No. 20,762 of 1908 is shown. The whole of the lamp casing Q is supported by the flanged ring P.

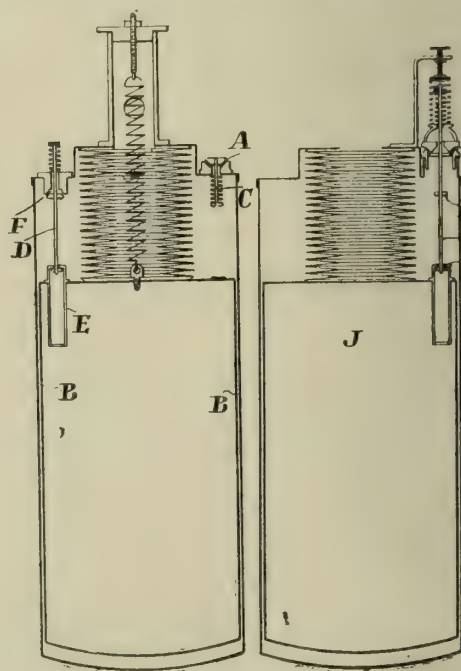
Fig. 3 shows a method of supporting a lamp by one flanged ring composed of several sections, and in which there is no air casing. M is the burner-tube, O is the air-chamber, and P is the flanged ring to which the chimney is attached.

High-Pressure Gas-Lamps.

CHIPPERFIELD LAMP SYNDICATE, LIMITED, of Victoria Street, S.W., and BROWNING, E. M., of Buckhurst Hill, Essex.

No. 8450; April 7, 1909.

This high-pressure gas-lamp is of the type described in patent No. 20,521 of 1906; the objects being to obviate the use of slide valves—substituting mushroom or disc valves therefor—and also the provision of a silencing device, whereby the noise resulting from the exhaust and intake actions of the valve is considerably reduced.



The Chipperfield High-Pressure Gas-Lamp.

In the first arrangement shown, the outer vessel is fitted with an exhaust port A, opened or closed by a mushroom or disc valve, so constructed that when the inner vessel or displacer B is at any portion of its upward or downward stroke, it will not be in contact with a rod C for operating the valve. The rod passes through the port A to the interior of the outer vessel until the displacer is almost at the end of its upward stroke, when it will come into contact with the inner end of the valve rod C and raise the valve from its seat, thereby opening the port A and permitting the escape of the heated air. The valve-rod is caused to follow the displacer B in its downward movement, by the action of a spring, until the port A is again closed.

The intake valve consists of a reciprocating rod D, the inner end of which is connected to the displacer B through an opening in a small closed chamber E, formed partially within the displacer as shown; the port F being normally kept closed by a spring attached to the upper portion of the rod D, which holds the mushroom or disc valve secured to the rod against its seat on the under face of the port. The inner end of the rod D is provided with an annular projection, which comes into contact, during the downward movement of the displacer, with the top of the closed chamber E, through which the rod passes, thus opening the valve F and permitting the intake of air from the atmosphere.

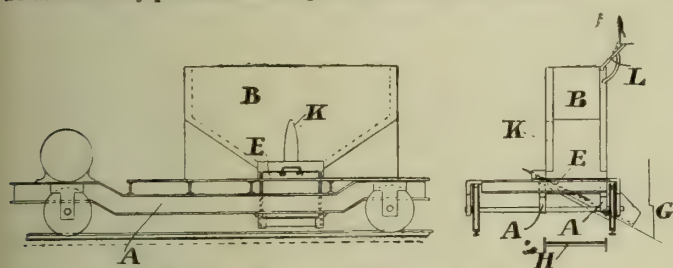
In the second arrangement, the intake and the exhaust valves are combined; the arrangement being such that when the reciprocating rod D has almost reached the end of its upward stroke, the port G will be opened by the valve being raised from its seating, consequent upon the annular projection H coming in contact with the top of the closed chamber I, which will have caused the rod to travel upward with the displacer J until the valve is lifted, permitting the escape of the heated air to the atmosphere.

Directing Coke from Gas Retorts to Furnaces or Alternatively to Conveyors or Trucks.

HUNT, P. C. H., of South Yarra, Victoria.

No. 8848; April 14, 1909.

This invention relates to means whereby the coke from retorts may be removed in its hot condition and delivered into the furnace used for heating such retorts, or, alternatively, for receiving the coke from the retorts and delivering it upon a conveyor or into trucks; so that it may be taken to any predetermined spot for cooling and storage.



Hunt's Travelling Platform and Coke Screen.

The illustration shows a longitudinal elevation and end view of apparatus embodying the invention, which was referred to and illustrated in the course of an article by the patentee in the "JOURNAL" for Nov. 2 last year, pp. 307-11; as also in his Presidential Address to the Victorian Gas Managers' Association—see "JOURNAL" for Feb. 15 last, pp. 423-30.

The patentee employs a combined travelling platform A and coke-shoot or hopper B in connection with machinery, wherein the coke is discharged from the retorts at one end, either by means of a pusher or ram, or by gravitation when the retorts are inclined. The platform (of steel construction) is mounted on wheels running on rails on the floor of the retort-house. The hopper B has a movable bottom plate E (working in guides), which, when in position, deflects the coke into the furnace entrance at G or, when removed, allows it to drop through the floor into trucks or on to a conveyor H. When it is desired to feed the coke into the furnace, the platform is placed with the shoot opposite the retort to be discharged; the movable bottom plate E being left in position, so that the coke as it comes out of the retort is deflected into the furnace. A slot K in the back-plate allows the workman to see the coke falling into the furnace, and affords him facility for assisting to fill it.

When it is not required to put the coke into the furnace, the bottom plate E is withdrawn, and the coke is allowed to drop through on to a conveyor H or into trucks beneath. Flaps L are provided on the front of the shoot, to divert the coke from the retort mouthpiece into the body of the shoot.

The slot K is of such dimensions as will allow of the working of a poker therein to assist the falling of the hot coke, when in the hopper, to either the furnace opening G or receptacle H beneath for removing the surplus coke.

Imparting Rotary Motion to Gas Taps from a Distance.

PEGLER, B. C. H., of Kingston-on-Thames.

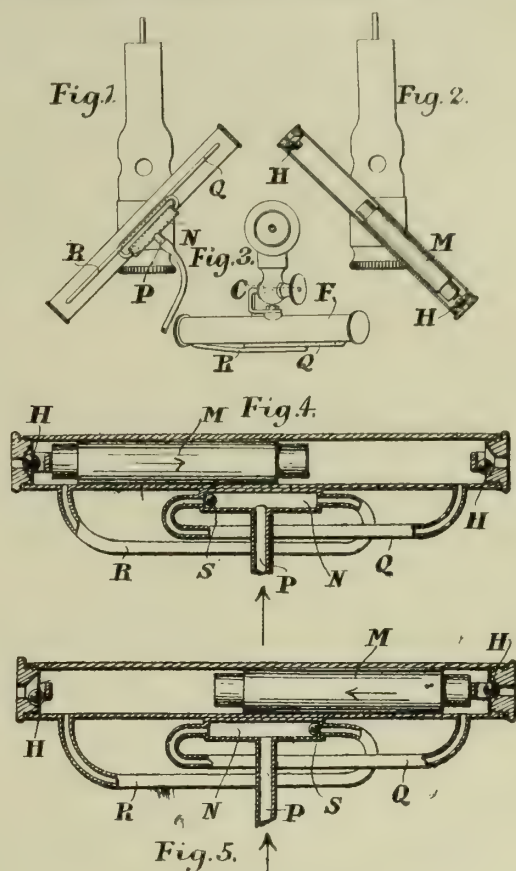
No. 11,133; May 11, 1909.

This invention relates to means for turning on and off a tap for the supply of gas to a burner, in which a weight is caused to move from one end to the other of a vessel pivoted toward its middle and actuating the gas-tap; the weight being caused to move from side to side of the fulcrum by variation of fluid pressure. Thus, by compressing a bulb at any distant point, the heavy piston can be alternately driven from one end to the other of the cylinder, causing a rocking motion of the cylinder and the plug to which it is attached. At each end of the cylinder is a ball valve opening inwards when the ball is off its seating. When the cylinder is tilted with the right end upwards, the air enters on the left end or lower side of the cylinder, and the ball closing over the valve will not allow the exit of the air from the cylinder, and, therefore, it drives the piston to its highest position, tilts the cylinder over, and thus turns the gas on. The air in front of the piston is driven out upwards through the open valve; the ball having in the meantime fallen away from its seating.

Fig. 1 is an elevation of a burner with the device fitted. Fig. 2 shows the mechanism in another position. Fig. 3 is a plan of fig. 1. Figs. 4 and 5 are diagrammatic views explaining the action of the mechanism.

The burner fitting is provided with an ordinary tap; but through the hole through which the lever actuating the tap is usually passed is inserted a screw pin C, held in position by a screw nut. The pin is bent

twice (as shown at fig. 3) and is attached to a cylinder F, provided at each end with a cap having a central perforation. Beneath each perforation, and within the cylinder F, is a small ball valve H, kept in the neighbourhood of the hole by a bar attached to the cap. M is a heavy piston fitting closely, but moving easily in, the cylinder F. N is a valve-chamber attached to the cylinder and having a pipe P leading from some source of air pressure. The ends of the valve-chamber N communicate by pipes Q and R with opposite ends of the cylinder. The valve-chamber N is provided with a small ball S.



Pegler's Gas-Tap Actuator.

In action, supposing the parts are in the position shown in fig. 1, and that a pressure of air is created in the valve-chamber N by means (say) of an air-bulb blowing through the pipe P, the air can only pass through the pipe R, since the ball S closes the other pipe Q. Consequently, the air passing down the pipe at R comes below the piston M; and as the ball H at this end is over the hole in the cap, the air forces the piston to the opposite end of the cylinder, causing it to overbalance and turn the tap, allowing the gas to light by means of a pilot flame. When it is required to turn off the gas, it is simply necessary to again squeeze the air-bulb, when the operation will be reversed, as the ball S will have fallen over to the other end of the valve-chamber N, and closed the passage R; and the air will thus be compelled to pass through the pipe Q and actuate the piston M in the opposite direction. In each case the motion of the piston is not impeded by the air in front of it, as the ball H at the forward end drops on to the cross bar.

Kindling Devices for Burners.

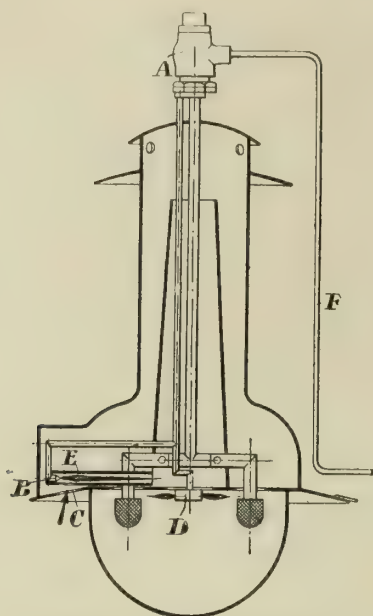
NEUE KRAMERLICHT G.M.B.H., of Charlottenburg, Germany.

No. 13,787; June 11, 1909. Date claimed under International Convention, June 15, 1908.

This invention essentially consists in the provision of a tube adapted to conduct an elongated pilot flame from one end to the interior of the casing, and which flame, on issuing from the other end of the tube, ignites the unburnt gases and causes the mantle to be lighted. In view of the manner in which the kindling flame is conducted, the collection of a quantity of gas in the lamp interior is prevented; the gas escaping through the burner being at once carried off by the chimney, so that "it is impossible for an explosive mixture to form."

The gas enters at the top of the lamp (p. 382), and is distributed to the down pipes by a multiple-way cock A; one of the down pipes conducting the gas to the inverted burners and mantles, while the other pipe leads to the kindling flame burners B. The latter burners are accessible through an opening C; while a number of burners D, arranged in the middle of the lamp, transmit the ignition to the main burners. The burner B is either arranged in proximity to the wall of the lamp casing or else in a projecting portion of the casing; so that the lighter can conveniently be brought into contact with it through an opening in the casing. Preferably the gas current issuing from this burner is given a horizontal direction towards the interior of the lamp; and in order that the gusts of air shall not be able to deflect it from the desired direction, a pipe E is fitted to the burner, and beneath the mouth of the burner presents an opening for the kindling of the gas, while its other end opens into the lamp chimney. An arm F extends downwards from the cock A, so that it can readily be turned around the lamp by means of the lighter, and thus open or close the cock.

Preferably the passages in the cock are so constructed that when the arm F has been rotated a certain distance the gas is supplied to the



A German Lamp with Kindling Device.

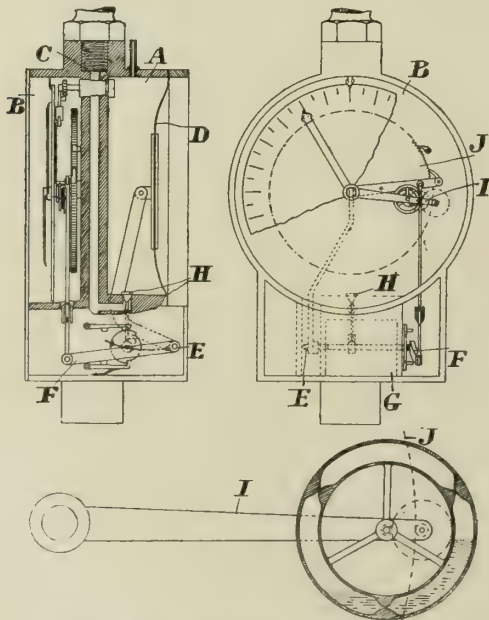
kindling pipe, and through branches of this latter to the burners B D, whereupon the lighter is inserted in the lamp through the opening C, and the gas kindled. If the arm is further rotated in the same direction, the gas is also admitted to the main inlet pipe. The gas which then issues from the burners at once becomes kindled at the flames D and the incandescent mantles. If the arm is rotated into its end position, the supply of gas is cut off from the main supply pipe, so that all the kindling flames are extinguished and only the mantled burners are supplied. If, however, the arm is rotated in the opposite direction in the first place, the gas is again admitted to the main pipe, and the gas issuing from the kindling burners becomes kindled at the illuminating burners.

Self-Acting Gas-Lamp Igniter and Extinguisher.

GERDES, A. F., of Berlin.

No. 19,258; Aug. 21, 1909.

This is an apparatus "for the automatic ignition and extinction of gas-lamps at certain times of day determined automatically by the apparatus itself; the gas which feeds the permanent jet flame acting as in a gas-meter on a distensible device (for instance, a diaphragm) in consequence of the rythmical movements of the same, and driving the regulating mechanism of the valve or cock controlling the luminous flame." By the movements of the diaphragm, the valve-controlling admission to the diaphragm chamber is suddenly opened and closed; and the movements communicated to the regulating mechanism are timed by the stroke being limited in its action by a regulator.



Gerdes' Lamp Lighter and Extinguisher.

The casing is divided (as shown) into two chambers A B by a wall which contains a passage C leading to the burner. In front of the chamber A the diaphragm D is interchangeably mounted, and the swinging plate connected with the diaphragm is connected with the shaft E. On this shaft (away from the flow of the gas) are fastened a spring and weighted lever F, which transmits the movements of the diaphragm to the timing mechanism; so that both must follow the movements of the plate on D. In this manner, the spring, through its connection with a switch held fast by one of two pawls, is kept in tension until the lever F releases the pawl which is holding the switch, and the latter is thrown round by the tension of the spring, so that the

other pawl engages with the tooth on the switch which then lies next to it.

The gas enters the ante-chamber G and flows uninterruptedly to the cock; and as the valve H, on account of the weighted lever F, must be open, the gas can also enter behind the diaphragm D, thus moving it and the diaphragm plate out. The rythmical movements then succeed each other without interruption, so that the lever with a regulator I rolls on the toothed wheel J through a certain distance, and is raised again through a certain distance without the regulator stopping, because the weighted lever F turns the toothed wheel J only as far as the regulator has rolled on the periphery of the toothed wheel, so that, in spite of being driven non-uniformly, the motion of the mechanism is timed sufficiently accurately.

The inlet to the diaphragm chamber is much larger than the outlet to the permanent flame; so that, by means of the gas pressure, the toothed wheel is driven suddenly and powerfully, while the movement of the regulator is such that, on descending, it lags behind, and is independent of the lever F, which, because of the slow rate of flow of the gas to the jet flame, sinks slowly. Thus great differences in pressure in the main line have no influence on exact ignition and extinction at the times set.

The regulator (shown separate) is a fluid regulator; the fluid—quick-silver or glycerine—being contained in its hollow circular rim, which is provided with three restrictions for retarding the flow of the liquid during the rotation of the regulator. The weight of the liquid tends to rotate the regulator through the latter being geared through toothed wheels with the wheel J, and the restrictions cause this rotation to be retarded to the desired extent.

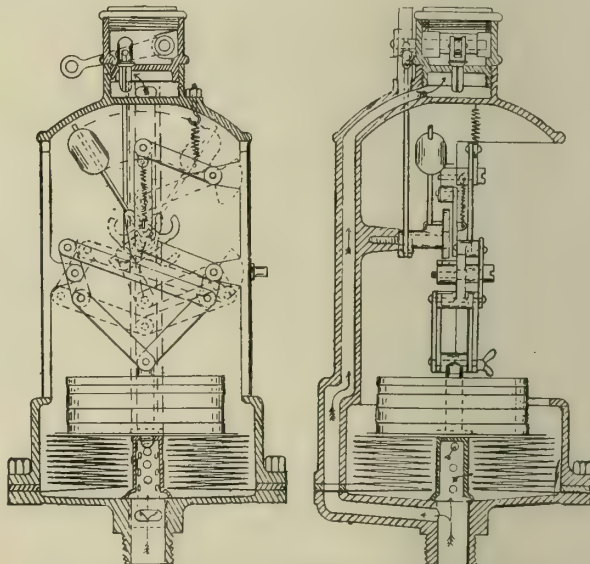
Lighting and Extinguishing Gas.

INGREY, C., of Holborn Viaduct, E.C., and BARTLETT, J., of Camberwell, S.E.

No. 19,206; Aug. 20, 1909.

The object of this invention is to provide means whereby street lamps can be simultaneously ignited or extinguished under control from the gas-works or district station, by transmitting a slightly increased pressure of gas through the mains to the lamps.

In carrying out the invention, the patentees connect directly on to the admission pipe a casing or chamber in which a piston works, or, preferably, a diaphragm, which may be weighted down to a load in excess of the ordinary working pressure, so that the piston or diaphragm will not rise until an increased pressure acts upon its surface.



Ingrey and Bartlett's Lamp Lighter and Extinguisher.

The arrangement shown is such that the pressure will act only upon one side of the piston or diaphragm; the other side being open to the atmosphere. The chamber is connected by a pipe or channel to a valve box above the piston or diaphragm, which latter is caused to operate a rocking bar or tumbler and so give motion to a fall-over lever, in such a manner that when the lever falls in one direction it will cause a valve to be opened and in the other direction to close it. The rocking bar or tumbler is pivoted with an inclined or wedge-shaped projection, on one or the other side of which a roller or pin can travel when the piston or diaphragm takes an upward movement. The roller or pin is carried by a lever or arm pivoted to a standard or spindle capable of rising or falling with the piston or diaphragm. When, therefore, the latter is caused to rise by the excess of pressure, it will, in one case, operate the rocking bar or tumbler and open the valve; when the excess of pressure decreases, the piston or diaphragm will descend to its normal position and remain so until the pressure is again increased, when it will again rise, and in this case reverse the action of the rocking bar or tumbler, and so close the valve.

In order to regulate the apparatus, so as to deal with any predetermined pressure of gas, the piston is so arranged that it is capable of receiving upon its upper side a number of metal discs or weights marked to denote the pressure they represent; and for the purpose of obtaining a finer adjustment, there is a hinged lever carrying a weight which can be moved farther from, or nearer to, its pivot, and so apply more or less weight to the piston or diaphragm.

Reduction in Price at Wallingford.—From June 25 next, the price of gas at Wallingford will be reduced from 3s. 9d. to 3s. 6d. per 1000 cubic feet.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress had been made with Bills at the rising of the House for the spring recess :—

Bills brought from the Commons, read the first time, and referred to the Examiners: Glasgow Gas Consolidation Bill, Worksoy Urban District Council Bill.

Bills read a second time and committed: Little Hulton Urban District Council Bill, Mallow Urban District Gas Bill, Pontypridd Water Bill.

Bills reported: Aberdeen Corporation Water Bill [preamble not proved], Great Grimsby Gas Bill, Havant Gas Bill.

Bill Royal Assented: Wicklow Gas Bill.

The Gas Orders Confirmation Bills No. 1 (relating to Brownhills and District, Bultth Wells, Chertsey, Cranleigh, and Llanidloes), No. 2 (relating to Burnham in Somersetshire, Dinnington and District, Dunblane, Higbbridge, and Pinner), and No. 3 (relating to Ripley, Rowley Regis and Blackheath, Sheffield, and Swansea), and the Water Orders Confirmation Bill (relating to Barnstaple, Chelsham and Woldingham, East Kent district, and South Kent), were presented on the 28th ult., read the first time, and referred to the Examiners.

HOUSE OF COMMONS.

The following further progress had been made with Bills at the rising of the House for the spring recess :—

Lords Bill read a second time and committed: South Lincolnshire Water Bill.

Bills reported, with amendments: Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill [Lords], Bristol Gas Bill, Gowerton Gas Bill [Lords], Pontypridd and Rhondda Joint Water Board Bill, Rhondda Urban District Council Bill.

Bills read the third time and passed: Glasgow Gas Consolidation Bill, Worksoy Urban District Council Bill.

LEGAL INTELLIGENCE.

CONNECTION OF GAS-MAINS TO PUBLIC LAMPS.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Wednesday, May 4.

(Before Mr. Justice PHILLIMORE.)

Liverpool United Gaslight Company v. Corporation of Liverpool.

The hearing of this action, which was commenced on the 20th ult. (see ante, p. 251), was resumed to-day.

Mr. DANCKWERTS, who appeared for the defendants, reminded his Lordship that the point in dispute was whether there was an agreed price to cover the cost of lamps in certain passages in Liverpool, which really appeared to be a question of fact; and the Corporation took the view that the agreement did cover the lamps. He would suggest that the proper course was to refer the matter back to the Arbitrator.

Mr. MACMORRAN, representing the plaintiffs, said there was an agreement in existence with regard to street-lamps; and when it was sought to apply it to lamps in passages, it was repudiated altogether. So that from the very earliest stage it was impossible to say that there had been an agreement with regard to these lamps—assuming they were public lamps.

Justice PHILLIMORE said he thought the lamps were public lamps, and that the plaintiffs were bound to light them. But the terms on which they should do so were a matter for agreement under section 41 of the Act of 1848. It might be referred to the Arbitrator to find whether or not there was any agreement.

Mr. MACMORRAN thought it an extraordinary thing if gas companies were liable to light public lamps in private passages when they had no statutory power to lay the pipes. The real question here was as to whose duty it was to lay the pipe from the main to the lamps in question. His submission was that the matter was regulated by section 41 of the Act of 1848, and that section 24 of the Gas-Works Clauses Act, 1871, had no application, as it was not the controlling section.

Justice PHILLIMORE said section 41 was the controlling section. The Gas Company were bound to light the passages and to make their own terms—subject to this, that if they could not agree, the matter must go to arbitration. The point was not raised by the special case for the Court to decide.

Mr. DANCKWERTS agreed that it was not, and said his Lordship could only decide it as an arbitrator. He suggested that his Lordship should declare: (1) That the lamps were public lamps; (2) that there was a statutory duty on the part of the Company to lay the pipes up to the lamps; and (3) that the parties who were to pay for the work must depend upon the agreement.

Mr. MACMORRAN: Agreement, if any.

Mr. DANCKWERTS said he was prepared to go a step further, and say that, if there was no agreement between the parties as to these particular lamps, the Arbitrator should decide what was to be the price to be paid for the gas, inclusive of the charge for laying the pipe.

Mr. MACMORRAN said the parties were before the Court on the assumption that there had been no agreement with respect to lamps in passages.

Justice PHILLIMORE: If you have done the work under contract, there must be some implied promise to pay.

Mr. MACMORRAN: If there is an implied promise, I do not mind.

Mr. DANCKWERTS: The price must be fixed with reference to the duty of the Company to lay pipes up to the lamps and to supply gas.

Justice PHILLIMORE: I think the Company have a statutory duty to do the work, but not at their own expense. The question as to who is to bear the cost of the work done is a matter of agreement; and it will be referred back to the Arbitrator to decide that point.

After further discussion,

Justice PHILLIMORE made the following declaration: "That the Gas Company were under a statutory duty to do the work in all cases in which the lamps in connection with which the work was done were public lamps; that the lamps in the unadopted passages were public lamps; that the Company were not, by reason of the section, under a statutory duty to do the work at their own expense. As to whether the work should be done at the expense of the Company or of the Corporation, his Lordship declared that this point, like the question of the price to be charged for the gas, was a matter of agreement between the parties; and if they could not come to an agreement, the matter was to be determined by arbitration, in accordance with the provisions of the Act. He referred the case back to the Arbitrator, to find out whether there was any such agreement; and in the event of his finding that there was none, either express or implied, he directed him to report specially. He gave liberty to apply; and the costs were reserved.

A Gas Company Fined.

At the Tottenham Police Court last Thursday, the Tottenham and Edmonton Gas Company were summoned by Mr. R. A. Robinson, Chief Inspector of the Middlesex County Council, under the Weights and Measures Act, for having in their possession for use in trade six unjust weights, and also two weights that were unstamped. An inspector stated that on March 9 he examined the weighing machines and appliances at the Gas Company's premises, and found five 56 lb. weights which were from 3 to 6 oz. light, and one 28 lb. weight which was between 1 and 2 oz. light. Two of the weights were also unstamped. Some of the weighing machines were unstamped and unjust. Mr. Phillips (for the Company) admitted that there were technical offences; but he said that the weights were used for weighing 2 cwt. bags of sulphate of ammonia, which were afterwards checked on a weighbridge. No complaints had ever been received by the Company of shortages. The action of sulphate upon iron caused the weights to depreciate. The Bench imposed a fine of 10s. and costs on each summons.

Gasholder Inlet and Outlet Pipes.

An Engineer writes: I note on p. 315 in the number of the "JOURNAL" for the 3rd inst. two French proposals in regard to inlet and outlet pipes for gasholders. In my opinion, one fatal objection to the rectangular pipe in the first patent referred to is that it is very liable to get stopped up with naphthalene. It is a sufficient difficulty with the ordinary smooth-bore round pipes; but to have a narrow flat pipe of wrought iron with sharp angles about it would further considerably the deposit of naphthalene. The more sharp corners and angles are avoided the better. Again, such a narrow pipe would be extremely difficult to clean out. In large gasholders, the inlet and outlet pipes are generally made large enough for a man to get inside; but this could not be done with the French flat pipe. As to the other patent, it is a striking example of theory untempered by practice.

Winsford's Successful Gas Undertaking.

At a meeting of the Winsford (Cheshire) Urban District Council last Tuesday, Mr. F. Sidwell, the Gas Engineer, gave some particulars as to the excellent progress made by the gas undertaking. The total receipts for the year ending March 31 amounted to £5941. The quantity of gas made was 28,950,000 cubic feet, as against 28,979,800 cubic feet the previous year. The gas sold to consumers was 25,464,642 cubic feet, an increase of 657,212 cubic feet, or 2.6 per cent. The gas unaccounted for equalled 8.28 per cent., or 2,397,638 cubic feet; being 2.36 per cent. less than the previous year. The quantity of cannel carbonized was 272 tons, and of coal 2303 tons. The gas made per ton of coal carbonized was 11,237 cubic feet. The average make for the last four years was 11,282 cubic feet per ton. The quantity of lime used for purification and retorts was 55 tons 12 cwt.; being a decrease of 106 tons as compared with the previous year. The actual saving in five months, during which time the new scrubbers, purifiers, and condensers were at work, was £98. Mr. Sidwell estimated that the annual saving by the new plant would be £116, which would more than cover the interest and principal required to repay the loan on it.

Gas Prices and Profits at Nottingham.—Nottingham having been faced with the prospect of a 2d. increase in the rates, the Gas Committee held a special meeting, and decided that they will pay over out of their profits £4000 more than they had first agreed upon and the Finance Committee had accepted. They have also determined to reduce the price of gas to private consumers by 2d. (from 2s. 6d. to 2s. 4d.) per 1000 cubic feet. In consequence of this additional contribution—£35,000, instead of £31,000—only an increase of 1d. in the rates will be necessary.

Winding-Up of the South Luton Gas Company.—An extraordinary general meeting of the South Luton District Gas Company was held last Tuesday, to consider the following resolution: "That Mr. Augustus Edwards, chartered accountant, of Capel House, New Broad Street, London, E.C., be and is hereby appointed Liquidator for the purpose of winding-up the Company." Only three gentlemen were in attendance; and the proceedings were very brief. Mr. Knapton (who presided) formally moved, and Mr. Bryan seconded, the resolution; and it was declared carried.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of the Association was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. R. W. Wilson) read the notice convening the meeting, and the following report of the Directors:

The Directors have pleasure in reporting on the results of the Association's operations during the half year ended Dec. 31, 1909.

The profit of the half year, together with the sum of £33,445 brought forward from the account of the previous half year, amounted to £247,298, as compared with £266,248 for the corresponding period of 1908. Although the profit of the half year is less by £18,950 than that of the corresponding period of 1908, this decrease is more apparent than real and is capable of a simple explanation. The accounts of the second half year of 1908 included the profit derived from the Association's Frankfort establishment, which, as the proprietors are aware, was last year incorporated with the Frankfort Gas Company. That Company's accounts are made up annually from April 1; and the dividend will only be declared during the current year. Consequently, comparison with the second half year of 1908 suffers by the exclusion of the yield from the Frankfort business.

Allowing for the exclusion of Frankfort from our comparisons, the results of the half year clearly indicate that the Association's business continues to develop satisfactorily. The output of gas by the Association during the half year in the various towns supplied directly by the Association amounted to 5797 million cubic feet, and showed an increase at the average rate of 5 per cent., notwithstanding an exceptionally mild and bright winter. The number of consumers on the books of the Association on Dec. 31 last was 412,789, and indicated an increase at the rate of 10 per cent. per annum. The number of meters in use at the close of the half year was: 365,537 ordinary meters, and 123,603 prepayment meters, indicating increases at the rate of 5.8 per cent. and 13.2 per cent. respectively. The total quantity of gas sold through prepayment meters represents about 11 per cent. of the total sale of gas by meter.

Sixty miles of new mains were laid during the half year under review; making the total length of mains on Dec. 31 last 2229 miles.

One of the effects of the unusual mildness of the winter was to render the disposal of coke difficult, except at considerable reductions in price; and notwithstanding a decrease of 10d. a ton in the average gross cost of coal, the net cost of coal worked out at 6s. 11.58d. per ton, or a fraction of a penny higher than in the corresponding half year of 1908. Changes in the revenue derived from tar and ammonia were unimportant; the effect of slightly lower average prices being counterbalanced by increases in the quantities produced.

The plant and mains at the stations have been, as usual, maintained in efficient condition.

Further progress was made with the erection, at the Aix-la-Chapelle station, of the new retort-house with vertical retorts.

At Antwerp, the new works at Hoboken were completed, and put in action on Oct. 12, 1909.

At Berlin, a site in the suburb of Schmargendorf was acquired for the purpose of a governor station. The steel tank for the 5½ million cubic feet gasholder at Schöneberg was completed, and progress was made with the erection of the holder itself. The erection of four purifiers on the Mariendorf works was completed. At the same works, fourteen furnaces of vertical retorts, in the house of which the completion was announced in the preceding report, were completed, and brought into action.

A contract was concluded with the Commune of Gross Lichterfelde, a suburb of Berlin, by which the Association's monopoly of the supply of gas was extended from 1939 to 1959. The Association's monopoly for the supply of gas to the Commune of Teltow—another suburb of Berlin—was prolonged from 1946 to 1956.

At Brussels, the new house of vertical retorts at the Forest works was completed, and brought into use. Good progress was made with the construction, at Drogenbosch, of the electricity station referred to in the report for the second half year of 1908. Contracts were concluded with the suburban communes of Cortenberg and Nossegem for the exclusive right to supply gas and electricity until the year 1948.

At Flushing, the retort-house, to contain twelve regenerator settings of eight retorts each, was completed, and progress was made with the construction of the benches. The erection of the new building to contain offices and show-room was completed.

At Corbeil—one of the towns supplied by the Cie. Continentale du Gaz—a monopoly for the supply of gas in the suburban commune of St. Germain lez Corbeil until 1941 was secured; and at Thizy—another of the towns supplied by this Company—the monopoly was extended from 1922 to 1948.

In conclusion, the Directors desire to draw the attention of the proprietors to the accounts for the half year ended Dec. 31 last, and to the balance-sheet, copy of which was appended to the circular calling the meeting. These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 4 per cent. for the half year ended Dec. 31, 1909, payable, free of income-tax, on and after Tuesday, the 10th of May next.

The Directors who go out of office by rotation are: Sir Charles James Jessel, Bart., John Henry Birchenough, Esq., C.M.G., and Corbet Woodall, Esq. These gentlemen are eligible for re-election, and offer themselves accordingly. The Auditor who goes out of office by rotation is Theodore Bromhead Bassett, Esq., J.P., who is eligible for re-election, and offers himself accordingly.

Scheme for the Division of the Profits of the Half Year ended Dec. 31, 1909.

| | | | |
|---|----------|----|----|
| DR. Balance brought forward from last half year . . . | £33,444 | 12 | 9 |
| Profit resulting from the workings at the stations, and dividends on investments, less interest on debenture stock, and the charges on account of depreciation and income-tax | 213,853 | 9 | 1 |
| | £247,298 | 1 | 10 |
| CR. Dividend of 4 per cent. for the half year . . . | £197,600 | 0 | 0 |
| Credit to pension reserve | 40,000 | 0 | 0 |
| Balance carried forward to next half year . . . | 9,698 | 1 | 10 |
| | £247,298 | 1 | 10 |

THE RATE OF GAS INCREASE AND OF CONSUMERS.

The CHAIRMAN, in moving the adoption of the report, said, on many occasions, he came to the proprietors' meeting charged, he might say, almost full with very important information and facts to be given to the proprietors with regard to the half year then under review. But there were occasions—the present was one—when he had really very little important information and what he should have to relate on this occasion was merely dry business detail representing the progress of the work of the Company during the half year. According to the report the business had not shown the same percentage of increase as in previous half years. This could be readily accounted for by the extraordinarily fine and mild weather which was experienced all through Germany, and he believed nearly all over the Continent, during the six months ending December last. He himself was in Berlin during October; and he did not remember, in all his numerous visits to that city, such a brilliant and delightfully warm period as existed last autumn. Of course, this naturally affected the Association in two ways. It reduced the average of their increase in the sale of gas; and it also necessarily had its effect upon the sale of coke, which he would touch upon later. With regard to the volume of business done, the proprietors might have been led to think that the Association had had to submit to a decrease; but, instead of that, it was only the average increase that had not been so great as usual—i.e., 5 per cent., as mentioned in the report. To give a concrete example, he might mention the results which had been obtained in Berlin in the immediate past. In the period extending over ten years to December, 1908, the rate of increase in the output of gas was never less than 7 per cent. But the average for the ten years had been nearly 9 per cent.; while on this occasion they were only able to report an increase there of 5½ per cent. At the same time, they were thoroughly satisfied with the progress of their work, because they did not find that the increase in the number of consumers registered in their books tended in any way to decrease. In fact, they had had a considerable increase in the number of consumers. The highest rate of increase was shown by Brussels, where it was 12½ per cent. At Berlin, the number of consumers increased by about 11 per cent.; at Hanover, by 10 per cent.; while both Aix-la-Chapelle and Antwerp showed an increase of slightly over 9 per cent. So far, he thought the proprietors would agree, this was a thoroughly satisfactory record, notwithstanding the bright and warm weather they had experienced.

EXTENSIONS OF PLANT—THE NEW WORKS AT ANTWERP.

With regard to the works, their engineers, who were on the spot, and able to judge well what the future was likely to bring forth, had been very insistent in their demands for further producing and storage plant. The result was the Directors had given out orders for a large gasholder of 5½ million cubic feet capacity to be erected in Berlin; and a smaller one to be built at their works at Weissensee—a suburb of Berlin. They also hoped to put up a large gasholder at Brussels in the course of next year. They had, during the year under consideration, opened the new works at Antwerp; and though he had given the proprietors in past half years full information as to the progress of these works, he thought on this occasion he might supply a little sketch of exactly what might be seen at Hoboken. The works covered an area of about 70 acres, with a long frontage to the River Scheldt. The capacity of the first section of the producing plant was equal to 2½ million cubic feet per diem; and each of the gasholders could store one whole day's make. A considerable economy was effected by erecting two gasholders at once; and the general increase of the business at Antwerp would no doubt soon necessitate the erection of the second section of the producing plant. He might add that this station was unique among their many stations, in that the whole of the power required was supplied by an electric generating station which the Association had to acquire when purchasing the site. Steamers were able to come alongside the wharves direct from England, and discharge straight into the works, where they had the most modern and economical patterns of coal conveying and handling plant.

COAL AND COKE.

He mentioned earlier in his address that they had had a very bad time with regard to the sale of coke. He remembered that a year ago he gave the proprietors the interesting information that they had made coal contracts for a year at considerably reduced prices; and he then hoped that the reduced price would put extra profits in the coffers of the Association. So far from this being the case, the great reduction in the price of coke had wiped out the whole of the extra profits they had hoped to receive. To give an instance of how the price of coke had fallen: at Berlin, it dropped no less than 3s. 3d. per 1000 kilos, as compared with 1908; and they still had a large stock there to get rid of—in fact, there were heavy stocks of coke in every important town on the Continent. But he was not particularly distressed with regard to this, because, in his long experience as a Director of the Association, extending now over 35 years, he had seen at the various stations mountains of coke which had afterwards, when the weather allowed, been disposed of profitably. Respecting the coal contracts for the coming year, they had made them at an increase of 8d. per ton over last year. They could not do better than that—in fact, he thought they had done rather better than some other companies.

MATTERS OF DOMESTIC INTEREST—LONG SERVICE.

There were one or two matters of domestic interest to which he wished to refer. During the half year under review, another member of their staff had been added to those who had completed fifty years of continuous service in the Association. That was Mr. Phillips, who was the Chief Accountant at the home office. He retired on a well-earned pension, after this long period of service. It was rather curious to note that they had now six names on the jubilee roll (if he might so call it)—three of them belonging to the engineering staff, and three to the accountants or clerical staff. So that the technical and the clerical staff shared the honours so far; but next year they hoped to have to record another jubilee honour. Mr. Salomons, their distinguished Engineer at Brussels (whom he was glad to see present in such an excellent state of health), would then complete his fifty years of service with the Association. Regarding the workmen, they had had no difficulties with them. Every now and then there had been small clouds on the horizon, which

had quickly passed away. There was really no reason why their workmen should be dissatisfied, because the Association treated them extraordinarily well, and the Directors were always ready to meet any little demand that appeared to them fair and reasonable. He mentioned, at the meeting a year ago, that many laws were under consideration on the Continent—especially in Germany and Austria—which made it absolutely imperative on employers to insure not only their workmen, but also their clerical staffs. In Austria, this law had come into force; and therefore they had had to pay larger sums for the insurance of their salaried staff there. Most drastic laws had also been passed in France and Belgium in connection with accidents to workmen—no matter whether the accidents were fairly attributable to the negligence or fault of the workmen, the employer had to pay. That was one of those things they had to provide for in the future by allocating sums to the pension fund.

INUNDATIONS IN FRANCE.

Then there was one other thing he should like to mention. He had on a previous occasion spoken about the inundations in Germany, the difficulties caused by which had been splendidly overcome by the Engineers of the works threatened by the water. But in the case of the Compagnie Continentale, M. Delebecque (who was the General Manager in France) had had to report, in connection with the inundations in that country, that at Morez the principal gas-main going over the river was destroyed by the bridge being washed away by the floods. In Corbeil—almost a suburb of Paris—the supply was entirely discontinued for no less than seventeen days. It cost a great deal to put that right. At Meaux the sale of gas was also restricted by reason of the floods. At their own offices in Paris, they were without light or heat; and the cellars were inundated, so that a Board meeting which it was intended to hold in Paris had to be postponed.

THE BALANCE-SHEET.

Coming to the balance-sheet, they were in what might be called a period of partial transition, both in regard to technical and financial matters. At the last meeting, he gave the proprietors the very fullest information with regard to the merging of the Company's business at Frankfort into that of the Frankfort Gas Company; and it was the habit of foreign industrial companies not to pay interim dividends, but to wait until a full year had elapsed, and pay only one dividend in the course of a year. The result was that this half year they had not received a penny-piece from the substantial holding—amounting to £378,000—that they had in the Frankfort Gas Company. He believed the Directors were holding a meeting very shortly, when they would decide the dividend to be paid. This was the principal reason why the balance-sheet on the present occasion showed a reduction in the amount of the profits earned by the Association. This would naturally be adjusted six months hence. Therefore he did not think any shareholder (to all of whom a report of these proceedings would be sent) need be at all unhappy with regard to the balance-sheet.

The DEPUTY-CHAIRMAN (Mr. Arthur Lucas) seconded the motion.

Mr. S. H. HARRIS asked whether the Chairman would give the proprietors some idea of the nature of the investments—whether they were mostly kindred to their own, or outside investments.

Sir JOHN RUNTZ said the proprietors had listened very attentively to the Chairman's clear and explicit statement of the Company's working during the past half year. They could not always expect the Association's business to make progress at the highest rate they had attained; and he thought the Chairman and his colleagues must welcome a quiet time occasionally. Comparing the figures of the past half year with those for the corresponding one, considerable variations in certain of the totals were noticed. The Chairman had given them some reason for these variations; the chief being in consequence of the changed circumstances at Frankfort, which was explained fully at the previous meeting. Some of the figures, however, to December last were very different from those in the corresponding account. He noticed the item of stocks was £606,086, or a reduction of £48,000. The item of loan on security of bills was £13,000; in the previous December, it was £306,526, which was indeed a large reduction. Then freehold property in London and abroad (£236,277) had increased by £54,000. Investments in English, Colonial, and Indian securities (£416,740) had increased by £149,000. Investments and loans abroad (£2,079,767) had advanced by £523,000. These were large figures; and he took it the considerable investments and variations in totals were in great measure due to the change at Frankfort. The proprietors would like some information as to the reason for the increase of £523,000 in the investments and loans abroad. They knew it was all right; but such large figures meant interesting details. The increase in the English securities (£149,000) was also a considerable difference. He ventured to hope the Directors had not put much in Consols, because they knew what a variable quantity that was with regard to price. It was suggested on a former occasion that the Directors should invest considerably in Colonial stocks in order to avoid the violent fluctuations in Consols. The Association was a concern of great promise. The Chairman had referred to the longevity of some of their employees; and that he himself had served on the Board for 35 years. And looking round the room, he (Sir John) saw the faces of proprietors who had been there for very many years; and so it seemed the Imperial Continental Gas Association was a centre of longevity. He sincerely hoped the Chairman would add many more years' service to the 35 years already recorded; and continue to give them the clear business statements to which they had become accustomed half year by half year.

The CHAIRMAN said it seemed to him that the two proprietors who had asked for information had put their fingers on the same item—that was the investments and loans abroad, £2,079,767. He had explained from time to time how this amount had gradually grown. It had been the result of the policy the Company had been obliged to adopt of converting some of the principal stations into foreign companies. It was, as the proprietors must be aware, increasingly difficult for an English Company under an English name to work abroad. They must move with the times. They must convert their businesses into foreign companies in the countries in which they were situated, and very often give the foreigner an interest in the business to enable the work to be carried on. As a result, investments and loans

abroad had increased by over £500,000—owing to the transfer from the Imperial Continental Gas Association of their Frankfort undertaking to the Frankfort Gas Company, in which they were the predominant partner. They held 58 per cent. of the whole of the capital of the Company; and therefore they had the predominant right of saying how the business should be worked. And so long as it was in the hands of the gentlemen who had been elected on the Board, of the Chairman (Mr. Delbrück), and of the Managers (in whom they had every confidence), he did not think any great risk had been run in putting the amount to investments and loans abroad. There were other companies in which they had from time to time acquired large interests for the purpose of control, and for such a purpose as not allowing them to interfere or encroach on the Association's business, and so on. All this was included in investments and loans abroad; and conducted to the good of the Association. He had a list of these investments. The principal ones were the Wazemmes Gas Company at Lille, the Compagnie Continentale, the Central (Hungarian) Company (of which he gave full particulars on the last occasion), the Oberspree Gas Company (which was really part of their business in Berlin), the Lille Electric Light Company, and many others. This, he thought, satisfactorily answered the inquiry as to the £2,079,767. Sir John Runtz had made some remarks upon investments in Consols and Colonial securities. The only Consols the Association held were those put into the reserve fund a few years after he (the Chairman) became a Director; and the amount was mentioned in a foot-note to the balance-sheet. It said: "In addition to the above, the Association possesses £400,000 2½ per cent. Consolidated Stock as a reserve fund." Other investments were in Colonial and Indian securities, a few gas companies' shares, and so on. These the Directors considered good and satisfactory holdings, and he believed they would, if sold, secure something more than the amounts appearing in the balance-sheet.

The motion was unanimously carried.

The CHAIRMAN moved the declaration of a dividend of 4 per cent. on the £4,940,000 capital stock, for the half year, free of income-tax.

Sir CHARLES J. JESSEL, Bart., in seconding, said, as he knew the Chairman would like to be quit of any inaccuracy, he might say that, besides the amount of Consols comprised in the reserve fund, they had a sum of £80,000 of stock, which was the residue of the £100,000 stock in which they invested on the realization of the Amsterdam assets many years ago. This £80,000 was now valued at 82; and therefore stood in their books at £65,600.

The motion was adopted.

The CHAIRMAN thanked Sir Charles Jessel for his correction; and he then moved his re-election as a Director.

The DEPUTY-CHAIRMAN seconded the motion, which was agreed to.

Proposed by the CHAIRMAN, and seconded respectively by Sir E. CHANDOS LEIGH and Mr. ROBERT TINDALL, Mr. J. H. Birchenough, C.M.G., and Mr. Corbet Woodall were also re-elected to their seats at the Board.

The retiring Auditor (Mr. T. Bromhead Bassett, J.P.) was re-appointed, on the proposition of Mr. DENDY MARSHALL, seconded by Sir JOHN RUNTZ.

On the motion of the CHAIRMAN, seconded by Colonel MITCHELL, a hearty vote of thanks was passed to the officers and staffs at home and abroad—their excellent services being duly commented upon by the Chairman.

Mr. WILSON having responded on behalf of himself and his colleagues, The Chairman and Directors were also thanked for their services, on the motion of Sir JOHN RUNTZ, seconded by Mr. J. GURNEY FOX.

This concluded the proceedings.

SOUTHAMPTON GASLIGHT COMPANY.

The Half-Yearly Meeting of the Company was held at the Offices, Ogle Road, Southampton, last Wednesday—Captain A. J. CORSE SCOTT, J.P., presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said the latter for the past half year showed that the Company were still progressing, and the maximum dividends could again be paid. Notwithstanding the mildness of the weather, compared with the corresponding period of the previous year, more gas had been sold. In October last, the Directors decided to let out on hire a large variety of gas-fires. These were greatly appreciated by consumers; upwards of 788 being hired in the last three months of the year. The cleaning and adjusting of consumers' burners by the Company's servants had also given satisfaction; and the number of consumers who availed themselves of the offer steadily increased. The Directors had now decided to fix gas-cookers free of charge to approved consumers; and they hoped this would lead to a large increase in their use. There was little doubt that a consumer having once experienced the advantages which a gas-cooker offered, would be very loth to revert to the old form of cooking by a coal-range. At the last meeting of stockholders, mention was made that the Corporation had decided to light a large number of the street-lamps by electricity instead of gas; and this notwithstanding that in other parts of the kingdom the practice was to light by gas. Recently the important district of Westminster decided to light all their streets by gas. It might be of interest to stockholders who were also ratepayers of Southampton to point out the expense to which the town was being put in carrying out the alterations. The cost to the town when a lamp was erected and supplied with gas was (apart from the lamp-column), on an average, £1 9s. 6d. per lamp. The removal of gas service and fittings cost 6s. 6d.; and the installation of electric cable and fittings, according to figures supplied to the Council by the Chairman of the Electricity Committee, averaged £2 15s. 5d. per lamp. Thus for every lamp where electric light was installed in place of gas, the town paid £4 11s. 5d. Upwards of 500 had already been so fitted at a total cost of over £2200. In addition to this, there was no saving to the town in the cost of lighting. The light of the electric lamps was supposed to be greater than that of the gas-lamps. This was a point which was open to question; and it would not be shown that the town

was receiving any monetary benefit. The Directors complained that no opportunity was given by the Corporation to the Company to show what could be done by the latest form of gas lighting, nor had any complaint been made that the lighting of the streets had not been carried out as required. If the opportunity had been offered, the Directors were prepared to show that gas could maintain its position as the best and cheapest form of artificial lighting. The outside of the Company's offices was now lighted by a system of high-pressure gas, and the important railway station at Brighton had had this system recently installed in place of electric light. In view of the continued growth of the Company's business, £10,000 of ordinary stock of the Company was offered for sale by tender at £112 per £100 of stock. The Directors anticipated that the stock would, as before, be readily subscribed for.

The motion was carried unanimously, as was also the resolution for the declaration of the maximum dividends.

Thanks were accorded to the Chairman and Directors and acknowledged by the CHAIRMAN, who proposed a vote of thanks to the Secretary, the Resident Manager, Consulting Engineer, and the staff.

Mr. J. R. H. JACOBS (the Secretary), Mr. F. DURKIN (the Deputy-Resident Manager), and Mr. JOSEPH CASH (the Consulting Engineer) returned thanks; the latter remarking that the works were in a very good condition.

WELSBACH INCANDESCENT GASLIGHT COMPANY.

Further Reduction in Profits—Proposed Scheme of Reconstruction.

In the report of the Directors of the above-named Company for the year ended the 31st of March last, to be submitted at the meeting of shareholders to-day, they state that the net profit of the whole undertaking, including the dividend for the year 1908-9 upon the Company's holding in the Austrian Company, amounts to £18,590. To this must be added £5373 brought from the previous year; making £23,963 in all. After deducting the dividend for the half year upon the 6 per cent. preference shares, which was paid on the 1st of January, there remains to be dealt with £5966. The Board recommend that this sum should be carried forward.

The Directors express regret that the continued trade depression has again prejudicially affected the Company's sales, and that the net profit for the year shows a decrease. The year under review has borne the cost of special propaganda in connection with the launching upon the market of the new electrical section of the Company's business, as to which it should be remarked that no capital expenditure has been incurred. The Board also regret that the result of the past year's trading does not allow of any further distribution to the shareholders. As regards the ordinary shares, it is impossible, in view of existing conditions, to hold out any hope of dividends. After an exhaustive review of the position and prospects of the whole undertaking, and after conference with a number of the largest holders of preference and of ordinary shares, the Board are of opinion that the time has arrived when the final reorganization of the capital of the Company should be undertaken.

The accounts of the Austrian Company for the year ended March 31, 1910, have not yet been finally audited; but it is understood that the dividend to be declared shortly (and which, when received, will be brought into next year's accounts of the Company) will be at the same rate as the previous year.

Accompanying the report is a circular dealing with the proposed reorganization of the capital. The Directors recommend that this should be written-down by a sum of £843,000 (being the aggregate of £70,000, the value of patents of which the chief have expired, and £773,000 lost or unrepresented by available assets); the new capital thus standing at a sum not exceeding £500,000. The Directors express the hope that the course of trade may render it possible to earn regular dividends on the reduced capital, and at the same time make provision for consolidating and strengthening the Company's future position. The Board propose to convert both classes of shares into common stock on the basis of 15s. for each of the 600,000 £1 preference shares, making £450,000, corresponding approximately to the estimated amount of the tangible assets; and at the rate of 1s. 4d. each for the 743,975 £1 ordinary shares, about £50,000, representing approximately the figure at which the remaining assets, such as goodwill, patents, and trade marks will stand when written-down.

Veteran Gas Official's Retirement.

At the monthly meeting of the Bolton Town Council last Wednesday, reference was made by several members to the retirement (intimated in the "JOURNAL" for the 3rd inst.) of Mr. William Walch, the Office Superintendent of the Gas Department. Mr. Webster, the Chairman of the Gas Committee, said Mr. Walch was an old and valued official of the Corporation, and well known and respected by everyone connected with the gas undertaking. He was resigning after very many years' faithful service, and was deserving of all the praise that could be showered upon him. Mr. Walch was associated with the old Bolton Gas Company for 14 years; and when the Corporation took over the works in 1872, he entered their service, and had continued without a break for 38 years—making his service with the undertaking well over the half-century. He hoped Mr. Walch would live long to enjoy in comfort and pleasure his well-earned retirement. Alderman Miles, a Past-Chairman of the Gas Committee, also paid a warm tribute to the manner in which Mr. Walch had carried out the duties of his office.

A Decreased Sale at West Bromwich.—The Gas Committee reported to the West Bromwich Town Council that the sales of gas for the financial year ending March 31 amounted to 321,506,608 cubic feet—a decrease of 7,838,780 cubic feet. The amount of gas-rental was £38,908—a decrease of £1166. Alderman Wilson, the Chairman of the Committee, drew attention to the decrease in the consumption, and said it was a very sorry state of things; but they had made certain economies at the works, and had every reason to believe that they would next year come out better than last.

BELFAST CORPORATION GAS SUPPLY.

The Proposed Auxiliary Gas-Works—Public Lighting.

At the Meeting of the Belfast County Borough Council on Monday last week, the above-named subjects were under consideration on the presentation of the minutes of the Gas Committee, which contained a recommendation that an engineering assistant should be appointed to prepare the necessary plans and estimates in connection with the proposed auxiliary gas-works, the appointment to be left with the Manager. Details were given as to the negotiations which had been in progress with the Harbour Commissioners for the acquisition of the Twin Island site for the new works.

Mr. J. A. DORAN, in moving the adoption of the minutes, said that, as Chairman of the Gas Committee, he was trying to look after the gas-works to the best of his ability, and prevent the squandering of money. The public were continually urging as a reason for not having the auxiliary works that the age of electricity was coming in; and to this he replied by saying that the age of gas was also coming in, for it was as yet only in its infancy. He felt very much obliged to Mr. Riddell for the report made with reference to a recent visit to London. In the course of his observations, he mentioned that he "inspected the electric street lighting, and was of opinion that the most brilliantly lighted streets were Regent Street and Oxford Circus; that at a recent meeting of the Westminster City Council, which was held to determine the lighting contracts for the next five years, it was decided by a very large majority to abandon electricity for street lighting purposes in this district, and to substitute gas, on the ground that the same light can be got at two-thirds of the cost." The Council should mark the words of Mr. Riddell's report—"two-thirds of the cost." This showed them what London was doing with regard to gas; and instead of appointing a deputation to go there, they should accept the figures given in the report referred to. What were they going to do now? He heard that they were going to make another experiment, and were going to introduce electric light in High Street and Donegall Place. They should ask the Chairman of the Police Committee to take the advice given them by the Westminster City Council, as conveyed to them by Mr. Riddell, and see if it were not wiser for him to stay his hand for the present.

Mr. RIDDELL said he was a friend of both Committees. A penny per unit was an impossible price to charge for electric current, because the cost to the Corporation was 1-86d. He had no objection to the difference being presented to the city; but it was well that members of the Corporation and the citizens should know what was being done.

Dr. WILLIAMSON said he was not prepared to accept Mr. Riddell's figures with regard to the cost of electricity. He held that the councillor had no right to spring the matter on the Gas Committee without first bringing it before the Police Committee. The question of lighting the city by electricity had never had fair consideration; and the conditions which existed in London and Belfast were not identical.

Mr. CURLEY mentioned, in regard to a letter written by him asking for a copy of Messrs. Hunt, Herring, McLaughlin, and Stewart's estimates for the gas-works extension at the Twin Island site, that he had received no reply. He wanted to see the papers in connection with the borings; and he moved, as an amendment—"That all reference to the gas-works extension on the Twin Island site be eliminated from the minutes."

The amendment was not seconded.

Mr. DORAN said the Committee would be happy to give Mr. Curley every document in their possession.

The TOWN CLERK (Mr. R. Meyer) read the resolution passed in March regarding the Twin Island site, and said it authorized the Gas and Law Committees to take the necessary steps to acquire the land. They were now doing so.

Mr. DONNELLY thought every member of the Corporation should have a copy of the documents referred to by Mr. Curley. He said there were people who believed that the works to be established at the Twin Island site would really be the gas-works of the city of Belfast in a very short time, and there was natural anxiety to know if the whole question was not to come up again before the Corporation.

Mr. DORAN said what they were going to do was to put up works equal to the production of 5 million cubic feet of gas per day; and they would go on extending as their requirements increased. They would not expend any more money on the old works; and eventually all the output would be from the Twin Island works. As opportunity served, they would do away entirely with the Ormeau Road site. They had 13½ acres of very valuable land there; and, no matter where they built, the ratepayers would, with economical management, not lose a shilling. The minutes were then adopted.

ROCHDALE AND ITS RATES.

Protest against Further Filching of Gas Profits.

The Rochdale Town Council adopted, at their Meeting last Thursday, the report and estimates of the Finance Committee for the current year. By further "milking" the gas and electricity profits, coupled with a cutting-down in the estimates, the borough rates are kept down to last year's level—namely, 7s. 9d. in the pound.

When the amount for the General Purposes Rate came up for consideration, Mr. Sharp protested against £9000 being taken from the gas profits in aid of the rates, and moved, as an amendment, that the sum be £8000, as decided upon by the Gas Committee. In seconding, Mr. Thomas maintained that it was bad management on the part of the Council to continually take these large sums from gas profits, when they were required to build up the reserve fund to pay for the new retort-house. The building of the retort-house had been delayed by this policy of taking so largely from profits. Mr. Ogden observed that the gas-works were extremely well administered; but the Council had, in

his opinion, managed things badly in seizing so much of the profit. He pointed out that in the last fifteen years the Gas Department had contributed over £170,000 for the relief of the rates. Mr. Blomley contended that the principle was wrong of making large profits out of the gas consumer, and applying them to reduce the rates of other people who did not use gas in their houses, mills, or workshops.

By a large majority, the amendment was defeated. Therefore the Gas Committee must contribute £9000, instead of £8000 as originally proposed.

ROTHERHAM GAS DEPARTMENT.

Referring to the business of the Gas Department, at the quarterly meeting of the Rotherham Borough Council, Alderman Gummer, the Chairman of the Gas Committee, pointed out that there had been a decrease in the sale of gas in the past year of 4,383,000 cubic feet. The explanation was partly bad trade; and the falling off was particularly owing to one or two large works, which used to run all night, having only day-shifts. On the other hand, while the gas had decreased in sale for manufacturing purposes, household consumers had taken 2,500,000 cubic feet more. This had passed through prepayment meters. Some £15,145 had been collected from automatic meters—meaning that the inspectors had carried 34 tons of copper. Leakage had increased to 9 per cent., as against 8·81 per cent. last year. The gas made per ton of coal carbonized was 12,404 cubic feet, compared with 12,345 feet—an increase of 59 cubic feet. This constituted a further record for the department. It was the highest make of gas per ton of coal of any gas department in the country where they made coal gas alone. He thought it reflected the very highest credit upon the officials, and showed the coal that had been purchased by the Committee to be of very good quality. The gross profit was £15,493; and this would help to give them some idea as to whether the gas-works were doing fairly well. It represented 10½ per cent. on the present net debt, which was £146,826; and it represented, if they took the whole of the capital that had been paid on the works, 7½ per cent. Dealing with the amount contributed in relief of the rates by the Gas Department since the Corporation had owned the gas-works, he said the total was £109,000. If the works had been carried on as a private undertaking, the shareholders would not only have had reasonable interest for the money invested, but the whole of the capital would have been paid off. If the Rotherham Corporation had done the latter, instead of relieving the rates, they would in all probability have been able to distribute gas as cheaply as any works in the country. They had robbed the gas consumer in order to keep down the rates. By taking out £6000 for the rates this year, the department would have a deficit at the bank upon which interest would have to be paid. This was not dealing fairly with the department.

The Gas Engineer (Mr. J. S. Naylor), in his report for the year, stated that the amount of gross profit made was £15,493, as against £14,768; being an increase of £725. The net profit, after allowing for interest, redemption instalments, and sinking fund, amounted to

£6136, as against £5395 last year—an increase of £741. If the gas for public lighting—£2492—was again given by the department, as in former years, there would remain an available surplus profit of £3644, as against £2981 last year.

DUKINFIELD GAS DEPARTMENT.

The Past Year's Working.

The Manager of the Dukinfield Corporation Gas Department (Mr. William Lindley) reports that the carbonizing plant again worked satisfactorily during the past financial year; but, owing to depression in trade, there was a decrease in the make of gas. The total quantity of gas accounted for was 78,834,300 cubic feet, apportioned as follows: Cottages, by ordinary meters, 39,785,800 cubic feet; do., slot-meter consumers, 10,532,100 cubic feet; mills, 21,301,238 cubic feet; public lamps, 6,132,825 cubic feet; offices, works, &c., 1,082,337 cubic feet. The total revenue for the year was £12,672 (£9809 being for gas), and the expenditure £9075 (£4797 being for coal); leaving a gross profit of £3597. Adding £34 received as cottage rents, a total of £3631 was produced. Of this sum, £3154 was required for annuities, interest, and sinking fund; leaving a net profit of £477, compared with a profit of £868 for the year 1908-9, and of £552 for 1907-8. According to a table, which has been verified by Mr. William Moss, of Ashton-under-Lyne, showing the cost of gas per 1000 cubic feet sold for the past and the preceding financial years, the total cost of production in the former was 2s. 4½d., and in the latter 2s. 6¼d.; the average prices being 2s. 5½d. and 2s. 8½d. There was consequently a gain of 1½d. in 1909-10, compared with 2½d. in the preceding year and 1½d. in 1907-8. Mr. Lindley is to be again congratulated on the results of his year's work. The quantity of coal and cannel carbonized in the twelve months was 7389 tons; and the total make of gas was 85,471,000 cubic feet. As the quantity sold was 78,834,300 cubic feet, the unaccounted-for gas was 6,636,700 cubic feet, or 7·76 per cent. The make and sale per ton of coal were 11,567 and 10,669 cubic feet respectively, compared with 11,817 and 10,937 cubic feet in the preceding year.

Leeds and Vertical Retorts.—At last week's meeting of the Leeds City Council, Mr. Brassington moved, and Mr. W. Wood seconded, to refer back a proposal to send a deputation to London to visit an installation of vertical retorts. Mr. Badley contended that at the Leeds Gas-Works machinery had been scrapped, and new appliances had been adopted to save labour; but on account of the piling-up of interest and sinking-fund charges, the expenses of the works had been actually increased. Mr. R. Armitage, M.P., said that money would be well spent if the whole of the Council were taken to see vertical retorts in operation and taught to appreciate the advantages to be derived by employing them. The amendment was defeated, and the minutes were approved.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 363.

| Issue | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest- ment. | Issue | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest- ment. |
|------------|--------|-----------------------|-------------------------------------|---------------------------|--------------------|---------------------------------|-----------------------------------|-----------|--------|-----------------------|-------------------------------------|---------------------------|--------------------|---------------------------------|-----------------------------------|
| £ | | | p.c. | | | | £ s. d. | £ | | | p.c. | | | | £ s. d. |
| 1,474,000 | Stk. | Apl. 1 | 5 | Alliance & Dublin Ord. | 82-84 | .. | 5 19 1 | 4,940,000 | Stk. | Nov. 11 | 8 | Imperial Continental | 181-183 | .. | 4 7 5 |
| 310,000 | Stk. | Jan. 13 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 1,435,000 | Stk. | Feb. 10 | 3½ | Do. 3½ p.c. Deb. Red. | 94-96 | .. | 3 12 11 |
| 200,000 | 5 | Oct. 28 | 7½ | Bombay, Ltd. | 68-68½ | .. | 5 5 8 | 195,242 | Stk. | Mar. 16 | 5 | Lea Bridge Ord. 5 p.c. | 122-124 | .. | 4 16 9 |
| 40,000 | " | " | 7 | Do. New, £4 paid. | 5-5½ | .. | 5 6 8 | 561,000 | Stk. | Feb. 25 | 10 | Liverpool United A. | 222-224 | .. | 4 9 3 |
| 50,000 | 10 | Feb. 25 | 15 | Bourne- 10 p.c. | 29-30 | .. | 5 0 0 | 718,100 | " | " | 7 | Do. B. | 163½-165½ | .. | 4 4 7 |
| 311,810 | 10 | " | 7 | mouth Gas B 7 p.c. | 162½-163 | .. | 4 3 7 | 306,083 | " | Dec. 29 | 4 | Do. Deb. Stk. | 143-145 | .. | 3 16 2 |
| 75,000 | 10 | " | 6 | and Water Pref. 6 p.c. | 15-15½ | .. | 3 17 5 | 75,000 | 5 | Nov. 26 | 6 | Malta & Mediterranean. | 48-5 | .. | 6 0 0 |
| 380,000 | Stk. | " | 12½ | Brentford Consolidated | 251-254 | .. | 4 18 5 | 560,000 | 100 | Apl. 1 | 5 | Met. of 5 p.c. Deb. | 100-102 | .. | 4 18 0 |
| 300,000 | " | " | 9½ | Do. New | 183-197 | .. | 5 0 0 | 250,000 | 100 | " | 5 | Melbourne J 4½ p.c. Deb. | 100-102 | .. | 4 8 3 |
| 50,000 | " | Aug. 12 | 5 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 8 | 541,920 | 20 | Nov. 11 | 4½ | Monte Video, Ltd. | 128-132 | .. | 5 5 8 |
| 206,250 | " | Dec. 20 | 4 | Do. 4 p.c. Deb. | 101-103 | .. | 3 17 8 | 1,775,892 | Stk. | Dec. 25 | 4½ | Newcastle & G'tesh'd Con | 104-106 | .. | 4 2 7 |
| 220,000 | Stk. | Mar. 16 | 11 | Brighton & Hove Orig. | 213-216 | .. | 5 1 0 | 329,435 | Stk. | Dec. 29 | 3½ | Do. 3½ p.c. Deb. | 91-93 | .. | 3 15 3 |
| 246,320 | " | " | 18 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 300,000 | Stk. | Feb. 25 | 7 | North Middlesex 7 p.c. | 134-138 | .. | 5 1 1 |
| 460,000 | 20 | Apl. 1 | 10 | British | 41-45 | .. | 4 14 8 | 60,000 | 5 | Apl. 1 | 8 | Oriental, Ltd. | 138-140 | .. | 5 14 |
| 109,000 | Stk. | Feb. 25 | 6 | Bromley, A 5 p.c. | 118-120 | .. | 5 0 0 | 31,800 | 53 | Feb. 25 | 13 | Ottoman, Ltd. | 6-6½ | .. | 6 8 |
| 165,700 | " | " | 4½ | Do. B 3½ p.c. | 88-90 | .. | 5 0 0 | 60,000 | 50 | " | 12 | Portsea Island A. | 134-136 | .. | 5 1 |
| 82,278 | " | " | 5½ | Do. C 5 p.c. | 105-107 | .. | 5 2 10 | 100,000 | 50 | " | 13 | Do. B. | 120-128 | .. | 5 1 7 |
| 55,000 | " | Dec. 29 | 3½ | Do. 3½ p.c. Deb. | 87-89 | .. | 3 18 8 | 114,800 | 50 | " | 12 | Do. C. | 119-121 | .. | 4 19 2 |
| 500,000 | 10 | Oct. 14 | 7 | Buenos Ayres (N.W.) Ltd. | — | .. | — | 398,490 | 5 | " | 10 | Do. D and E. | 100-102 | .. | 4 18 0 |
| 250,000 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 98-100 | .. | 4 0 0 | 796,980 | 5 | Apl. 29 | 7 | Primitiva Ord. | 74-74½ | .. | 4 10 4 |
| 100,000 | 10 | " | — | Cape Town & Dis., Ltd. | 4-5 | .. | — | 489,903 | 100 | Jan. 27 | 4 | Do. 5 p.c. Pref. | 516-518 | .. | 4 9 11 |
| 50,000 | 50 | May 3 | 6 | Do. 4½ p.c. Pref. | 6-7 | .. | — | 1,000,000 | 10 | Dec. 1 | 5 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 100,000 | Stk. | Dec. 29 | 4½ | Do. 6 p.c. 1st Mort. | 48½-49½ | .. | 6 1 3 | 312,050 | Stk. | Dec. 29 | 4 | River Plate Ord. | — | .. | — |
| 157,150 | Stk. | Feb. 25 | 5 | Do. 4½ p.c. Deb. Stk. | 96-98 | .. | 5 2 3 | 250,000 | 10 | Apl. 1 | 9 | San Paulo, Ltd. | 99-101 | .. | 3 19 3 |
| 1,513,250 | Stk. | Feb. 25 | 5½ | Chester 5 p.c. Ord. | 103-111 | .. | 4 10 1 | 62,500 | 10 | " | 6 | Do. 6 p.c. Pref. | 152-154 | .. | 5 14 3 |
| 560,000 | " | " | 5 | Commercial 4 p.c. Stk. | 106-108 | .. | 4 16 4 | 125,000 | 50 | Jan. 3 | 5 | Do. 5 p.c. Deb. | 112-114 | .. | 4 18 0 |
| 475,000 | " | Dec. 29 | 3 | Do. 3½ p.c. do. | 103-105 | .. | 4 15 3 | 135,000 | Stk. | Mch. 16 | 10 | Do. 5 p.c. Deb. | 5½-5½½ | .. | 4 17 1 |
| 800,000 | Stk. | Dec. 10 | 5 | Do. 3 p.c. Deb. Stk. | 81-83 | .. | 3 12 3 | 209,984 | " | " | 10 | Sheffield A | 232-234 | .. | 4 5 5 |
| 200,000 | " | " | 7 | Continental Union, Ltd. | 98-100 | .. | 5 0 0 | 523,500 | " | " | 10 | Do. B | 232-234 | .. | 4 5 5 |
| 492,270 | Stk. | " | 5½ | Do. 7 p.c. Pref. | 138-140 | .. | 5 0 0 | 70,000 | 10 | Oct. 14 | 10 | Do. C | 232-234 | .. | 4 5 5 |
| 55,000 | " | " | 5 | Derby Con. Stk. | 121-123 | .. | 4 9 5 | 6,429,895 | Stk. | Feb. 10 | 5/9/4 | South African, | 122-122½ | .. | 7 16 11 |
| 145,095 | " | Apl. 1 | 12 | Do. Deb. Stk. | 101-105 | .. | 3 16 2 | 1,895,445 | " | Jan. 13 | 3 | South Met., 4 p.c. Ord. | 122-122½ | .. | 4 9 7 |
| 486,090 | 10 | Jan. 27 | 12 | East Hull 5 p.c. Ord. | 96-98 | .. | 5 2 0 | 209,821 | Stk. | Mar. 16 | 8 | Do. 3 p.c. Deb. | 81-83 | .. | 3 12 3 |
| 351,060 | 10 | " | 12 | European, Ltd. | 24½-24¾ | .. | 4 17 8 | 605,000 | Stk. | Feb. 25 | 5 | South Shields Con. Stk. | 157-158 | .. | 5 1 3 |
| 16,198,671 | Stk. | Feb. 10 | 43 | Do. £7 ios. paid. | 184-184½ | .. | 4 16 0 | 60,000 | " | " | 5 | S'th Suburb'n Ord. 5 p.c. | 121-123 | .. | 4 12 0 |
| 2,600,000 | " | " | 3½ | Gas 4 p.c. Ord. | 103½-104½ | .. | 4 9 3 | 117,058 | " | Jan. 13 | 5 | Do. 5 p.c. Pref. | 121-123 | .. | 4 1 4 |
| 4,092,235 | " | " | 3 | light 3½ p.c. max. | 88-90 | .. | 3 17 9 | 502,310 | Stk. | Nov. 11 | 5 | Do. 5 p.c. Deb. Stk. | 122-124 | .. | 4 0 8 |
| 4,531,716 | " | Dec. 29 | 3 | and 4 p.c. Con. Pref. | 104-106 | .. | 3 15 6 | 120,000 | Stk. | Feb. 10 | 5 | Southampton Ord. | 110-112 | .. | 4 9 3 |
| 258,740 | Stk. | Mar. 16 | 3 | Coke 3 p.c. Con. Deb. | 81-83 | .. | 3 12 3 | 453,940 | " | " | 58 | Tottenham A 5 p.c. | 133-135 | .. | 5 1 9 |
| 62,500 | 10 | " | 6½ | Hastings & St. L. 3½ p.c. | 93-95 | .. | 5 5 3 | 149,470 | " | Dec. 29 | 4 | and B 3½ p.c. | 113-115 | .. | 4 13 6 |
| 70,000 | 10 | Apl. 29 | 11 | Do. do. 5 p.c. | 117-119 | .. | 5 9 3 | 182,380 | 10 | Dec. 29 | 8 | Edmonton 4 p.c. Deb. | 59-101 | .. | 3 19 3 |
| 137,090 | Stk. | Mar. 16 | 7 | Hongkong & China, Ltd. | 17-17½ | .. | 6 5 9 | 149,900 | 10 | Jan. 3 | 5 | Tuscan, Ltd. | 94-96 | .. | 8 4 2 |
| 65,780 | " | " | 5½ | Ilford A and C | 145-147 | .. | 4 15 3 | 236,476 | Stk. | Feb. 25 | 5 | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 19 0 |
| 65,500 | " | Dec. 29 | 4 | Do. B | 103-110 | .. | 5 0 0 | 255,636 | Stk. | Feb. 25 | 6½ | Tynemouth, 5 p.c. max. | 113-115 | .. | 4 6 11 |
| | | | | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 79,416 | " | Dec. 29 | 3 | Wands- B 3½ p.c. | 139-141 | .. | 4 14 0 |
| | | | | | | | | | | | | worth J 3 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |

Prices marked * are "Ex div."

† Next dividend will be at this rate.

GAS COMPANIES (STANDARD BURNER) BILLS.

Withdrawal of Opposition at Tunbridge Wells.

At the Meeting of the Tunbridge Wells Town Council last Wednesday, the Lighting Committee reported that a conference of local authorities had been held at the Westminster Palace Hotel, to consider the further action to be taken by way of opposing the Gas Companies (Standard Burner) Bills in the House of Commons; and that a resolution had been passed recommending that the opposition should be continued. The proportion of cost payable by the Tunbridge Wells Corporation in opposing the Gas Companies (Standard Burner) No. 2 Bill in the House of Lords was about £100; and the Committee recommended that the opposition should not be continued in the House of Commons. On the motion for the adoption of the report, Mr. Hyde asked how many of the authorities with whom they joined had decided to continue the opposition, how many had come to terms with the local gas companies in arranging for a reduction in price or in other respects, and what special circumstances there were with regard to Tunbridge Wells which made it desirable that the opposition should not be continued, having regard to the fact that the Gas Company had not revised their terms. Mr. Tylor said a considerable proportion of the authorities were remaining in to oppose the three Bills. Several had dropped out—in one or two cases because certain arrangements had been made with them by the gas companies in the district for a reduction in price. The Committee thought it would put the town to a great expense to continue the opposition, and that as it had failed in the House of Lords it would probably also do so in the House of Commons; but, of course, nobody could predict this with certainty. The Gas Company had not made any overtures to the Committee. In view of the fact that the town possessed an electricity undertaking, it was doubtful whether the Company would take advantage of the Act when they got it; but if they reduced the quality of their gas for lighting and heating purposes, it would very much assist the undertaking of the Corporation in more ways than one. Mr. Hyde said the object of the Corporation should be to see that the gas, as an illuminant and as a heating agent, should be up to the comparatively low standard provided for by the local Act of Parliament, which was 15 candles. He moved, as an amendment, that the Town Clerk be instructed to take the necessary steps to present a petition against the Bill. Mr. Emson seconded the amendment. Alderman Delves (the Chairman of the Gas Company) asked permission to address the Council on this matter. He pointed out that a reduction of 2 candles in illuminating power would mean a decrease of only about 2 per cent. in the calorific power of the gas; and no one, he said, would be able to distinguish this. He claimed, and with reason, that the Gas Company had considered the poor people as much as anyone in the Council. There were 1500 incandescent gas-burners used by them; and arrangements had been made to supply burners to those people who consumed a certain amount of gas. Mr. Berwick remarked that it was probable that some of the authorities

who had withdrawn their opposition had done so because they had come to arrangements with the local gas company; but in Tunbridge Wells nothing of the sort had happened. Mr. Elwig said he believed that several of them had not made any terms at all. He thought the Gas Company had met the town fairly, and had treated their consumers very well. After further remarks, the amendment was lost. Opposition by the Council will consequently be withdrawn.

THE INQUIRY AS TO PORT OF LONDON RATES.

Lord St. Aldwyn's Report.

It will be remembered that an inquiry was recently held by Viscount St. Aldwyn with respect to the schedule of maximum port rates on goods submitted to the Board of Trade by the Port of London Authority and the Draft Provisional Order embodying the schedule. A very large number of objections to the latter were sent in; among them being those by the Gaslight and Coke, South Metropolitan, Brentford, Commercial, and Wandsworth and Putney Gas Companies. The list of objectors also included the Anglo-American Oil Company, Limited; the Bargeowners' and Lightermen's Defence League; the British Alizarine Company, Limited; the British Petroleum Company, Limited; Messrs. Burt, Boulton, and Haywood, Limited; the London Chamber of Commerce (Cement and O.I. Trades Sections); and the London Waterside Manufacturers' Association. Many of the objectors were represented or appeared at the inquiry, which was held towards the close of February and for a number of days in March; and the proceedings, so far as they related to the Gas Companies named, were reported in the "JOURNAL" at the time. Lord St. Aldwyn has made his report; and the following are some extracts from it.

The inquiry commenced with a statement from the Port Authority of the procedure adopted by them in framing a schedule of maximum rates. It appeared that this was prepared in the summer of 1909, and circulated among the leading trading associations and firms in London with a request for their observations. From more than 200 of these bodies criticisms and objections relating to about 45 per cent. of the articles named in the schedule were received; and 16 deputations from the most important objectors laid their views before the Port Authority. In the case of about 45 per cent. of the rates objected to, the schedule was modified before being submitted to the Board of Trade. The schedule thus modified was estimated to produce about £550,000 a year from maximum rates on overseas imports, and £200,000 from maximum rates on overseas exports; but there are no trustworthy statistics available as to the probable yield of rates on coastwise traffic, except that 1d. per ton on coal is estimated to yield from £33,000 to £35,000. The deductions which it may be necessary to make from these figures on account of the statutory exemption of transshipment traffic, or the exemptions or rebates which the Port Authority may find it necessary to make in any special cases, can only be arrived at by experience in

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working. In addition to these, it appeared, from statements made by the Port Authority in the course of the inquiry, that the rates actually charged would not, generally speaking, exceed half the maximum rates. After making all reasonable deductions on these grounds and on others which will be subsequently mentioned, I was satisfied that the maximum rates submitted to the Board of Trade were in very many cases unnecessarily high; and large reductions were made in the schedule settled at the inquiry as compared with that submitted to the Board of Trade.

Many of the objectors showed a want of confidence in the future action of the Port Authority in dealing with the matters in which they were specially concerned, which certainly gave no sufficient weight to the care taken by Parliament in constituting the Authority so as fairly to represent the varied interests of the Port, or to the difference between the position of such an authority and that of the directors of (say) a railway company. Putting aside any question of the action of the Port Authority in matters connected with their dock or warehousing business, which is dealt with by section 27 of the Port of London Act, the sole interest of the Port Authority is to maintain and increase the trade of the Port. They have no shareholders to satisfy; and therefore I considered that, however proper or necessary the interference of the Board of Trade may be between a railway company and the public or the traders, there could be no justification for making the Board a Court of Appeal against the rates actually charged or other administrative action by the Port Authority. But in view of the strong desire for some protection in the Provisional Order, especially on the part of the waterside manufacturers and those concerned in the re-export business, I have thought it advisable to insert clause 5 as a general direction that the Port Authority should endeavour, so far as they consider practicable, so to adjust the rates actually charged and the exemptions and rebates as to ensure that (1) the import rates on the materials used in the manufacture of any article shall not be more than the import rates on a like manufactured article imported from parts beyond the seas; and that (2) the port rates actually charged on goods exported to parts beyond the seas shall not exceed one-half of the port rates for the time being actually charged on similar goods imported from parts beyond the seas. The words are so framed as to leave it open to the Port Authority, in exceptional cases, to prevent any administrative difficulty or injury to some other interest that might result from a universal application of the rule.

In dealing with the objections, I held that Parliament had laid down the general principle that import and export rates should be levied on coastwise and oversea goods, and that the levy should be commenced as soon as it could be legalized; and therefore I declined to entertain objections to the enactment of any port rates, or of any export or any coastwise rates, or proposals that the levy should be delayed until part, at any rate, of the contemplated improvements had been undertaken. The questions to be discussed were, as far as possible, grouped under the following heads: (1) Definition of Transhipment. (2) Rates on Coastwise Goods. (3) Rates or Rebates on Exports and Re-Exports. (4) Rates or Rebates on Raw Materials. (5) Rates on the River Trade.

(6) Miscellaneous, including Short Sea Trade. (7) Rates on Particular Articles, commencing with Coal. (8) System of Collection.

The important points raised on each subject, with a brief statement of the arguments and the conclusions at which Lord St. Aldwyn arrived, are summarized under the several heads. In the course of his Lordship's remarks on the fourth subject, he says many objectors applied for reductions in the maximum rates on the raw materials of their industry and on coal. These objections were considered in dealing with the schedule of maximum rates; and in very many cases reductions were made. Among them were the Gas Companies, in the matter of coal and coke; and the steel trade, in respect of the rates on rolled iron and steel and structural work. The subject of the port rate on coal is dealt with under the seventh heading as follows.

In the schedule of maximum rates submitted by the Port Authority to the Board of Trade, the proposed rate on coal, culm, patent fuel, and coke was 6d. per ton, and that on coal dust and cinders 3d. These proposals created considerable alarm, largely because many persons failed to observe that as the coastwise maxima were to be half the maxima in the schedule, and these articles are almost entirely coastwise trade, the maximum rates really intended were 3d. and 1½d., with an entire exemption for bunker coal. The leading objectors, however, opposed any port rates on coal on two grounds—first, that it was the raw material of manufacturers; and, secondly, that any such rates would give a preference to railway-borne as against sea-borne coal. It was stated that out of 8½ million tons of sea-borne coal imported last year into London, Messrs. Cory imported or handled 5 millions, mainly from the North of England and Scotch collieries, and South Wales; that about 3½ million tons were used by the Gas Companies; and 1½ million tons as bunker coal. The value of sea-borne coal was stated to average 10s. or 11s. a ton; most of the household coal, which would be of higher value, coming by rail. The trade is carried on in the river; thus getting the advantage of the port without any payment except, in some cases, a small charge for moorings. At Liverpool, 1d. per ton is actually charged on coal; at Belfast, 1½d.; considerably more at Bristol and Cork; 1d. at Hull and 1½d. at Grimsby; and at Goole an export rate of 1d. per ton was put on for the improvement of the Ouse Navigation. Export dues are also charged on the Tyne and Wear.

I considered that, in spite of the importance of coal to manufacturers, there was no reason why sea-borne coal should be excepted in London from the rule generally adopted elsewhere of making it pay something towards the maintenance of the port. So far as the evidence enabled me to compare the existing charges for sea freight and land freight, I was satisfied that the imposition of a moderate port rate on sea-borne coal would have but a slight effect on the present competition between different coalfields for the supply of London; and as it appears that the sea-borne trade is a very prosperous trade, it ought to find no difficulty in bearing whatever part of the rate it cannot pass on to the consumer. The consumer cannot be largely affected, though it will be in the power of the Gas Companies to exact from their customers the greater portion of any charge they may bear. But it is not unreasonable

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that the population of London generally, who are saved from the heavy local taxation for the improvement of their port which is imposed, for example, at Bristol, should indirectly make whatever small contribution for this purpose may result from a port rate on coal. I have therefore inserted in the schedule a maximum rate of 2d. per ton on coal, which would in practice probably work out at not more than 1d. actual rate; and as this is really a coastwise import, to avoid misconception I have proposed that this maximum shall apply to coastwise as well as overseas coal.

In concluding his report, Lord St. Aldwyn says: I venture to express a hope that it may be considered a fair, intelligible, and accurate account of all that passed at the inquiry, whether in matters of principle or detail, which it is necessary to bring under your notice; and that the Provisional Order and schedule of maximum rates in their present form may be found, while sufficiently providing for the requirements of the Port Authority, to meet so many of the objections that were made as materially to assist Parliament in the difficult work of introducing for the first time a system of port rates on goods into a port so important, so peculiar in its characteristics, and including so many conflicting interests, as the Port of London.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The death of King Edward VII. is a theme upon which many pens will write with greater effect, though probably not with a deeper feeling of regret, than mine; for without doubt a great Ruler of the race, yet a man of the people—intelligent, active, sincere, and happy in all that he did—has passed away. There will be much interruption to business for a little, the first of which that has come under my notice being an intimation by order of Lord Provost Brown, of Edinburgh, that he has ordered to be postponed a meeting of the Edinburgh and Leith Gas Commissioners which had been called for Monday.

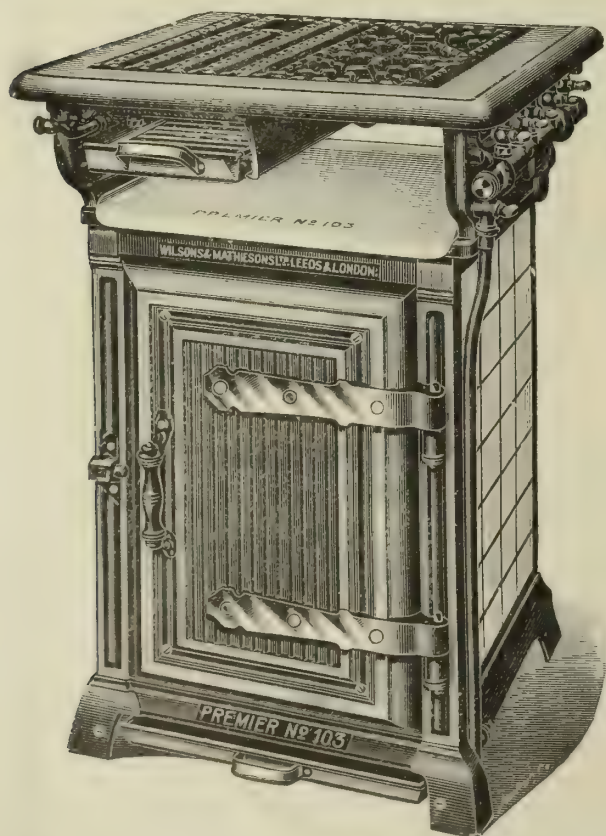
In the Edinburgh Town Council on Tuesday, Treasurer Leishman, in submitting the draft estimates of expenditure for the year from the 15th inst., said that the cost of public lighting showed an increase of nearly £2000 over the estimated figure of last year. He wished to make a serious complaint against the Lighting Committee and its officials. Nearly the whole of this amount was due to the increase in the number of stair lights. In recent years, the lights in the streets had been converted into incandescents; and this year they should have been prepared for a heavy diminution of the capital expenditure, as the conversion had now ceased. In October last, the Council sanctioned the conversion of the stair lights into incandescents. They were told, and they had reason to believe, that the system of incandescent lighting was very much better, that less gas would be burned, and that, consequently, there would be less to pay. In the proceedings which took

place before the Parliamentary Committee, when the Gas Commissioners were getting their new Provisional Order, Mr. Herring, the Chief Engineer to the Gas Commission, said on oath he had prepared a statement showing that, after allowing for the cost of equipment, they would save £2000 in the first year, and that after two years the saving would be £3630 per annum. The Cleaning and Lighting Committee of the Town Council obtained an offer from the Gas Commission for the conversion of the lights. Mr. Mackay, their Inspector of Lighting, reported favourably upon the offer, and said that the Corporation were offered a superior system of stair lighting at no additional cost. The Inspector stated that a number of additional lights might be required in the common stairs; and he estimated the cost at £300 per annum. But what was the actual fact? By the estimate before them, which was supposed to run from May 15 next, there had been placed in common stairs in Edinburgh no fewer than 2013 extra lights. This was, in the main, how the increased sum was realized. The lights cost 17s. 6d. each, which made nearly £2000, instead of the £300 that the Inspector had said might be required. If this sort of thing were tolerated and passed by the Town Council, they would have no control at all over their finance. An official, without a single word of writing or authority, spent nearly £2000 per annum. It was one of the most unbusiness-like things ever done in the city. He wished those estimates cut down, for they had never been authorized. The estimates of all the Committees were sent back for reconsideration.

On Wednesday the Parliamentary Bills Committee of the Glasgow Council met, and considered the situation which has arisen with reference to the Corporation Gas Consolidation Bill. By a majority, it was agreed to recommend that the Bill should not be dropped, but be proceeded with in the House of Lords.

A Parliamentary Commission has been sitting in Edinburgh this week considering applications for statutory powers. One of these was by the Corporation of Kirkcaldy, who sought powers for the extension of the burgh boundaries, and, among other things, borrowing powers in connection with the gas undertaking, which they are about to acquire. There was no opposition to the gas clauses of the application; but the Commissioners took exception to some of the proposals. One of these was a clause in which power was to be taken to apply surplus gas profits in relief of the burgh general assessment, if the Corporation saw fit. This proposal, it was pointed out, was an alteration of the general law. If the Corporation were selling gas to outside communities, it would not be fair that the profit on the undertaking should be applied to the burgh assessment. Counsel for the Corporation pointed out that here it was different, because the Corporation were to sell gas to their own consumers only. As precedents, the powers given to Greenock at Westminster, and to Hamilton by Provisional Order (both last year), were cited. The undertaking would be carried on for behoof of the burgh only. The Earl of Kintore, who was Chairman, remarked that he would rather say it would be carried on for behoof of the consumers of gas. These, Counsel replied, were practically the ratepayers. Then the Chairman gave forth the dictum that they had electric light coming on more and

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more; and the people who consumed gas were generally poor people. Any surplus must go to gas purposes. The clause was accordingly deleted. In the application it was asked that the time for the repayment of money borrowed should be forty years; and it was asked that the forty years should run from the first repayment, which was to be in the second year after the Corporation commenced to supply gas. The Commissioners proposed that the period of repayment should be thirty years. Counsel said the Corporation had to contemplate additions and extensions to the undertaking; and he thought that some concession should be made. The purchase price was to be fixed by private bargain or by arbitration. The present consumers would have to bear the heavy end of the burden. At the start, they would have to pay interest on the price; and in addition they would have to pay into a sinking fund. They would have to pay one-fortieth part of the total capital sum; and, in addition, the total interest on the total rate. Counsel mentioned precedents—in the cases of Lisburn in 1909, and Ardrossan in 1901. The profits, as they stood, would just meet the interest and repayments. The Commissioners struck out the clause; and the conditions of repayment will thus be regulated as required by the Commissioners. The Corporation are empowered to charge for gas as they see fit. The minimum illuminating power is fixed at 14 candles, as determined by the "Metropolitan" argand burner No. 2 and the bar photometer. Users of gas-engines, if required by the Corporation, must use an effective anti-fluctuator; and power is taken to supply, but not to manufacture, gas-fittings, engines, stoves, ranges, and the like, for lighting and motive power.

The "Dundee Advertiser" on Wednesday of this week published this statement: "The Gas Committee have broken a meter combination. A fortnight ago they took in offers for the supply of meters for the year. Fifteen were sent in, and they were all the same price. Instead of accepting these offers, the Committee asked new offers for three years instead of one, with the result that a considerably lower price has been secured. The matter was reported at a meeting of the Gas Committee yesterday. Mr. High, the Convener, said that the Manager learned that there was an opportunity of breaking through the combination if they made a contract for three years. The result was that the lowest offer now was £443 below the former offers, and £630 lower than the contract for last year. They would have gone to Germany if they had not broken through the combination. It was remarked that the reduction was equal to 3d. per 1000 cubic feet of gas. Mr. A. Yuill, the Engineer, said that this was so, but that they were paying £2000 more for coal, which would prevent them giving gas consumers any consideration. The offer for meters which was accepted was that of Messrs. R. Laidlaw and Son (Edinburgh), Limited, of Edinburgh."

In Dundee there is at present a movement in the direction of promoting an amalgamation between the city and the adjacent burghs of Broughty Ferry and Monifieth. A Sub-Committee of the Dundee Town Council have prepared a memorandum on the subject, a copy of which has been sent to the Town Councils of the smaller burghs, along with an invitation to meet in conference on the matter. In this document it is pointed out that in gas supply Broughty Ferry would, in the event

of amalgamation, have gas at 7d. per 1000 cubic feet less than at present—being a total saving of £1750 on their annual sale of, roughly, 60 million cubic feet of gas. As 1d. in the pound in Broughty Ferry yields £271, the saving would be equal to 6½d. in the pound on its rating. Further, in Dundee, cookers, &c., are supplied free; and these in Broughty Ferry yield a revenue of £107. The withdrawal of the rent charge, it is set forth, could not fail to greatly increase the use of gas appliances; and in Dundee's ratio this would come to about £500. Monifieth would have gas at 2s. 6d. per 1000 cubic feet less than at present—a total saving, on their annual sale of about 7 million cubic feet, of £875. As 1d. in the pound in Monifieth yields £71, this represents 1s. in the pound on their rating.

Particulars were laid before the Carnoustie Town Council on Monday evening as to the purchase price, expenses, &c., payable on the 16th inst., in connection with the taking over of the gas undertaking. The purchase price amounted to £21,000. The Committee recommended the Council to fix the prices for the year from the 15th inst. at 3s. 6½d. per 1000 cubic feet for gas consumed through ordinary meters, and at 4s. 2d. for gas consumed through prepayment meters. They further recommended that no meter-rents be charged, and that gas-cookers be supplied free. The Convener said he hoped they would be able to make a reduction in the charges in twelve months.

The Parliamentary Commission sitting in Edinburgh this week, were to have considered an application by the Corporation of Fraserburgh for a Provisional Order, the purpose of which was to augment the water supply of the town; but opposition to the measure having been overcome, it was withdrawn from the consideration of the Commissioners, and will be dealt with at Westminster as an unopposed measure. The scheme provides for taking a supply of water from Fedderate—a distance of 15 miles from the town. The estimated cost of the works is £48,000.

The Strathmiglo Gaslight Company, who had been in existence for seventy years, have transferred their business as a going concern to a new Company, for a payment. The old Company was formally dissolved last week.

Yesterday, in the Sheriff Court at Peterhead, application was made on behalf of the Fraserburgh Town Council to have their resolution adopting the Burghs Gas Supply (Scotland) Act, recently confirmed by the ratepayers, recorded in the books of the Sheriff Court. Evidence was submitted as to the steps which have been taken in the procedure, and the advertisement of the application, to which there had been no objection. Sheriff Henderson Begg granted the application.

The Town Clerk of Carlisle has reported to the Water Committee that he has been unable to complete the deed of grant of the land and easements required from Lord Carlisle for the purposes of the Geltsdale Water-Works, owing to the fact that Lord Carlisle's Solicitors wish to insert in the deed a clause restricting the Corporation's rights-of-way and their use of the land. The Town Clerk was instructed to make application to the Courts in order to have the matters in dispute finally settled.

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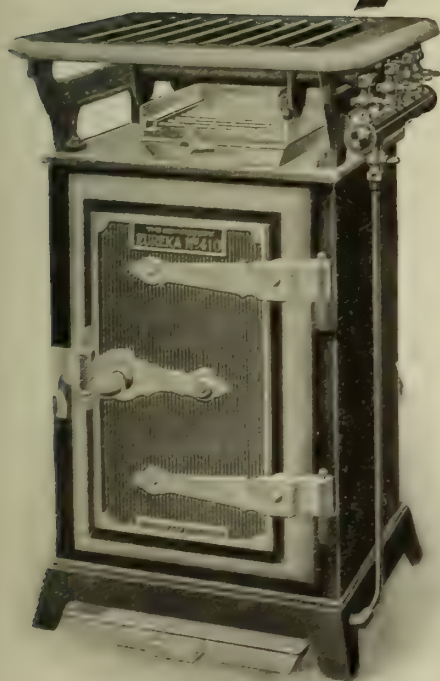
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CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, May 7.

Owing to the continued paucity of new business, the weakness in the market has become more accentuated within the last few days, and the decline in prices has been more rapid. There is not much inquiry for export, and demand for home consumption has also slackened off. The nearest values at the close of the week are, consequently, £11 15s. per ton f.o.b. Hull, £11 16s. 3d. f.o.b. Liverpool, and £11 18s. 9d. f.o.b. Leith. The makers have so far not made any reduction in their quotations for future delivery; but it is reported that there are speculative sellers over the second half of this year at less money than manufacturers are asking.

Nitrate of Soda.

The market for this article remains dull, and the spot quotations now are 9s. 4½d. per cwt. for ordinary 95 per cent. quality, and 9s. 7½d. for 96 per cent.

Tar Products.

LONDON, May 9.

The markets for tar products have been firm during the past week. Pitch has again improved; and the position is very firm for prompt and for forward delivery. Creosote is steady, though there is not much new business. The market in crude carbolic is still very unsettled, and consumers' ideas cannot be brought up to those of manufacturers; consequently business is practically at a standstill. Naphthas and benzols remain firm.

The average values during the week were: Tar, 18s. to 22s., ex works. Pitch, London, 40s.; east coast, 39s. to 40s.; west coast, 38s. to 39s. f.a.s. Mersey ports, 39s. f.o.b. others. Benzol, 90 per cent., casks included, London, 8d. to 8½d.; North, 8d.; 50-90 per cent., casks included, London and North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4½d. to 4¾d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has been rather quiet during the past week; but towards the close there was a little inquiry, which, however, did not affect the market. To-day actual Beckton is quoted at £12; and outside makes, upon Beckton terms, £11 12s. 6d. to £11 13s. 9d. In Hull, the price is £11 17s. 6d. to £11 18s. 9d.; Liverpool, £11 17s. 6d.; Leith, £11 18s. 9d. to £12; Middlesbrough, £11 17s. 6d. to £11 18s. 9d.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now an ample supply of coal, and prices have for some kinds shown a further slight fall. In the steam coal trade, best Northumbrian steams are from 11s. 3d. to 11s. 4½d. per ton f.o.b.; second-class steams are 10s. to 10s. 6d.; and steam smalls are steady at from 6s. to 7s. 6d. The collieries are practically all at work; and the demand at present barely furnishes full time. In the gas coal trade, the home consumption is naturally low at this season of the year; but the exports are fair. Durham gas coals vary in price according to quality—the usual classes being about 10s. to 10s. 9d. per ton f.o.b.; and "Wear" specials about 11s. 6d. As to contracts, little is yet known as to the large Metropolitan ones; but they do not seem to be very eager to close them. It is thought that one or two will be soon settled; and this may define the extent of the rise in prices that is generally to be looked for. Some small export contracts for gas coals are settled at prices near to those that are current, as quoted above; but they are not large enough to affect the market much. Coke is steady; and as gas coke is now in smaller output, the price is maintained at from 13s. 9d. to 14s. per ton f.o.b. for good quality.

Scotch Coal Trade.

Trade is not encouraging. It is felt that orders for Baltic ports are being held over, which gives a depressed feeling to the market. Coal-owners are waiting for this trade, and are not reducing prices. The other markets are fairly brisk. The prices quoted per ton f.o.b. Glasgow are: Ell, 9s. 3d. to 10s. 3d.; splint, 10s. 3d. to 10s. 6d.; steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 314,036 tons—a decrease upon the preceding week of 8247 tons, but an increase upon the corresponding week of 2415 tons. For the year to date, the total shipments have been 5,034,146 tons—an increase upon the corresponding period of 694,552 tons.

Chorley Gas-Works Results.—The Chorley Town Council have had before them the report of the Gas Manager for the past year. It stated that the total quantity of gas made was 151,042,000 cubic feet, an increase of 10,430,000 cubic feet over the previous year. There were 13,979 tons of coal carbonized; the yield being 10,636 cubic feet per ton. Of the consumption, 133,180,700 feet was for lighting, and 9,380,200 feet for power. The consumption of gas by mills, workshops, and large consumers showed a reduction of 6.6 per cent.; and with the decrease in the previous year of 11.7 per cent., this made a total reduction of 18.3 per cent. in two years. During the twelve months, 615 new consumers had been connected; and the total was now 8546. Alderman Whittle, in referring to the report, said that, but for the bad trade, the increase would have been doubled.

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The Birmingham Gas Secretaryship.

The following statement appeared in the "Birmingham Mail" last Thursday: Some difficulty is being experienced in finding a gentleman to fill the responsible position rendered vacant by the death of Mr. G. Hampton Barber, the Secretary of the Birmingham Gas Department. The preliminary selection of a suitable man for the post is in the hands of a small Sub-Committee consisting of Alderman Sir Hallelwell Rogers (Chairman of the Gas Committee), Aldermen Lloyd and Bishop, and Councillor Murray; and these gentlemen are devoting considerable time and attention to the matter with which they are charged. As may be imagined, there were many applications for the post, having regard to the probable salary; and the Sub-Committee have not only reduced the number of these applicants down to a few, but have also interviewed the most likely of the candidates whose names remain on the reduced list. At a meeting this morning, another applicant was interviewed; and it may be that further interviews will be necessary. Anyhow, it is not regarded as probable that the Sub-Committee will be in a position to make any final report or recommendation on the subject to the meeting of the full Gas Committee on Monday.

New Holder for the Salford Gas-Works.—At last week's meeting of the Salford Town Council, Alderman Phillips, the Chairman of the Gas Committee, moved the confirmation of the Committee's minute that the tender of Messrs. Newton, Chambers, and Co., Limited, of Sheffield, for the supply and erection of a two-lift gasholder, 100 feet in diameter, be accepted. He explained that the holder was for the Bloom Street works; and the cost would be £3967, including certain alterations to the guide-framing. The motion was carried without discussion.

Mansfield Gas-Works Extensions.—A report submitted by the Gas Engineer (Mr. A. Graham) to a special meeting of the Mansfield Town Council stated that during the past winter every retort had been in use; and the maximum daily output was on Dec. 22—746,000 cubic feet. There was no reason to doubt that this figure would reach over 800,000 cubic feet during the coming winter. Additional gas-making plant should therefore be provided without delay. A deputation of six members of the Gas Committee had visited several towns where carburetted water gas was being made; and they were of the unanimous opinion that it would be advantageous to instal a similar plant to that inspected at Lincoln and Preston. Tenders had been secured; and the Committee recommended a plant to produce 330,000 cubic feet per 24 hours, at a cost of £3820. The provision of the gasholder, alterations to buildings, new roof, foundations, and gas-mains would raise the expenditure to a total of £7000. The Committee had adopted the report; and the Council did the same, together with a resolution that the Council make application to the Local Government Board for sanction to a loan of £7000 for the purpose, repayable within a period of thirty years.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards sold, by order of executors, stocks and shares in various gas companies. The first lots offered consisted of £500 of 5 per cent. consolidated ordinary stock of the Chigwell, Loughton, and Woodford Gas Company, the last dividend on which was at the rate of 5½ per cent. per annum; and it fetched from £123 to £125 per £100. A few fully-paid £10 "A" shares (10 per cent.) in the Harrow and Stanmore Gas Company, carrying dividend at the rate of 10½ per cent. per annum, realized £23 apiece; some "C" shares (7 per cent.), of the same nominal value, carrying £7 7s. per cent. dividend, fetching from £15 7s. 6d. to £15 12s. 6d. each. A parcel of 4 per cent. perpetual debenture stock of the same Company was placed at from £100 10s. to £101 5s. per £100. Some 5 per cent. preference stock of the Horley District Gas Company was sold at par; and a small quantity of 4 per cent. irredeemable debenture stock at £95 per £100. Ten fully-paid £10 "A" shares in the Waltham Abbey and Cneshunt Gas Company, ranking for a standard dividend of 10 per cent., but carrying 8½ per cent., fetched £18 10s. each; and some 7 per cent. "C" shares, of the same nominal value, but carrying 6½ per cent. dividend, realized from £13 5s. to £13 15s. each. A parcel of 4 per cent. perpetual debenture stock of the same Company was sold at from £100 to £101 per £100. The last lots offered consisted of £1000 of new ordinary stock of the Southend Gas Company, ranking for a standard dividend of 5 per cent., but carrying 5½ per cent., fetched from £120 5s. to £120 10s. per £100. The following day, Messrs. Fox, Bousfield, and Co. sold at the Mart some original £25 shares in the Lewes Water Company at £72 and £72 10s. apiece; two additional shares at £55 and £45 each; and £60 of 5 per cent. preference stock at £80.

Smaller Rates at Malvern.—It is a pleasure in these times to be able to chronicle an instance in which it is found possible to make a substantial reduction in the rates; and Malvern affords us an opportunity of doing so. Here the Council find themselves with a handsome surplus on the past year; and consequently they have been able to fix the new rate at 4s., which is a decrease of 7d. in the pound. In this connection, it may be remarked that the gas undertaking has done exceedingly well during the past year; the general expenditure having been £911 less than the estimate, while the receipts were considerably in excess of the amount estimated—a state of things on which, as a local paper points out, "the Manager (Mr. W. J. Rendell Baker) is entitled to the thanks of the ratepayers." The encouraging outlook has even led one writer to put forward the following: "Possibly, in the course of a few years, we shall see the gentlemen who used to be called rate-collectors calling round with each resident's share of the profits on the gas and electricity works. The ratepayers will then be the rate-collectors, and the collectors the ratepayers, and Malvern will be truly the Queen of Health Resorts."

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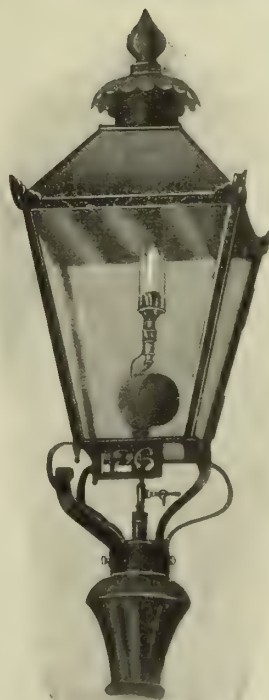
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Municipal and Health Exhibition.—The second Municipal and Health Exhibition was opened at the Royal Agricultural Hall, Islington, last Saturday. It has been organized mainly for the purpose of promoting municipal work by bringing under one roof all the latest appliances and inventions for sanitation, road making, and building construction; and it will remain open until the 14th inst. During the week a series of non-technical lectures on various departments of municipal undertakings will be given. The Organizing Manager is Mr. F. W. Bridges (one of the organizers of the Earl's Court Gas Exhibition), assisted by a strong Honorary Advisory Committee.

New Joint-Stock Companies.—The East Hants Gas Company, Limited, has been registered with a capital of £30,000, in £10 shares (1500 "A" and a like number of "B") to carry on the business of a gas and water company, and to acquire the existing gas-works and plant at Woolmer. The Maltby and Bramley Gas Company, Limited, has been registered with a capital of £15,000, in £1 shares, to manufacture and supply gas for lighting, heating, or motive power to certain parishes in the county of York, and to carry on the business of a gas company in all its branches; also to take over all or any of the property, interest, and liabilities, &c., of Mr. H. Ellison, of Cleckheaton, manufacturing chemist, in and under two agreements—viz., one between H. Ellison and H. Mollekin with respect to the supply of gas to the new model village at Maltby, and the other with respect to the laying of gas-mains.

The Gas Committee's revenue account, presented to the Knaresborough Urban Council some days ago, showed receipts £4418 and expenditure £3768—a gain on the year's working of £649, as against £508 the previous year.

In a paragraph which appeared in the "JOURNAL" last week (p. 332), it was stated that among the orders lately secured by Messrs. Ashmore, Benson, Pease, and Co. was one for a condenser and tar-extractor for the Luton Gas Company. We are asked to say that the statement is incorrect.

The New Mills Urban District Council have agreed to apply to the Local Government Board for power to borrow £1650 for purposes of extension and other matters connected with the gas undertaking. They have also entertained a proposal to reduce the price of gas by 1½d. per 1000 cubic feet. The offer of the Gas Committee to give £350 out of the profits for the relief of the rates was accepted.

We have received from Messrs. Trier Bros., of Caxton House, Westminster, a pamphlet containing particulars of "Stauffer's Lubricant" (a machine grease of which they are the sole makers), and of their lubricators and engineering appliances; the latter being shown in considerable variety. The lubricant was the result of an attempt made more than a quarter-of-a-century ago to replace liquid oil; and it is claimed for it that it has maintained its standard of excellence.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

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Stocks and Shares.

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DORKING GAS COMPANY. May 24.

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CHORLEY GAS DEPARTMENT. Tenders by May 18.
CIRENCESTER GAS COMPANY. Tenders by June 2.
DROITWICH GAS DEPARTMENT. Tenders by May 20.
GUILDFORD GAS COMPANY. Tenders by May 20.
GLOUCESTER GAS COMPANY. Tenders by May 30.
HEYWOOD GAS DEPARTMENT. Tenders by May 12.
LINCOLN GAS DEPARTMENT. Tenders by May 20.
OMAGH URBAN DISTRICT COUNCIL. Tenders by May 31.
TIVERTON TOWN COUNCIL. Tenders by June 4.
TYLDESLEY-WITH-SHAKERLEY URBAN DISTRICT COUNCIL. Tenders by May 30.

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BUXTON GAS DEPARTMENT. Tenders by May 28.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

WHITSUNTIDE HOLIDAY.

In consequence of the WHITSUNTIDE HOLIDAY, Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office

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Gas and Water Manager.

Gas-Works, Tyldesley,
May 5, 1910.

CORPORATION OF DROITWICH. (GAS DEPARTMENT.)

THE Gas Committee are prepared to re-
ceive TENDERS for the Supply of 2000 Tons of
Best Screened GAS COAL, to be delivered to Droitwich
(Great Western Railway), as required during the
Twelve Months ending June 30, 1911; also for a similar
Quantity for the Year ending June 30, 1912.

The Committee reserve the right to accept Tenders
for the whole or any portion of the Quantity offered,
and do not bind themselves to accept the lowest or any
Tender.

Sealed Tenders, endorsed "Tender for Gas Coal," to
be sent to S. J. Tombs, Esq., Town Clerk, Droitwich,
not later than the 20th inst.

Forms of Tender to be obtained from the under-

F. SHEWRING,
Manager.

Gas-Works, Droitwich,
May 4, 1910.

LINCOLN CORPORATION. (GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the Lincoln Cor-
poration invite TENDERS for the Supply of
30,000 Tons of Screened or Unscreened GAS COALS
and NUTS, to be delivered during a period commencing
the 1st of July, 1910, and terminating the 30th of June,
1911.

Further Particulars and Forms of Tender may be
obtained from the undersigned.

Sealed and endorsed Tenders, addressed to the Chair-
man of the Gas Committee, must be delivered on or
before the 20th of May next.

The Committee do not bind themselves to accept the
lowest or any Tender.

JNO. CARTER,
Manager.

Gas Offices, Lincoln,
April 22, 1910.

BOROUGH OF TIVERTON.

TENDERS FOR COAL.

THE Town Council are prepared to re-
ceive TENDERS for the whole or part of 4000 Tons
of Freshly Wrought GAS COAL, Screened or Un-
screened, including NUTS (giving full Particulars of
Coal, with Analysis), to be delivered at the Railway
Siding adjoining their Gas-Works at Tiverton during
the period of One Year, and in such Quantities as may
be directed by the Gas Manager.

Further Particulars and Form of Tender (which must
be used) may be obtained on Application to Mr. Clark
Jeffery, Gas Manager, Tiverton.

Sealed Tenders, endorsed "Tender for Gas Coal,"
and addressed to the undersigned, must be received on
or before Saturday, the 4th day of June, 1910.

The Committee do not bind themselves to accept the
lowest or any Tender.

By order
C. M. HOLE,
Town Clerk.

Tiverton, May 2, 1910.

BARRY URBAN DISTRICT COUNCIL.

TENDERS FOR TAR.

ALTERNATIVE Tenders are invited
for the Purchase of the Surplus TAR produced
at the Gas-Works during One, Two, or Three Years
from the 1st of June next, approximately 100,000 Gallons
per Annum.

The Tar will be pumped into Contractor's Tank
Trucks at the Gas-Works Siding, Barry.

The person whose Tender is accepted will be re-
quired to enter into a Contract and also give a Bond,
with approved Sureties, for its due performance.

The highest or any Tender not necessarily accepted.

Further Particulars may be obtained from Mr. T. E.
Franklin, Engineer and Manager, Gas-Works, Barry.

Sealed Tenders, endorsed "Tender for Tar," to be
sent to the undersigned not later than Twelve
o'clock noon on Monday, the 30th of May, 1910.

T. B. TORODFF,

Public Offices, Barry,
May, 1910.

BOROUGH OF CHORLEY. (GAS DEPARTMENT.)

TENDERS are invited for the Supply
and Delivery of GAS MAKING FUEL.
Full Particulars of Requirements may be obtained
on Application to Mr. J. W. Allin, Gas-Works, Chorley.
Tenders, addressed to me, to be delivered not later
than Wednesday, May 18.

The Corporation do not bind themselves to accept the
lowest or any Tender.

JNO. MILLS,
Town Clerk.

Town Hall, Chorley,
May 2, 1910.

GUILDFORD GASLIGHT AND COKE COMPANY.

COAL.

THE Directors of the above Company
are prepared to receive TENDERS for the Supply
of 13,000 Tons of Durham and South Yorkshire GAS
COAL (Screened or Unscreened), to be delivered free
at Guildford Station, between the 1st of July, 1910, and
the 30th of June, 1911, in such Quantities and at such
times as required.

The Directors reserve the right to accept the whole
or any portion of the Quantity offered, and do not bind
themselves to accept the lowest or any Tender.

Tenders to be endorsed "Tender for Coal," and to be
sent to Ferdinand Smallpeice, Esq., J.P., Chairman of
the Gas Company, on or before Ten a.m. on Friday,
the 20th of May, 1910.

By order,
WILLIAM TITLEY,
Secretary.

Gas Offices, Guildford,
May 2, 1910.

URBAN DISTRICT COUNCIL OF TYLDESLEY-WITH-SHAKERLEY.

TENDERS FOR THE SUPPLY OF COAL AND GENERAL STORES.

THE Gas and Water Committee invite
TENDERS for the Supply during the Twelve
Months ending June 30, 1911, of the following:—
4500 Tons of GAS COAL, COBBLES, or NUTS.
LEAD PIPE, (Gas and Water) and PIG LEAD.
CAST-IRON PIPES and SPECIALS.
WROUGHT-IRON TUBES and FITTINGS.
GAS-METERS.

Forms of Tenders and Particulars may be obtained
from the undersigned.

Sealed, endorsed Tenders to be delivered to W. J.
Matthews, Esq., Clerk to the Council, Tyldesley, on or
before Monday, May 30, 1910.

The Committee do not bind themselves to accept the
lowest or any Tender, and reserve to themselves the
right to divide any Contract.

H. R. S. WILLIAMS,
Engineer and Manager.

Gas and Water Works,
Tyldesley, May 5, 1910.

BOROUGH OF BURTON-UPON-TRENT.

THE Town Council of this Borough in-
vite TENDERS for:—
GAS COAL.

The Supply of 35,000 Tons of GAS COAL, to be de-
livered at the Gas-Works during the Twelve Months
ending June 30, 1911, in accordance with the Form of
Tender and Conditions which may be obtained from
the undersigned.

TAR.

The Purchase of the Surplus TAR, which will be
produced and delivered into the Purchaser's Tank
Wagons at the Gas-Works during the Twelve Months
ending June 30, 1911.

Terms of Payment Net Cash Monthly.

Tenders, endorsed "Coal" and "Tar" respectively,
are to be delivered to the Assistant-Manager at the
Gas-Works, Burton-upon-Trent, on or before Wednes-
day, May 18 inst.

The Council do not bind themselves to accept any
Tender.

T. N. WHITEHEAD,
Town Clerk.

Town Hall, Burton-upon-Trent,
May 4, 1910.

BUXTON URBAN DISTRICT COUNCIL. (GAS DEPARTMENT.)

THE Gas Committee invite Tenders
for:—
1.—GAS COAL, NUTS, and CANNEL.

The Supply of 6000 Tons of Best Screened GAS
COAL or large NUTS to be delivered as required, at
the Gas-Siding, Midland Railway, Buxton, during the
Twelve Months ending July 31, 1911, and 3500 Tons of
CANNEL to be delivered during the Twelve Months
ending June 30, 1911, in accordance with the Specifi-
cation and Conditions, which may be obtained from the
Gas Engineer, Mr. H. Barker, Town Hall, Buxton.

Sealed Tenders, endorsed "Coal" and "Cannel"
respectively, are to be delivered to the undersigned
on or before Saturday, the 28th inst.

The Council do not bind themselves to accept the
lowest Tender, and reserve the right to divide the
Contracts.

2.—SURPLUS TAR AND AMMONIACAL LIQUOR.

The Purchase of the Surplus TAR and the whole of
the AMMONIACAL LIQUOR which may be produced
at the Buxton Gas-Works during the Twelve Months
ending June 30, 1911. The same to be delivered into
Contractor's Tanks at the Gas-Siding, Midland Railway,
Buxton.

Sealed Tenders, endorsed "Tar" and "Liquor" re-
spectively, are to be delivered to the undersigned on or
before Saturday, the 28th inst.

Forms of Tender may be obtained on Application to
the Gas Engineer,

By order of the Committee,
(Signed), JOSIAH TAYLOR,
Clerk.

Town Hall, Buxton,
May 7, 1910.

THE Directors of the Alliance and
Dublin Consumers' Gas Company invite
TENDERS for the Supply of 85,000 Tons of GAS COAL,
to be delivered c.i.f. Dublin, June, 1910 and 1911, in
such Quantities as may be required.
The Directors do not bind themselves to accept these
or any Tender.

For full Particulars, Apply to FRANCIS T. COTTON, Esq.,
Secretary and Manager, Alliance and Dublin Consumers'
Gas Company, D'Olier Street, DUBLIN.

CHESTER UNITED GAS COMPANY.

TENDERS FOR PURIFIERS AND ROOF.

THE Directors of the above Company
invite TENDERS for the REMOVAL and RE-
ERECTION of Two existing PURIFIERS, 24 feet by
23 feet by 5 feet deep, and Alterations to Connections,
the SUPPLY and ERECTION of Two New PURI-
FIERS, 24 feet by 22 feet by 5 feet deep, with Con-
nections and Week Centre Valve to work the Set of Four,
Two overhead Travelling Cranes, and about 100 Tons
of STEEL and CAST-IRON WORK in Roof over
Purifiers and Oxide Sheds at the Roodee Gas-Works,
Chester.

Drawings, Specification, Bill of Quantities, and Form
of Tender may be obtained on Application to the
Manager, Roodee Gas-Works, on payment of One
Guinea, which will be returned on receipt of a *bond-fide*
Tender and Particulars supplied.

Tenders to be delivered (sealed) on or before Nine
a.m. on Thursday, the 12th day of May, 1910, addressed
to the undersigned and endorsed "Tender for Purifiers
and Roofs."

The Directors do not bind themselves to accept the
lowest or any Tender.

FRED. A. PYE,

Secretary and General Manager.

Gas Company's Offices,
Cuppin Street, Chester,
April 29, 1910.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company
invite TENDERS for the Supply of about 34,000
Tons of GAS COAL for One Year from the 1st day of
July next, in such Monthly Quantities as may be re-
quired by the Company.

Tenders to state the Price delivered at the Midland
Railway Sidings, Hempstead, near Gloucester, or the
Great Western Railway Wharf, Llanthony, Gloucester;
or, if sent (as preferred) by Water, the price f.o.b., and
also the price delivered at the Gas Company's Wharf
on the Gloucester and Berkeley Canal.

Further Particulars and Forms of Tender may be
obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Coal," spec-
ifying the Description and Quality of the Coal, to be ad-
dressed to the Chairman, Gas Offices, Eastgate Street,
Gloucester, and delivered not later than Monday, the
30th day of May next.

The Directors reserve to themselves the right to ac-
cept the whole or any portion of any quantity offered,
and do not bind themselves to accept the lowest or any
Tender.

By order,
WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
May 2, 1910.

BOROUGH OF WALSALL.

TO LIME MASTERS.

THE Corporation of Walsall invite
TENDERS for the Supply of about 800 Tons of
LIME for their Gas-Works, and about 250 Tons for
their Sewage Farm at Bescot, which will be required
during One Year from the 1st day of July next, the
deliveries to be in such Monthly Quantities as the Cor-
poration may from time to time direct.

The Lime is to be hand-picked and clear from Refuse
and Ashes, and to be delivered at the Corporation
Siding at the Pleck Gas-Works and at the Sewage
Farm, Bescot, as required.

Payments Monthly.

The Corporation do not bind themselves to accept the
lowest or any Tender, and they will not accept the
Tender of any person or Firm paying less than the
Standard Rate of Wages to their Workmen.

Tenders, sealed and marked outside "Tender for
Lime," are to be sent to the undersigned on or before
Saturday, the 21st of May inst.

JOHN R. COOPER,
Town Clerk.

Council House, Walsall,
May 2, 1910.

BOROUGH OF WALSALL.

TENDERS FOR BENZOL AND FOR BENZOLIZED CREOSOTE.

THE Corporation of Walsall invite
TENDERS for about 6000 Gallons of 90 per cent.
BENZOL for Enriching purposes; and also TENDERS
for about 2000 Gallons of BENZOLIZED CREOSOTE,
free from Naphthalene, to be delivered during One
Year from the 1st of July next, in Drums or in Casks,
to the Corporation siding at the Pleck Gas-Works
Walsall.

Further Particulars may be obtained from the En-
gineer, at the Pleck Gas-Works, Walsall.

The Corporation do not bind themselves to accept
any Tender, and they reserve the right to divide the
Contract between several Firms.

The Corporation will not accept the Tender of any
Person or Firm paying less than the Standard Rate of
Wages to their Workmen.

Tenders, sealed and marked outside "Tender for
Benzol," or "Tender for Benzolized Creosote," are to
be sent to the undersigned not later than Saturday,
the 21st of May inst.

When tendering for the Benzol, the amount of purity
should be stated.

JOHN R. COOPER,
Town Clerk.

Council House, Walsall,
May 2, 1910.

BRECON GAS COMPANY.

TENDERS are invited for the Supply of 2500 Tons of COAL, as required, to include Large, Cobbles, Nuts, Peas, and Slack, delivered at Brecon Railway Station, Twelve Months ending June, 1911—Expert Analysis to accompany each Tender, and Price quoted to be Net Cash Monthly, 2240 lbs. to the Ton.

The Company do not bind themselves to accept the lowest or any Tender.

Tenders to be sent in on or before noon the 31st inst., endorsed "Tenders for Coal," and addressed to the Chairman of the Company, Lion Chambers, Brecon.

OMAGH URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive **TENDERS** for the Supply and Delivery of 2000 Tons, more or less, of Best Screened GAS COAL, for delivery during the Year ending June 30, 1911.

The Council reserve to themselves the right to divide the Contract as they may think fit.

Tender Forms may be had on Application to the undersigned, to whom all Tenders are to be sent, endorsed "Coal," on or before May 31, 1910.

Wm. M. DOWNIE,
Manager.

Gas Office, Omagh,
May 4, 1910.

CIRENCESTER GAS COMPANY, LIMITED.

THE Directors are prepared to receive **TENDERS** for the Supply of 4000 to 5000 Tons of GAS COAL to be delivered free to their Siding at the Watermoor Station of the Midland and South Western Junction Railway Company during the Twelve Months commencing July 1, 1910, at such times and in such Quantities as may be required by their Manager.

Tenders to be sent in by June 2 next, Forms for which can be obtained from

J. P. BEECHAM,
Secretary.

12, Silver Street, Cirencester,
May 9, 1910.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the Supply of 12,000 Tons of COAL and 500 Tons of CANNEL.

Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager.

Sealed Tenders, endorsed "Coal," to be sent to me not later than Thursday, May 12, 1910.

By order,
Geo. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
April 20, 1910.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive alternative **TENDERS**, on Forms to be obtained at the Office of the Gas and Water Manager, for the Supply of Screened GAS COAL and CANNEL for One, Two, or Three Years from the 1st of July next.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office, not later than Twelve o'clock noon on Tuesday the 24th of May, 1910.

The lowest or any Tender not necessarily accepted.
By order,
L. HEWLETT,
Town Clerk.

Town Hall, Barrow-in-Furness.

THE Proprietor of the British Patents No. 8687, of 1908, for "LAMP BURNING WITH HYDROCARBON OR OTHER VAPOURS," and No. 10,736, of 1908, "IMPROVEMENTS IN PETROLEUM AND LIKE STOVES," desires to SELL his Patents or to grant LICENCES thereof.

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THE Owner of Patents No. 90, of 1906, and No. 14,189, of 1906, relating to "Improvements in Tubes made of Spirally Wound and subsequently Bordered Metallic Strips and Process of Manufacturing the same," and "Improvements in Machines for the Manufacture of Tubes from Metal Strips," desires to Negotiate with Manufacturers with the view of Granting LICENCES under them upon Reasonable Terms. For Information, Apply to LLOYD WISE and Co., Chartered Patent Agents, 46, LINCOLN'S INN FIELDS, W.C.

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A List of Books, Pamphlets, and Important References Prior to the Year 1840.

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MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

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By order of the Directors of the

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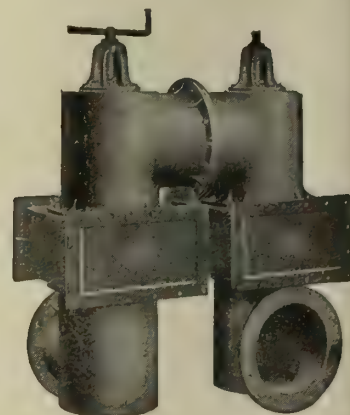
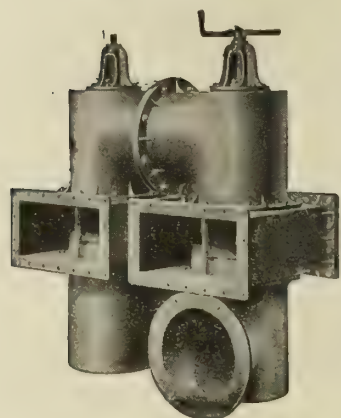
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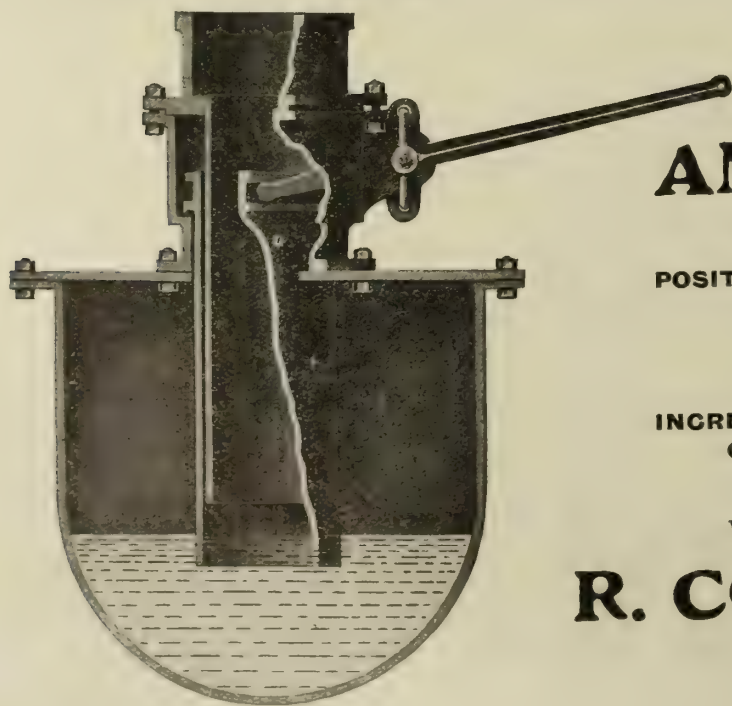
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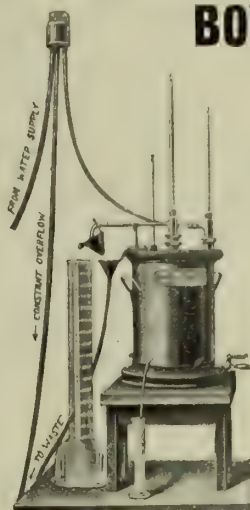
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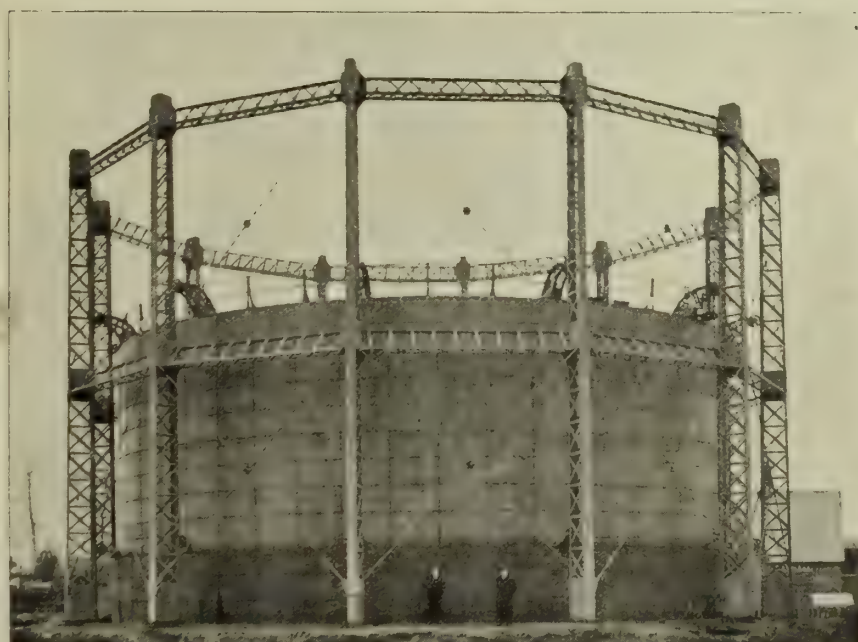
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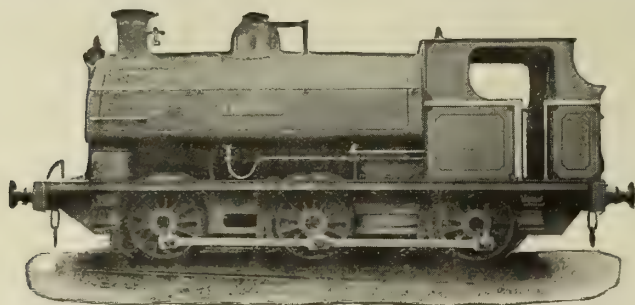
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Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 8 ins. |
| 2-light | . . . | 2 ft. 4 ins. |
| 3-light | . . . | 2 ft. 4 ins. |
| 4-light | . . . | 2 ft. 7 ins. |

Width over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in. |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

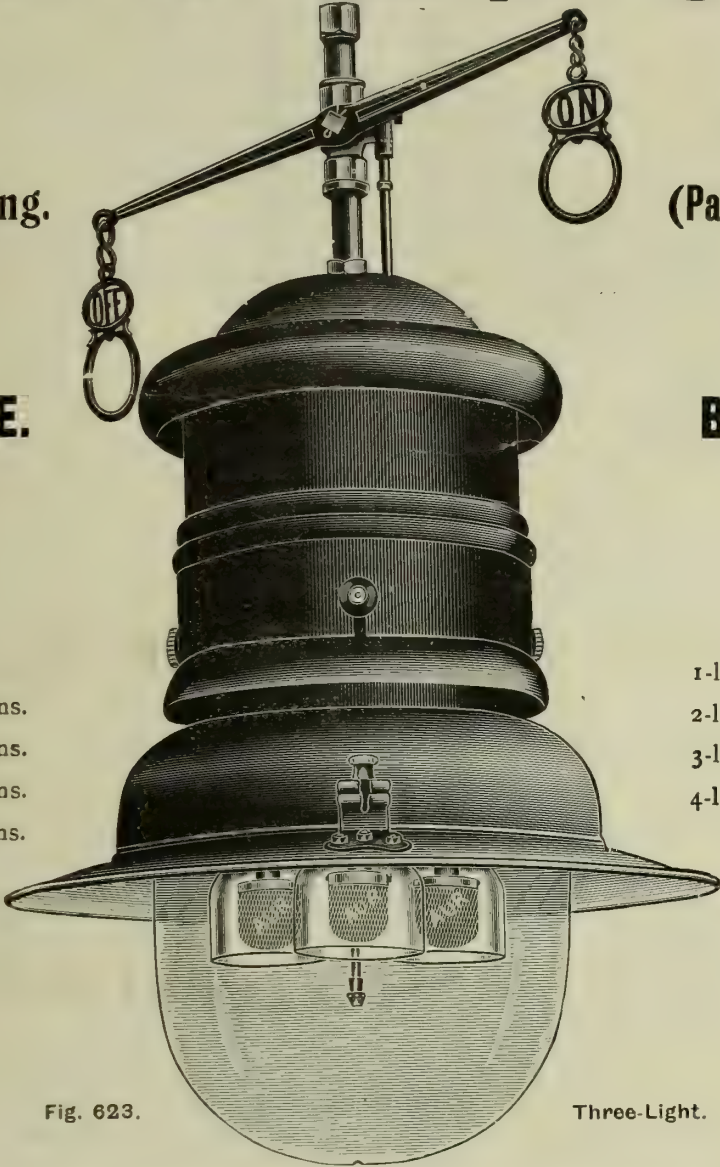


Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

| | Gas per hour. | C.P. | Steel. | Copper Case. | | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
| 2-light | 8 feet | 260 | 47/6 | 6/- extra. | 4-light | 16 feet | 550 | 72/6 | 9/- extra. |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

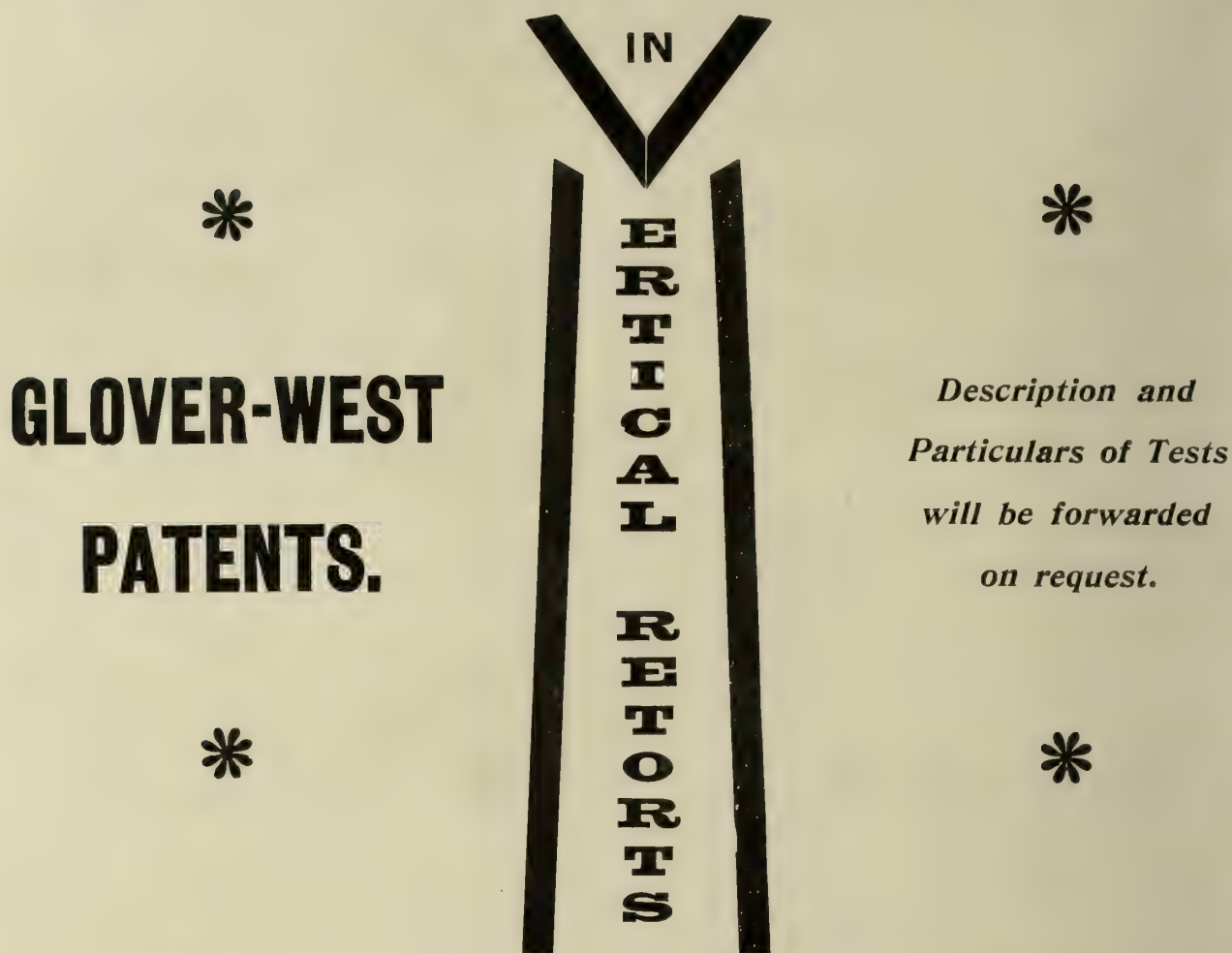
Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

| | 1-Light. | 2-Light. | 3-Light. | 4-Light. | | 1-Light. | 2-Light. | 3-Light. | 4-Light. |
|-------------------------------|----------|----------|----------|----------|----------------------------|----------|----------|-------------------|--------------|
| Clear Glass Globes, each | 2/3 | 5/9 | 5/9 | 9/- | Wired Globes, extra | each | 2/- | 2/- | 2/9 3/6 |
| " " " In Case lots per dozen. | 19/6 | 57/9 | 57/9 | 93/- | Parabolic Reflector, extra | " | 3/6 | 6/- | 7/6 Not made |
| Case contains | 80 | 18 | 18 | 12 | Welsbach Mantles, each | | 6d. | subject as usual. | |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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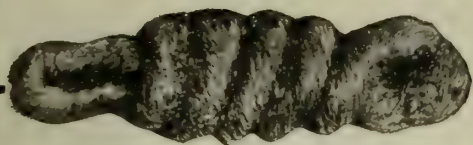
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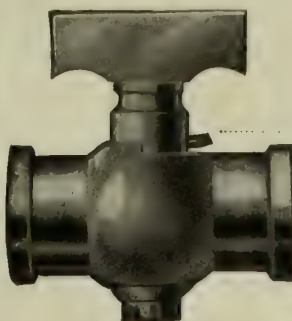


FIG. 1. The Old Style with the Old Trouble.
Note the Pin A.

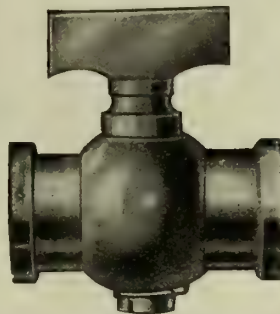


FIG. 2. Evered's Patent: "Safety Stop." No Pin.
No trouble.



FIG. 3. Underside showing "Safety Stop" in lieu of Pin.

EVERED'S PATENT "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

EVERED'S PATENT "SAFETY STOP"

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The projection shown in Fig. 3, marked B, working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

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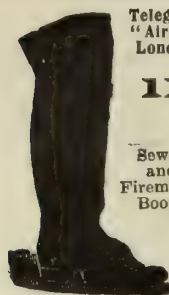
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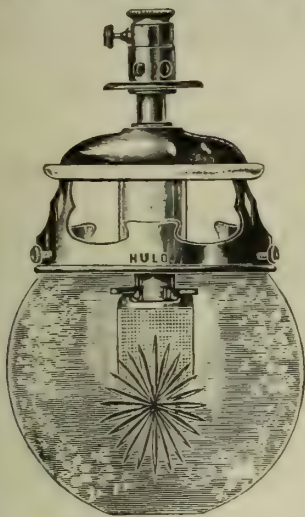
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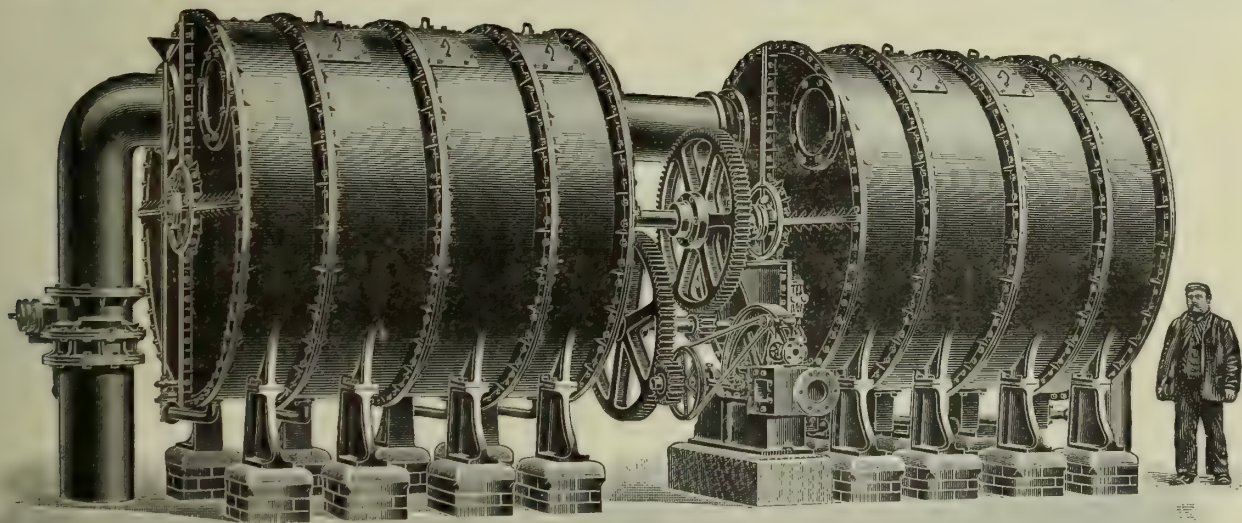


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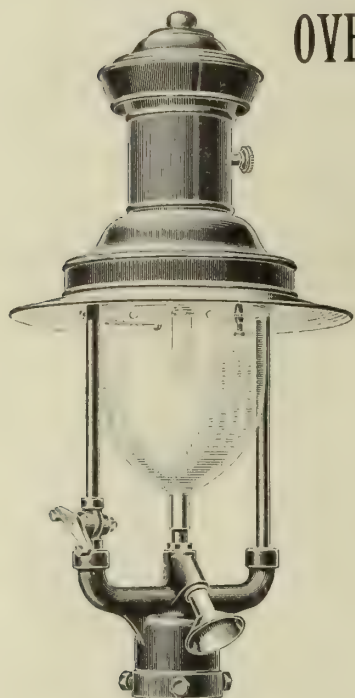


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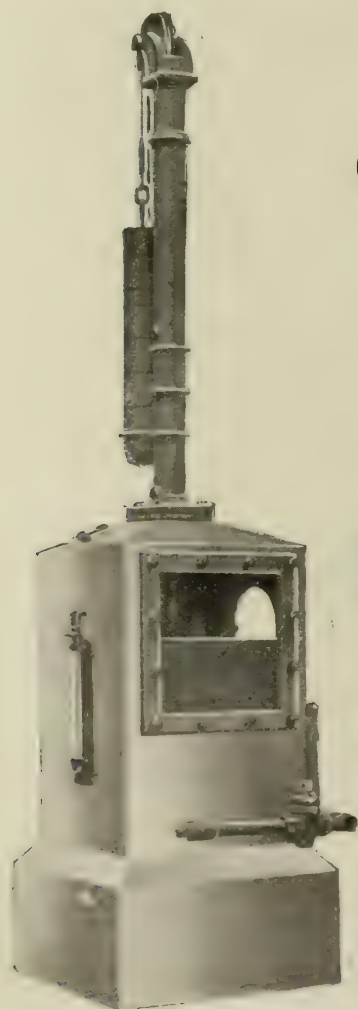
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THE JOURNAL OF GAS LIGHTING

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Vol. CX. No. 2453.]

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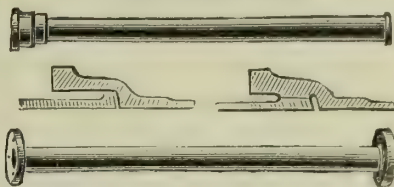
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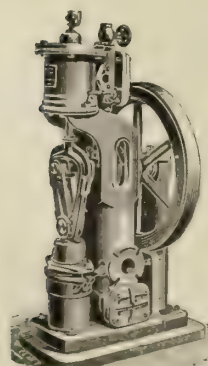


Fig. 703. "SINGLE RAM" STEAM-PUMP.

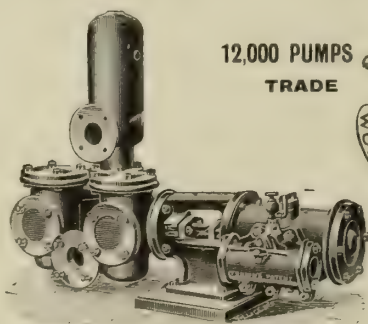


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

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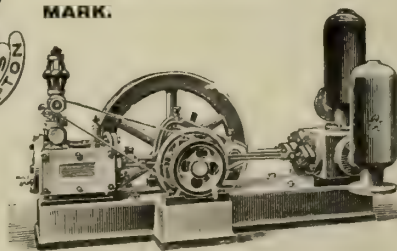


Fig. 688. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

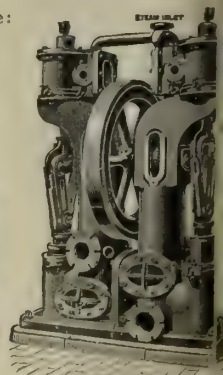
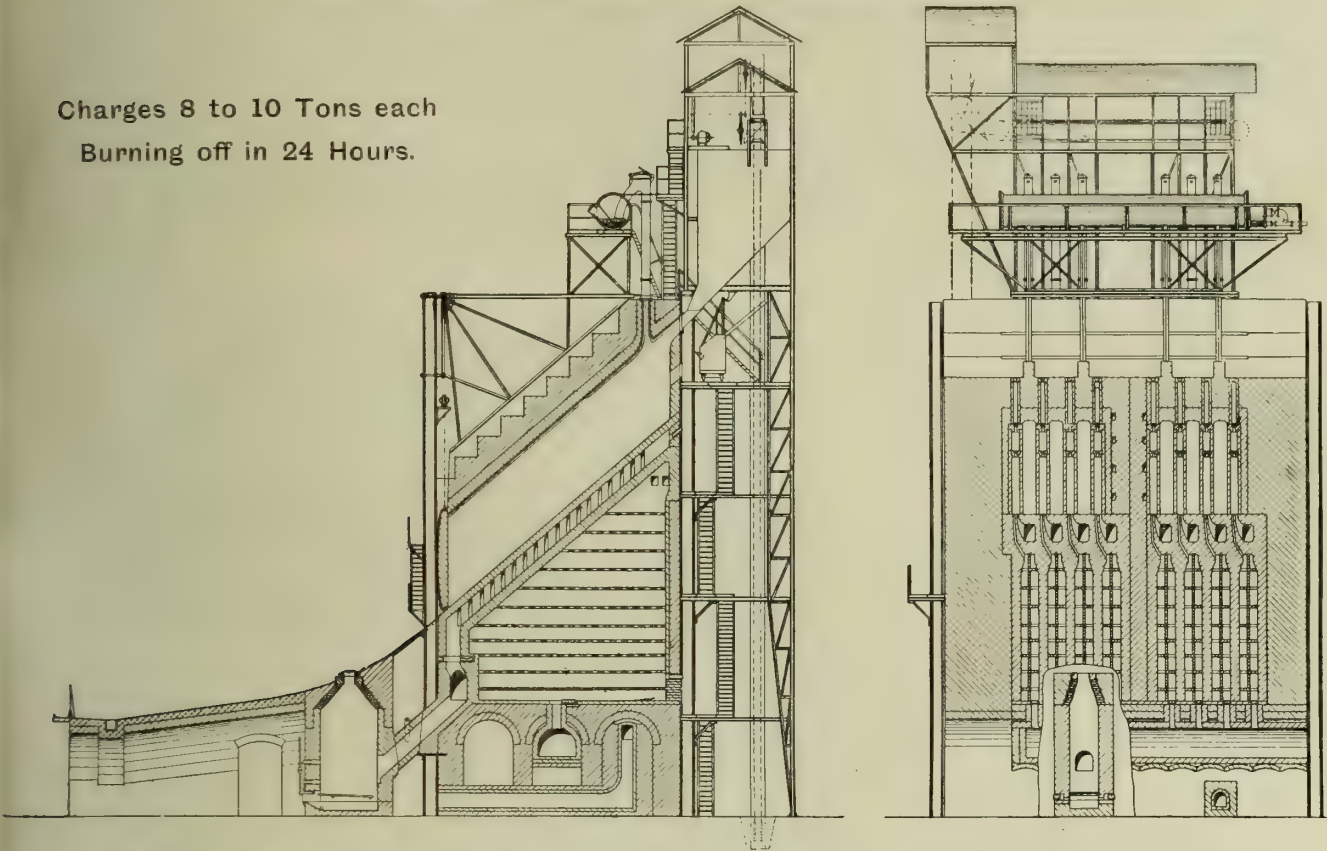


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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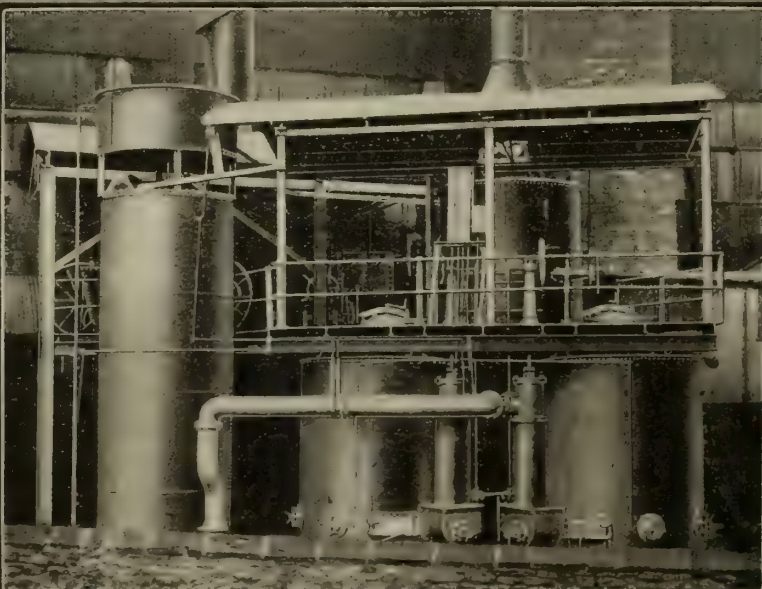
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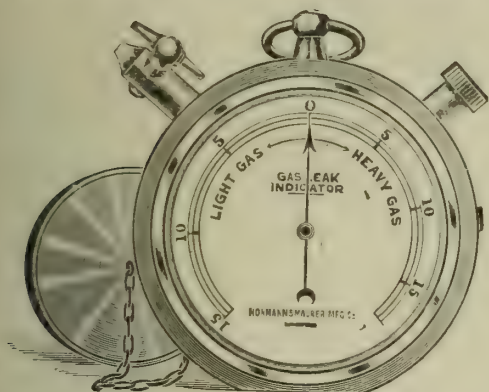
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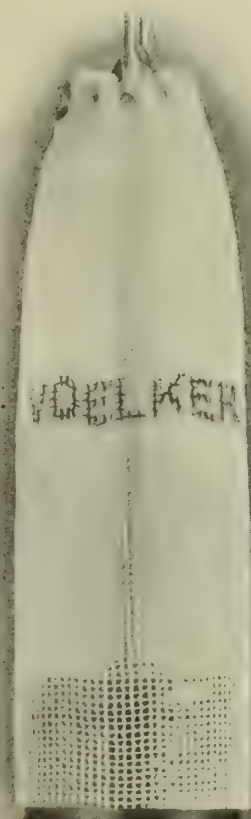
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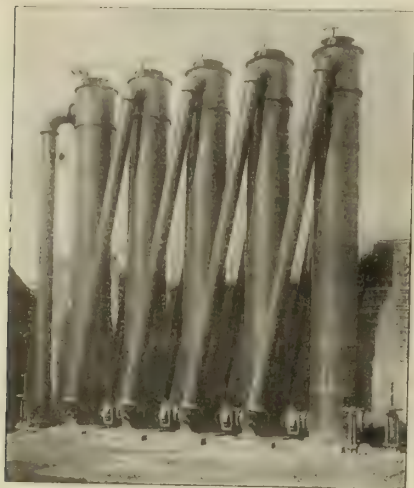
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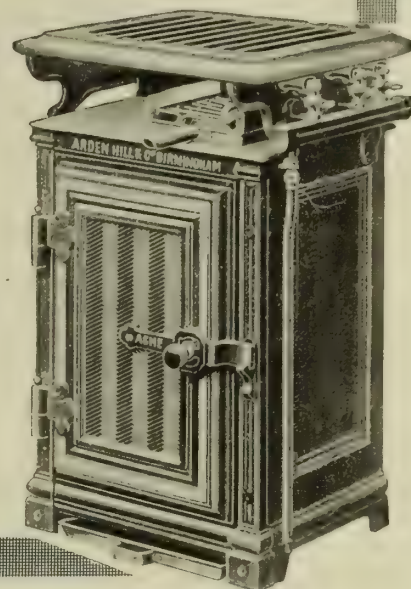
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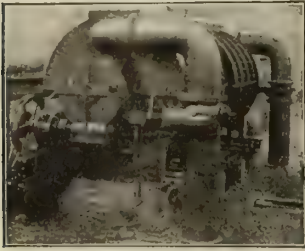
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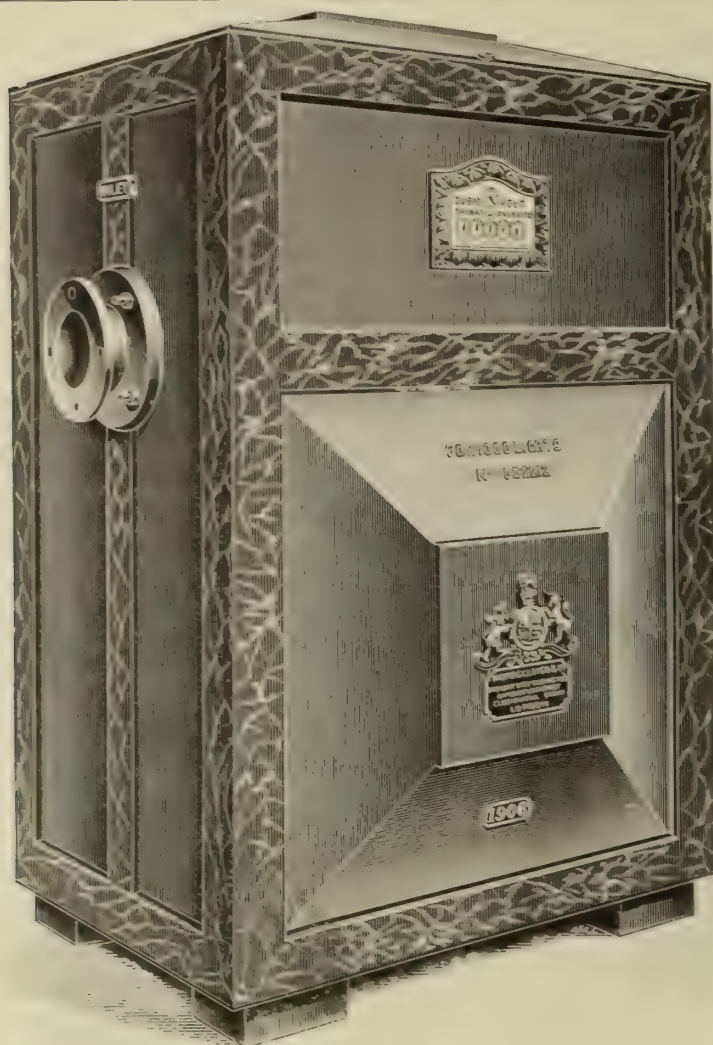
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VOL. CX., No. 2453.—TUESDAY, MAY 17, 1910.

EDITORIAL NOTES—GAS, &c.

Postponement of the Visit of our German Friends.

It had been hoped that next week the gas profession of this country would have been giving cordial welcome to a large and representative body of their German colleagues. The death of King Edward, however, has caused the visit to be deferred; but it is only a long-anticipated pleasure postponed for a time. The suggestion for postponement was spontaneously made by our German friends; and every patriotic and loyal British gas engineer will appreciate greatly the delicate consideration, the sympathy, and the tribute to union in sorrow that the simply-worded message from Dr. Bunte conveys: "German colleagues mourn with you the death of your great King Edward. We inquire whether our visit at the advised time is convenient." As the programme arranged for our guests would have been, and will be when now arranged, partly of a festive character, postponement was, under the sorrowful circumstance of a nation's mourning, the best possible course. One of the touching things about the calamity that has befallen the nation is the testimony to the power that the late King universally held over the hearts of people, and to the respect for him that extends through all civilized countries. His personal qualities were magnetic. In the name of the British gas profession, the German Association are thanked here (as they have been by the President of the Institution of Gas Engineers, Mr. James W. Helps) for their profound regard for the late King, and for their sympathy while the nation is in the shadow of a great sorrow. Of this we feel confident, that when our German friends are on their deferred visit among us, the sincerity and heartiness of their welcome will not be any the less intense than it would have been, but for misfortune, a week hence.

Burner Maintenance—A Central Publicity Agency.

THE examination, in the article last week, of the question of incandescent gas-burner maintenance, viewed in relation to current competitive conditions, brought us to certain conclusions, which, of course, are subject to modification on further change in condition. It was concluded that it is necessary for gas suppliers to take in hand the supervision of consumers' burners—initially of consumers who are in a position to afford electric lighting, and among whom are in the main found the consumers who will not give the little periodical attention that is necessary to maintain the efficiency of incandescent gas-burners; that the labour incurred in supervision should be provided free of charge, in so far as it can be regarded as "free" when the charge is included in the supply of gas; that mantles and glassware should, seeing that electric light users have to provide their own lamps for renewal, be charged for; but that this renewal material should be priced out at cost, so as to serve as an inducement to consumers to allow the gas suppliers to undertake the work of maintenance, and to obviate the objectionable notion that has obtained currency in some districts that the gas suppliers make a profitable thing out of the sale of mantles and glassware, under the guise of "free" maintenance.

Having arrived at these conclusions, the financial side of the question has to be considered. The inquiry has been raised by a few gas men, Can we afford to do anything in this way for the consumers? And we have, on a previous occasion, submitted the inquiry in another and more emphatic shape, Can we afford not to do something? Many gas men have come to the conclusion that trifling with the question will not do; that the minimum effort is free supervision; and that the expense of it must be looked upon as the price of the insurance or protection of the business. Following this to its logical conclusion, it may be held that, whatever is done that is successful in retaining business, is to the

advantage of existing consumers and capital interests. Retention of business means stability; its loss is an element of weakness. The weakest point in any business is that which requires the most careful guarding; and that point in our lighting business is the indifference of many consumers to the periodical attention that secures the maintenance of an economical illuminating efficiency. It is a question that must not be considered by gas purveyors in any narrow spirit. Evolution is continuous in the gas industry, as in other branches of the Arts and Sciences; and our own courses of action have to be shaped accordingly, and kept in parallel with all affecting development. The lesson is one to which we must pay heed. If expenditure is involved, it cannot be helped. There must be protection, and the cost of it must be faced. It is submitted that any revenue charge for this purpose is a deterrent to the lowering of the price of gas; and that it would be better to make a separate charge for burner supervision. We decline to admit the former as a fact in its ultimate effect. If a separate charge is made for supervision, few consumers will take advantage of the scheme; the injury arising from consumers' neglect will become chronic; and a larger proportion of the lighting business will go over to the competitor. The cost of "free" supervision would be comparatively small per 1000 cubic feet. By including it in the price of gas—incandescent gas lighting is so cheap—there will be no question on the part of the consumers; and the satisfaction engendered, inuring to the retention and extension of business, must in the end recoup the outlay. If peradventure it should not do so, then better the loss in the shape of expenditure than in custom. All gas consumers, more especially under company service, are materially interested in the continued progress of the gas undertaking; not in any set-back. And economical service for all classes of consumers—lighting, heating, and industrial—will be best promoted by a reasonable scheme of protection of any one part, as called for by changed circumstance. It is also submitted that, under the rule of the sliding-scale, any scheme of the kind that defers even a penny reduction in price infringes the rights of the shareholders. We cannot help feeling—however true it may be as applied to the time immediately before us—that this submission is a little short-sighted. The same argument applies to shareholders as to the consumers; protection of business means protection of dividend and price. It is a matter of policy that has to be regarded in perspective, as well as from the standpoint of proximate effect.

There is another direction in which protection is necessary; and that is in respect of the organized work of the electricity industry in general advertising and in the production of popularizing literature. It has for some time been a complaint in the organs of the electricity industry that, in its propaganda methods, it has followed in the wake of the gas industry. But in this particular, the gas industry has allowed the electrical industry to have precedence. This is the gas industry's own fault. In 1907, long before any co-operative movement was spoken of in the electricity industry, Mr. F. W. Goodenough, Chief Inspector of the Gaslight and Coke Company, strongly advocated, at the Dublin meeting of the Institution of Gas Engineers, a scheme of mutual publicity and defence. The idea, however, fell flat; and—mark this!—what was not then done by the gas industry has since been done by the electric industry. And the worst feature of it all is that we stand to-day without any effective means of taking counteracting measures, and of publicly combating misrepresentations. We must not be behind the electric industry in commercial strategy—that is to say, we must not be behind competitors in the good points of their commercial strategy, but we can afford to leave unimitated all kinds of disreputable misrepresentation.

This question of co-operative advertising and counteraction was also raised in the paper read by Mr. F. L. Wilmhurst at the Eastern Counties Association meeting; and the

necessity of a real movement in this direction was subscribed to by more than one speaker—more especially by Mr. J. W. Auchterlonie and Mr. R. G. Shadbolt. The former stated that the Board of the Cambridge Gas Company would be prepared to become contributors to any such scheme; and the gratifying intelligence was announced by Mr. Shadbolt that the Commercial Sections had recognized the importance of some agency being established for the purposes in view, and that, as a result, by the time of the June conference in London, a concrete scheme might be in readiness for consideration. Whatever is done should then be done promptly, so that the campaign may be started before next lighting season—a campaign above reproach and suspicion, and free from the blemish of misrepresentation. But gas-works administrators must not expect that this work is going to be done for nothing, nor must they anticipate that any central publicity authority that may be formed will pay special attention to those gas undertakings, the managements of which refuse their support. The work of advancing and protecting interests is not a matter that should be subservient to parsimony; and what is done now must be done well to be effective. And to do the work well, it is essential there should be a large and encouraging financing of a central agency of the kind projected—a central agency that can do much more by joint support than individual undertakings can alone. This is not the time for being penny wise and pound foolish in this matter; nor for our gas administrators in their commercial ways to live in the past, and not in the present.

The Birmingham Appointment.

THE announcement made in last week's issue as to the recommendation of the Gas Committee of the Birmingham Corporation that Mr. R. S. Hilton, Manager of the Clay Cross Coal and Iron Works, be appointed (at a salary of £1500, rising to £1600 at the end of twelve months) to the office of Secretary and Manager of the Department rendered vacant by the death of Mr. G. Hampton Barber, has settled much speculation and curiosity regarding the final choice from among those who were known to be near the goal. We heartily congratulate Mr. Hilton upon his success; and the Gas Department upon (subject to the approval of the City Council to-day) securing the services of one who, independent of the gas industry, has yet secured large experience of the markets in which the Committee have their most important dealings. But while we congratulate Mr. Hilton, it must be said that it cuts against the grain in the official ranks of the gas industry to see this particular appointment going outside. However, the reasons that have influenced the selection of a man for the office not technically trained in the gas industry, are more local than otherwise. There were circumstances existing that persuaded several, with considerable experience in the industry both technical and commercial, who might possibly have sought the position, from refraining to do so; and there was at least one actual withdrawal of candidature on the same grounds.

The whole position is governed by what was done some two years or so ago at the time of Mr. Henry Hack's retirement from the Chief Engineership, when each Works Superintendent was placed in full charge and responsibility of his station (without a technical head over the whole). The policy of divided responsibility without a technical chief is not one for general acceptance and application; and we are not going to turn our backs now on the views expressed, when the change was made at Birmingham, as to the general inexpediency of the policy. But we do most willingly and freely acknowledge that the technical results at Birmingham during the past two years show completely that the Station Engineers have worked—and that successfully—to prove themselves entirely worthy the confidence placed in them. That was where the Gas Committee, in making the new appointment, found themselves (as it were) on the horns of a dilemma. There were men with technical training well suited for the vacant position; but the Works Engineers claimed, and with reason, that the new policy had worked well, and what more natural than that they should desire to remain wholly unfettered by any technical domination from the occupant of the office at the Town Hall. As they stand at the present time, they have liberty in their work, and opportunities for proving their own abilities; and they do not care now to give up their independence as Station Engineers and Managers, and be content to work in the

shadow that might be cast over them by a Secretary and Manager with full technical competence. Whatever one's opinions may be on the general question of policy, one cannot help feeling a great deal of sympathy with the views on this particular matter of the Birmingham Station Engineers. They had much at stake; and we congratulate them on what is believed to be, from their point of view, a happy issue out of a matter that must have been disquieting to them while it hung in the balance. They may be trusted to continue to do their utmost to justify the reliance reposed in them by the Gas Committee and the City Council.

A Need in South Wales and Elsewhere.

WE cannot appraise too highly the practical move that the Welsh Association made at their meeting on Wednesday last, at Cardiff, in instructing the Council to appoint a Sub-Committee to seek the best means of providing facilities for the technical education, as distinguished from practical work, for the young men of the industry in their area who aspire to a full measure of competence in the altered circumstances of our times. The subject was introduced in a thoughtful paper, not overweighted with the trite argument which is generally accepted as true if not universally carried into practice, by Mr. H. D. Madden, the Engineer of the Cardiff Gas Company. He titled his paper "The Need of the Gas Industry in South Wales;" and the need of the territory covered by the Association is also that of many other extensive districts not blessed with readily accessible large centres boasting properly equipped scholastic establishments for imparting special knowledge on the higher planes that may be, and indeed must be, applied to the practical ends of our industrial work. The young men of the gas industry in a district like South Wales labour under peculiar disadvantages in the matter of obtaining requisite scientific education. For the greater part, the undertakings are not large; and the works give occupation to (except the distribution department) but one or two young fellows who endeavour to qualify themselves, under the adverse circumstance of restricted opportunity, for the more responsible posts. To them distance, railway fares, and time are barriers to obtaining all the benefits that would be theirs if they, by their collective numbers, could justify the extension of the curriculum of the centres of technical learning so as to embrace them. Technical colleges naturally lay down their educational plans on lines that will attract the greatest number of students; and the industries that are most prolific in their yield of students are those that get their special requirements in the matter of instruction catered for. A district like South Wales can really offer, under present circumstances, little inducement to the technical colleges in Cardiff and Swansea to make special provision for the students of the gas industry. A technical college wants some encouragement, and some guarantee as to a fair permanence, before it can be expected to launch out into new work in this way. There is the point that requires very earnest consideration and attack; and the point is governed by the, under their existing conditions, disabilities of the would-be students.

The Committee will find they have a big task before them; but it is a task that, from the very difficulties with which it is surrounded, should impel to very serious effort. It seems to us the first information to be collected by the Committee refers to the facilities that the technical schools of the area can offer; and the conditions on which they would be prepared to enter upon the new branch of work. Having ascertained this, the next thing to be done is of an even more serious character; and that is to remove the obstacles that lie in the paths of those who desire to be the students. These obstacles can only be cleared away by those in administrative capacity; and it is the governing body of every gas undertaking who have to be convinced by their technical officials (who are already themselves convinced) as to the need of rendering assistance in the attainment of desirable qualifications by the young men on whom executive burdens will devolve. The basis of the gas industry's work has broadened and deepened; but we have not traced any general broadening or deepening of receptive power on the part of our gas administrators that has enabled them to embrace the fact that upon them rests responsibility in rendering aid to produce the utmost efficiency in the ranks of those who have to deal, or will have to deal, with circumstances that have developed, and continue to develop, out of all character with the conditions

of the past. We have used the word "general," because we are pleased to say there are many and prominent exceptions. But beyond them custom seems adamant in the administrative ranks; and what was good enough in a bygone time seems to them good enough now. That is a hardened belief that will require much to shatter it. And to make a success of their work, the Sub-Committee will find that this is one of the primary matters that will have to be seriously tackled. What they have to do is not to look at the question generally from the point of view of the most favoured conditions of the best situated gas undertakings in the area, with probably the most open-minded and progressive boards of directors, but from the other extreme. We wish them well in their work, and can promise them that any assistance we can give, through our columns, shall be rendered willingly and freely in this, in our judgment, most important cause.

Refractory Material Destruction.

WHEN Mr. F. J. Bywater read his paper on "Refractory Materials" before the Institution of Gas Engineers in 1908, he did—no matter whether or not all professionally engaged in gas manufacture agreed with him *in toto*—an exceptionally good service to the gas industry. Since then more attention has been accorded the question than ever before. Those manufacturers who had not done so previously have realized (though they may have been slow to act upon the knowledge) that conditions have changed under which their goods are used, and that a policy of *laissez faire* on their part will not promote commercial security. Gas engineers, too, have recognized more deeply the importance of the matter to them, in view of the heavy expenditure entailed in retort-settings and their upkeep. It passes strange that on the surface there seems little willingness on the part of some of the manufacturers to publicly admit a mutuality of interest, and to give the evidence of a desire to comply, in every respect, with the demands of changed circumstance. A short series of articles is being contributed to our pages by Dr. Alfred B. Searle, on "The Causes of the Destruction of 'Refractory Blocks and Retorts,'" and our contributor is just as piquant as Mr. Bywater was two years ago in his denunciation of manufacturing firms who have failed to grasp, or who have ignored, the significance on their own work of the more stringent temperatures, and the greater physical endurance required, under the conditions of use of their own productions. Such changes in use are not met, in this case, by a sort of idolatrous adherence to the mixtures and methods of half-a-century ago. Mr. Searle does not put upon his indictment a universal appositeness; but he releases few from his accusation of a propensity to continue to dwell in the dark ways of incomplete knowledge regarding the best means of making productions suitable to contemporary purpose. This is seen in the pregnant lines: "In no branch of clay working is progress more needed than in the manufacture of retorts and blocks for the making of gas; and while there are a few manufacturers who are studying the subject in a thoroughly systematic and scientific manner, and who are willing to pay well for helpful advice and suggestion in this direction, the majority of manufacturers are trying to puzzle out a way for themselves—never noticing that they have not the necessary appliances, nor the needed training for carrying out highly technical and very delicate research work."

But Mr. Searle does not come forward with the view of merely whipping, by animadversion, the manufacturers of fire-clay goods into a more studious and scientific frame of mind (so that their fortunes may not be dependent alone on chance) in connection with the production of their goods. He offers them various suggestions, both explanatory and useful. There is no question as to the difficulties that besiege the manufacturers; but the critics are all agreed that insufficient work has been done to subjugate them. The difficulties and the problems are manifold; but that is not to say that they are altogether beyond the composing power of human effort, aided by Science. We know that they are not. It is equally a matter of knowledge that it is a case of every manufacturer for himself. Old methods and old convictions have to be thrown to the winds; and involved questions have to be faced. The chemical constituents of fire-clay have to be found and frequently checked; likewise their quality has to be determined with recurrent checkings; and proper mixtures have to be decided for the production of goods for specific purposes, requiring dissimilar degrees of

refractoriness. There has to be discarded the notion that refractoriness has some direct relationship with the percentage of silica a clay contains. There is warning against such unwarranted assumption in both the article by Mr. Searle and in the paper read by Mr. Bywater. There are many other considerations—for instance, the varying percentages of impurities in the clays—such as the authors put their fingers upon in their respective writings. The tests for heat resistance are treated of by Mr. Searle; but, from the standpoint of the user of fire-clay products, such tests are only of value within limits. Actual conditions of use, for example, in a retort-setting are much more drastic in character than the conditions obtaining in the mere submission of a piece of clay fashioned as a Seger cone to a more or less high temperature. This is recognized by Mr. Searle, when he says: "Many clays may pass the test for refractoriness, and yet may fail when made up and used. This is not 'due to faults in the test; but to the much more trying 'conditions of actual employment.'" What is required is some assurance that a retort, a fire brick or block, and such-like will (as our contributor puts it) withstand the action of a high temperature under the latter circumstances, which are often widely different from those under which the material is tested for its refractory value.

The Profits of a Promotion.

The promotion of the Kent County Gas Company comes to light again. The effects of these fraudulent promotions persist long in existence. The return to notice of the Kent County Company, however, has had a good result, in that a pronouncement has been obtained from Mr. Justice Phillimore regarding the profits made by the promoters; and his decision would apply to many other promotions of gas and water companies of recent years, which have, one by one, been added, or are becoming ready for adding, to the heap of wreckage. The question for the decision of the Court was as to whether there had been a breach of trust on the part of the man Darby, as a promoter of the Company, which rendered him liable for damages to the amount of the profit that he received on the promotion, less the promoting expenses, and the amount paid on account of the guaranteed dividend. The settlement of the question of liability rested on the point as to whether or not there should have been disclosure of the amount of profit made. The purchase of the Goudhurst works, which represented the lock, stock, and barrel of the Kent County Company, was effected by the promoters for £2350; and they sold the concern within a few months for £21,800. Mr. Justice Phillimore's view and decision are neatly concentrated in the one sentence, "If ever there was a case in which undisclosed profit ought to have been disclosed, this was one." The claim was therefore made out; and this will not add to the comfort of certain other promoting cliques of which the gas industry has had more than its full share.

Gas Profits at Burton-on-Trent.

It was indeed an excellent report that Alderman Lowe, the Chairman of the Burton Corporation Gas Committee, had to lay before the Town Council last week. The past twelve months have established a record in profit making; the surplus being £12,393, or £3660 in excess of that for the preceding year. Of this, £7000 is to be handed over in relief of the rates—a really magnificent sum, representing, as the Chairman stated that it does, a charge of no less than 5d. per 1000 cubic feet on the gas consumers. The man who does not use gas at Burton, may well thank the one who does for thus shouldering a portion of the burden which should in strict justice be borne by the non-consumer. However, this drain on the undertaking is likely to be less objected to in Burton than in some other places—though, of course, the question of the soundness or otherwise of the principle is not thereby affected—as the Chairman was able to hold out strong hopes (while declining to make any definite promise) of an early concession in regard to the charge for gas. The policy of supplying stoves free to prepayment consumers is stated to have been so successful that no turning back is likely in this direction. In fact, the popularity of the prepayment meter here, as elsewhere, continues to strikingly manifest itself. Another point on which the Chairman touched with evident gratification was with reference to experiments lately made with gas-works coke and breeze by one of the local brewery

companies. Its use in this connection, for boilers and coppers, has proved to the company in question that it is as efficient and as cheap as other fuel; and a contract for a supply during the current year has now been entered into by them. As Alderman Lowe emphasized, this is a matter of importance; for such contracts are of advantage to the brewers and to the town as a whole by doing away with the smoke nuisance, and to the gas undertaking as affording another outlet for their coke. Both the ratepayers and those responsible for the management are to be heartily congratulated upon the position of the Burton Corporation Gas-Works. Indeed, one member clearly showed the satisfactory aspect of affairs financially, by the remark that, taking into consideration the redemption fund and the reserve fund, the undertaking was at present virtually out of debt, though there were loans which would not expire for some three years.

Proportional Representation in Boroughs.

A Bill has lately been introduced by Mr. Aneurin Williams, who is supported by Lord Hugh Cecil, Sir Alfred Cripps, Sir Henry Kimber, Sir Mark Stewart, and other members, to authorize the introduction of proportional representation in municipal elections. At present each ward of a municipal borough, or the whole borough if not divided into wards, elects several councillors. In London, as a result of orders made by the Local Government Board, the elections are triennial, and affect the whole of the Council; but in provincial boroughs one-third of the Council are elected every year. In all cases a voter can give as many votes as there are vacancies, but not more than one vote to any one candidate. A bare majority of electors can thus secure all the vacant seats. It is proposed to allow municipal bodies, by a resolution of a three-fifths majority, to alter this system so as to allow each voter to give one vote only, and thus enable any considerable fraction of the electorate to return one member. In provincial boroughs adopting the Act, the Metropolitan system of triennial elections would be substituted for the present plan. The alteration would in the first instance take effect for three years only, but could be continued in force by two successive resolutions at intervals of three years. The last resolution would be laid on the table of both Houses of Parliament, and it could be annulled by an address of either House. On the system of voting proposed, the number of votes necessary to secure the return of one member is approximately the result of a division of all the votes cast by the number of vacancies, and is called the "quota." In order to prevent waste of votes, provision is made for the transfer of votes in excess of the quota given to any one candidate, and of votes given to candidates whose supporters are less in number than the quota. Such votes are transferred to the candidates whom the voters indicate on their ballot papers as next in order of their preference.

The Société Technique and the Late King.

The President of the Institution of Gas Engineers (Mr. J. W. Helps) received last Saturday morning from the President of the Société Technique du Gaz en France (M. Godinet) a letter expressing the regret of the Society at the severe loss which has plunged this nation into mourning. The President recalls the circumstance that the name of Edward the Seventh was acclaimed by the members of the Society as cordially as by their English colleagues on the occasion of their memorable reception two years ago; and he then proceeds: "To-day we assure you of our profound sympathy; and we bow respectfully before the tomb of a great Sovereign—a loyal Peacemaker—who leaves in France ineffaceable memories." Mr. Helps at once replied to this sympathetic letter.

Robert Dempster and Sons' Conveying Plant.

The gradual replacement of manual labour by mechanical appliances for the conveyance of material in gas-works renders it necessary for every gas manager to make himself familiar with the various kinds of plant in use for this purpose. To assist him in so doing, Messrs. Robert Dempster and Sons, Limited, of Elland, have issued a new catalogue dealing specially with the branch of their business connected with the elevation and conveyance of materials. As the catalogue is a bound volume of more than 400 large pages, most of which contain illustrations, its production must not only have entailed much thought, but considerable expense. There are 24 sections, the first nine of which are devoted to plant for the conveyance of material; the remaining sections dealing with aerial ropeways, hoists, waggons, power-transmitting appliances, &c.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 456.)

THE tone and tendency of the Stock Markets last week were quite favourable. In the state of general unpreparedness of the whole community for the saddening intelligence of the previous Friday, prices all round had been freely lowered as a measure of caution; for it was felt that time was needed for reflection and the recovery of calm. That this state had been attained was at once evident on the re-opening of the Exchange on Monday. Without abatement of mourning for him who had gone, there was a universal feeling of confidence in the new régime. Thus encouraged, the markets became firm and cheerful; and prices were put up again to the level from which they had been displaced, and higher in some cases. Government issues were strong. Consols rose $\frac{1}{8}$. Railways were full of rise, though they overran the mark a little before the close. The Foreign was good, and almost everything was better, except drapery and other undertakings most affected by the arrest of the London season. The tide was still rising on Tuesday, aided by the promising aspect of the fortnightly settlement. Consols were $\frac{1}{4}$ higher, and Railways had got over their little check of the day before. But in the fashionable speculation there was irregularity. On Wednesday, several minor factors co-operated to promote the cheerful feeling. The chief departments were very firm. On Thursday, further advances were made in many markets, though the last prices were not quite the best of the day. Consols lost $\frac{1}{8}$, owing to a tightening of discount rates. On Friday, business dwindled to light proportions, in view of closing for Whitsuntide. Consols were firmer; but there was no great movement anywhere. In the Money Market, for the first half of the week, the supply was abundant, and terms for short loans and discount eased away materially. But on Thursday a change supervened. Business in the Gas Market was only moderate; but the tone generally was firm, and there was but little change. In Gaslight and Coke issues, the ordinary was very steady—all transactions being within the limits of 103 $\frac{1}{2}$ and 104 $\frac{1}{4}$. In the secured issues, the maximum made 89 $\frac{3}{4}$, the preference 104 $\frac{5}{8}$ and 104 $\frac{3}{4}$, and the debenture from 82 $\frac{1}{4}$ to 82 $\frac{3}{4}$. South Metropolitan was firm at 120 $\frac{1}{2}$ to 121 $\frac{1}{4}$. In Commercial, the 3 $\frac{1}{2}$ per cent. was done at 104 $\frac{1}{4}$ and 104 $\frac{3}{4}$. Among the Suburban and Provincial group, Alliance and Dublin fetched 83 and 83 $\frac{3}{4}$, Brentford new 189 $\frac{1}{2}$, South Suburban 121, and Wandsworth 140. In the Continental companies, Imperial was done at from 181 $\frac{1}{4}$ to 182 $\frac{3}{4}$ *cum div.*, and at 178 and 178 $\frac{1}{2}$ *ex div.* The debenture realized from from 94 $\frac{1}{2}$ to 95 $\frac{1}{2}$. Union was done at 99, European fully-paid at 24 $\frac{5}{8}$, and Malta at 5 $\frac{1}{4}$ special. Among the undertakings of the remoter world, Bombay new changed hands at 5 $\frac{1}{4}$, Primitiva at from 7 $\frac{3}{4}$ to 7 $\frac{1}{2}$, ditto preference at from 5 $\frac{1}{4}$ to 5 $\frac{1}{2}$, ditto debenture at 99, San Paulo at 15 $\frac{3}{8}$, and ditto preference at 11 $\frac{3}{8}$ and 12 $\frac{1}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Penalty or Preventative—Local Government Board Requirements—
More Organization—Gross Profits and Gross Management—
The Tables Turned—Electric Lamp Ratings.

ONE of the things that have made our friends of the electrical industry stand agape over the Westminster lighting contract, is the temerity of the Gaslight and Coke Company (though they did, and naturally, try to get an abatement from 5s. to 6d. per lamp per night) in taking the contract with the first-named penalty attaching to it. The fact shows the confidence of the Company; but the electricians are shouting at them from all quarters, "You cannot do it." There is a remark in the "Electrician" with which, however, we are in total agreement; and it is that the 5s. per lamp per day, when applied to the lower candle powers contracted for, is an exorbitant charge, and the punishment is immensely disproportionate to the crime. It almost looks vindictive. There has been much written of late years as to fair conditions of contract as between all parties. Sir Alexander Kennedy was talking of it in his address when President of the Institution of Civil Engineers. The Institution of Gas Engineers and the Society of British Gas Industries have also been working with practical success at the question. Withal we have here what seems a severe punishment; but perhaps the Westminster City Council would say the fine must be regarded in the light of a preventative, as well as a penalty for misdemeanour.

It would be a very useful thing if some one would prepare a *vade mecum* relating to Local Government Board inquiries in respect of applications for loans for electric light undertakings. For it is a singular thing that with all the publicity that is given in the ordinary news channels from time to time, as to the requirements of the Local Government Board at such inquiries, many corporation officials, and particularly those of the electricity departments, do not appear to realize what is needed. There was an inquiry at Cheltenham just lately into an application for a loan amounting to £4000 for electricity purposes; and it transpired that there was an unexpended balance of £18,078 on loans previously sanctioned. No one could give Mr. H. Ross Hooper any information as to how this balance was arrived at; and consequently the Inspector expressed himself dissatisfied with the past method of keeping the accounts. It ought by this time to be

known far and wide that the Local Government Board require that capital accounts should be so kept that every sum sanctioned and allocated to a definite purpose shall have its history fully recorded in the books of the undertaking, and not form part of a pool from which the money is drawn at random for all sorts of purposes. The only way the Inspector could see out of the difficulty was by cancelling the balances of sanctions, and starting with a clean slate as from April 1 this year.

Another point upon which the Local Government Board have very properly formed an inflexible rule is in respect of only granting loans for new plant when the local authority have fully decided what work is to be done, and what it will cost. But at an inquiry into an application by the Southampton Corporation for a loan amounting to £16,000 for electric supply purposes, the Borough Electrical Engineer was unable to give anything but general information regarding the purposes for which the money was to be spent; and so the inquiry had to be adjourned *sine die* for the production of more positive information. At both the Southampton and Cheltenham inquiries, the old question of paying for meters out of revenue rather than capital, in accordance with the views of the Local Government Board, was brought up; and the Corporations were asked by Mr. Hooper to make this the practice in future, inasmuch as "electrical devices very quickly get out of date, and the system of charging meters to capital was not sound finance." In the case of Cheltenham, the Corporation had earmarked £1000 for meters; and this was reduced to £500—the other £500 being added to the amount needed for services. Another thing municipal electricity committees are fond of doing is to expend money before obtaining sanction to the loan. The Local Government Board are also looking after this matter with a little more severity; and a warning has passed between Whitehall and Bridlington to the effect that, if the Council proceed with extensions that are the subject of a loan application, and the Board decline a loan, the expenditure will have to be a charge on revenue. The Council are bold, and assert that they are going to run the risk. Reverting to the Southampton inquiry, the public lighting controversy was mentioned. There were ratepayers present to oppose the loan if any part of it was to be expended on public lighting; but the trouble was by-passed by a declaration being made that no part should be so expended. However, though the Local Government Board decree this and that, there are times when there is non-compliance with their decisions, and local authorities ride roughshod over them.

The electrical industry is interesting in more ways than one. From the first it has suffered from overdoing everything with which it has association. In the beginning of its history, capital expenditure was on a gorgeous scale; on its manufacturing side, mills and works sprung up with remarkable vigour, and now they are engaged in that exciting if unprofitable occupation of squeezing the life out of each other. The industry gave birth to quite a number of electrical papers, which—never mind, they are with us, and assist to make life pleasant. Then there is not a single branch of the industry that cannot boast of its own special organization. The engineers have an Institution; the municipal undertakings an Association; the manufacturers have their organization; and so have the electrical contractors. And yet the industry is not happy. Now a Committee has been formed, the primary object of which is to endeavour to secure united action with a view to the protection and advancement of the commercial and legislative concerns of the British electrical interests. We should have thought with the number of organizations in the electrical industry that another was not required for any purpose. It is singular that many of the present troubles of the industry have been brought about by excessive development of provision in all directions, and that it should be considered that his further development is required to help to right the errors of the past. The Committee, it is mentioned, in its collective capacity, stand under the banner of neutrality on all contentious matters. May they continue as they start.

There are inquisitive councillors at Hastings, and there are councillors who see a humorous side to a most serious state of things. A number of questions that were put to the Borough accountant regarding the finances of the notorious Electricity Department were answered at a recent meeting of the Council. The inquiries referred to the amount of the gross profit and its disbursement since the electricity undertaking, unfortunately for the ratepayers, was taken under the wing of the Council; and, among other points, information was asked as to the dividend that the gross profit would have allowed had the concern been in the hands of a company, without coming upon the ratepayers for a pennypiece. At the best, the dividends would have been shockingly emaciated and irregular ones; and last year there could not have been a fraction for the shareholders. This last announcement is reported to have caused laughter. What there is that is funny in a concern being so unproductive that nothing is available in the shape of the wherewithal to pay a dividend, we cannot see. But if the reporter was telling the truth, there are our own councillors at Hastings who find what to most people would be a source of deep regret a source of humour. But we do not see what benefit it is to the ratepayers to know that the gross profit (a large part of which has been provided by the ratepayers through expensive public lighting), since the purchase of the concern to March, 1909, has amounted to £81,187. Of greater importance to them is the fact that those who patronize the undertaking did not provide sufficient profit by £11,043, up to March, 1909, to meet the undertaking's liabilities; and that it is esti-

mated that last year will require a deficiency of £2000 to be made up. These sums the ratepayers have had to find, in addition to the heavy expense of public lighting by electricity. If there was a little less torpor among the general body of ratepayers, they would unitedly rise in revolt against this condition of things, instead of being cajoled by soft words, promises, and predictions from time to time as they are now. Wondrous things have been going to happen according to the mouthpieces of the Electricity Department; but as the succeeding financial statements have come along, promises have been found to be nothing but Dead Sea fruit. How the ratepayers must wish that some company had derived the lean dividends spoken of, rather than that they (the ratepayers) had had to meet from their own pockets the big deficiencies of municipal speculation and maladministration. At the same meeting at which these financial matters were up for discussion, the Council light-heartedly consented to a further extension of the electric cables without any guarantee of an adequate return from it; and contrary to the opinion of the Local Government Board, they passed a resolution for the conversion to electricity of a further 249 lamps. Here, again, the expenditure for this conversion is landed upon the ratepayers—not for their benefit, for the efficiency of the electric lamps is less than that of the gas-lamps, but solely to give the generating-station the dubious glory of turning out a greater number of units. The result of such foolishness is the frequent drain upon the ratepayers' pockets. How much longer are they going to meekly occupy the position of the unfortunate toad under the harrow? We shall see. While, however, the Corporation are making the ratepayers suffer in this way, they are also minded that the Gas Company shall (in addition to what they have to bear as large ratepayers), if the Council can get their way, have the heaviest possible load dragging at their heels. The Council have determined to again oppose the Standard Burner Bill; and it has rarely been our lot to read so ridiculous a medley of charges and requests as appear in their petition lodged against the measure. The House of Commons Committee will no doubt apply a little commonsense in adjudicating upon the position as affecting Hastings; and they may ask themselves whether the authors of this petition, in which is traced the simulation of righteous indignation, have any identity with the maladministrators of the Hastings electricity undertaking.

The tables are turned at St. Anne's-on-Sea. Since the electricity concern started nine years ago, the sum of £3500, which is grandiloquently spoken of as a "handsome return," has been transferred from the profits in relief of the rates. But Mr. Councillor Hodgkinson sees an injustice in this; and so do we. There are fewer electricity consumers than gas consumers, which is not surprising, though Mr. Hodgkinson asserts (and we just as positively deny it) that electricity in the town is as cheap as gas for lighting purposes. But it is the former fact with which we are concerned at the moment; and, being a fact, it lends emphasis to the declaration of the Councillor that "it is obviously unfair that electricity users should pay an unreasonable price in order to supply funds to relieve gas users." With a transposition of "electricity" and "gas," there is in the simplest and plainest of phrases, the contention at which we have been hammering long before electricity took the field against gas. But circumstances alter cases. Now if there were only a majority of Mr. Hodgkinsons on, for example, the Birmingham, the Manchester, and the Salford Councils, how happy the gas consumers would be, and how unhappy would be the managements of the municipal electricity supplies in those places. We do not suppose the gas consumers of St. Anne's-on-Sea desire to be relieved of their obligations at the expense of the electricity consumers, any more than they would want to have to meet deficiencies if there was undercharging; and so we have no doubt that they will congratulate the electricity consumers on the reduction of the charges (the latter can well do with this), which reduction wipes out any possibility of securing a substantial sum in aid of the rates. A passing thought is (we have no information on the subject) how stands at the present time the St. Anne's electricity concern in respect of reserves and depreciation.

An editorial article has appeared in the "Electrician" in which it is acknowledged, in as plain language as possible, that there has been a lot of bunkum in the past in reference to the ratings of electric lamps; and we may assume the same thing will continue, despite all virtuous protests. We read: "The rating of an incandescent lamp at 16-candle power is notoriously only the roughest approximation; and it is not so many years ago that arc lamps fell nominally under two headings—viz., those that gave 2000-candle power, and those that only gave 1000-candle power; the actual candle power being neither of these values. An incandescent lamp is usually rated according to its horizontal candle power in some direction, or according to its mean horizontal candle power. In an arc lamp, the mean hemispherical candle power is taken, while its light is never steady for a second at a time; and it is only possible to make an approximation by some rule-of-thumb method." There would have been some awful things said about us if the authorship of these lines had been in this quarter.

Mr. John Fazakerley, who has been Assistant-Manager for the Whitwood Gas and Chemical Company for the past twenty years, has been appointed, out of 80 applicants, Gas Manager to the Goole Urban District Council.

OBITUARY.

ROBERT SHARPE.

It is with much regret that we record the rather sudden death of Mr. Robert Sharpe, the Gas Engineer and Manager of the Belfast Corporation, which took place at his residence in Ormeau Park, on the 8th inst. He had been indisposed for some little time, but not to such an extent as to cause anxiety. Indeed, he was attending a meeting of the Gas Committee on the 6th inst.; and it was then that his illness became serious. He was conveyed to his home, and his medical adviser summoned. Subsequently further advice was obtained, and an operation was found to be necessary. The patient rallied from the effects of it, and appeared to be progressing favourably; but he gradually sank, and passed away on the evening of the above-named day.

Mr. Sharpe's first connection with the gas profession took place in the works of Messrs. Laidlaw, of Glasgow, where he served his apprenticeship. He was subsequently chosen by the late Mr. Foulis to fill a position in his office at the Glasgow Gas-Works. After gaining additional experience abroad, he was appointed in 1879 Assistant-Manager, under Mr. James Stelfox, at Belfast, on whose retirement at the end of 1906 Mr. Sharpe was promoted to the vacant position. The carrying on of the work that had been so ably performed by his predecessor naturally entailed considerable anxiety; but he discharged his important duties cheerfully and with unassuming assiduity, and served the city with ability and success. Our readers are aware that the question of extending the gas-works is now engaging the attention of the Corporation; so that the loss of so devoted and faithful an official as their late Gas Engineer will be all the more keenly felt. Mr. Sharpe joined the Gas Institute as an associate member in 1887, and was transferred to the class of members in 1890. He passed into the Institution, of which he was a member at the time of his death.

The funeral took place last Wednesday at the Dundonald Cemetery, and was attended by between 1500 and 2000 persons. A large number of members of the Corporation were present, as well as all the employees at the gas-works who could be spared. The cemetery is about six miles from the late Mr. Sharpe's residence; and the procession started soon after nine o'clock in the morning. The chief mourners were Mr. M'Kean (father-in-law) and Mr. M'Kean, jun. (brother-in-law); and following them were: Mr. Stelfox, Mr. David Terrace (Middlesbrough), Mr. J. Whimster (Armagh), Mr. J. Brodie (Lisburn), Mr. T. Frizelle (Holywood), Mr. W. Tallentire (Lurgan), Mr. H. Roberts (Newtownards), Mr. R. Harrison (Monaghan), and Mr. G. Airth (Dundalk); the two last-named gentlemen being the President and Secretary respectively of the Irish Association of Gas Managers.

We regret to record the death, as the result, according to the "Buenos Ayres Standard," of an accident (the nature of which is not stated), of Mr. ARTHUR GIBSON, who went to South America some years ago, and was engaged in the erection of several gas-works in the Argentine Republic, and the remodelling of those of the Buenos Ayres New and South Barracas and Rosario Gas Companies. Towards the close of 1906, Mr. Gibson undertook the construction of the new gas-works for the city of Bahia Blanca, of which an illustrated description was given in the "JOURNAL" for Oct. 22, 1907 (p. 233). They were designed to supply 60 million cubic feet of gas per annum, and were brought into use on Aug. 16, 1907. On their completion, Mr. Gibson returned to England, and resided for a time in a North London suburb. He subsequently, however, returned to South America, and was staying with his wife and children at Mar del Plata when his death occurred.

PERSONAL.

At a special meeting of the Nelson Town Council last Wednesday, Mr. A. MORTON FYFFE, the Chief Assistant-Engineer in the Gas Department of the Dundee Corporation, was appointed Gas Engineer and Manager, in succession to Mr. A. J. Hope, resigned. The salary is £350 per annum, rising to £400. Mr. Fyffe, who is thirty years of age, is a son of the late Councillor Fyffe, of Dundee, and received his early education in the Harris Academy, afterwards attending the University College, where he was first prizeman in 1900 in "Engineering." He entered the service of the Corporation; being apprenticed as an engineer to the late Mr. William Mackison, the Burgh Surveyor. While there he qualified as a civil engineer, and about eight years ago joined the Gas Department as an assistant to Mr. Yuill, the Engineer and Manager, by whom he is regarded as one of the rising men in the gas profession. He has had a valuable experience in everything that pertains to the manufacture and distribution of gas, as well as in superintending reorganization works, and on several occasions he has been consulted by other Corporations on the extension of their gas plant. He was President of the Eastern District Section of the Scottish Junior Gas Association for the session 1908-9, and in this capacity delivered an able Inaugural Address; while at the annual meeting in March last he read an interesting paper on the luteless purifiers at the Dundee Gas-Works. He is an associate member of the Institution of Mechanical Engineers. Mr. Fyffe is another of the Scottish juniors who have lately obtained more responsible posts.

CAUSES OF THE DESTRUCTION OF REFRACTORY BLOCKS AND RETORTS

By ALFRED B. SEARLE, Ph.D.

SOME years ago, when the temperatures reached in various chemical and engineering operations were not so high as at the present time, the ordinary grades of fire-clay were amply resistant to the action of the flue and other gases and to the heat with which they came into contact. But with more intensive operations in modern furnaces, the problems confronting both the user and the maker of gas-retorts, fire-clay blocks, bricks, and other refractory articles become more and more acute.

In spite of the widespread discussions which have recently taken place on this subject, there is no doubt that the fire-clay workers in this country can, among them, produce goods which will satisfy all likely and reasonable requirements, providing they really know what is needed and also the characteristics of the goods they offer. Among the best firms in the trade there need be little difficulty, providing that the customer is willing to pay the price; but there are many firms in a fair way of business who are still so hopelessly behind the times as to continue making bricks, blocks, and retorts from the same mixtures, and by the same methods, as were used fifty years ago, and are utterly oblivious of the fact that the requirements of engineers have become so much more stringent as to make quite useless to-day many of the older articles, which were satisfactory enough some years ago. Manufacturers who adopt this attitude are usually those who pay no heed to the technical matter published in the trade papers, who think that there is no more for them to learn of the way of clay-working, and who are not aware that competition in this line of business has become so keen that specialists already building substantial reputations by devoting themselves exclusively to the production of fire-clay goods for one small branch of industry. Yet such is the case; and the more progressive manufacturers are wisely keeping their eyes open to take advantage of hints which they may be able to get, and not a few of them are employing the services of specially trained chemists and ceramists (either in whole or in part) to study the problems as regards their particular works, and advise them accordingly.

In no branch of clay-working is progress more needed than in the manufacture of retorts and blocks for the making of gas; while there are a few manufacturers who are studying the subject in a thoroughly systematic and scientific manner and who are willing to pay well for all helpful advice and suggestion in this direction, the majority of manufacturers are trying to puzzle out a way for themselves—never noticing that they have not the necessary appliances nor the needed training for carrying out highly technical and very delicate research work. If a batch of goods is refused by the customer as not satisfactory or as not standing a certain test, such manufacturers try "something" added to their clay, or alter the method of manufacture in some way. Yet real improvement can only come to them by chance for they do not approach the subject in the right manner. These, as well as to that large body of intelligent men who are continually observing the behaviour of refractory goods in actual use and to the engineers in charge of the various gas-works, the following suggestions are made in the hope that they may, to some extent, explain numerous defects and "misbehaviours" and may lead to further improvements in the qualities esteemed so essential in all clay goods used in the manufacture of illuminating gas and the allied industries.

It is, at the present moment, quite impossible to suggest a definitely-worded specification which could be used for all gas-retorts of a particular pattern; for our knowledge of the constitution of clay is still in its infancy, and arbitrary specifications may in such a case do more harm than good, and may impede progress. At the same time, there are certain fundamental characteristics which should be insisted upon; and these may well be considered at the same time as the causes of failure in retorts and blocks.

TEMPERATURE.

A primary requisite in all refractory goods is that they shall not be appreciably affected by the action of heat at any temperature to which they are likely to be exposed in use. Unfortunately there are very few articles used in the gas-making industry which can withstand this test when it is made so severe as in the case of retorts and refractory blocks; though, with care and skill, articles of the necessary heat-resistance can be made. In connection, it is very necessary to distinguish clearly between (A) resistance to heat or exposure at a definite, high temperature *per se*; and (B) exposure to rapidly varying temperatures, or the sudden exposure to heat or cold. Two entirely different sets of phenomena may be observed in the two cases; and they must be kept quite distinct or confusion will result.

A retort or block will resist any given temperature providing it is composed of substances which do not melt, or do not react upon each other to form other substances fusible below the temperature. But to do this it may be necessary that the article shall be heated with extreme caution, and cooled very slowly after treatment. Otherwise, the disturbing action of changes of temperature—see "B" above—may occur. For simple resistance to high temperature (the primary meaning of the term "refractory")

toriness"), pure clay has many advantages over any other material. If sufficiently pure samples are selected—a by no means easy matter at the present time—they will be found to resist a temperature of 3362° to 3470° Fabr., which is much higher than anything yet demanded by a gas engineer. Such clays will be characterized by their high proportion of alumina and their correspondingly low proportion of silica; and while no definite limiting figures can be given, the alumina will seldom be below 33 per cent. nor the silica above 55 per cent.

These figures are quite opposed to the idea prevalent in the minds of many fire-brick manufacturers and gas engineers, who—assuming that, because the proportion of silica is usually the largest of all constituents, it must therefore be the most important—are apt to measure the value of a material by the proportion of silica it contains, whereas in reality they should proceed in an almost contrary direction, as beyond a certain, not well-defined limit, any additional silica only detracts from the refractoriness *per se* of the clay.

Except in the case of the better class fire-clays, however, the chemical composition, as shown by analysis, is but little use as a guide to the heat-resisting power of a clay, though in some cases excellent comparisons may be made by means of a graph in which the ordinates are the percentages of alkalies divided by that of the alumina in the clay, and the abscissæ are the percentages of silica also divided by that of the alumina. The whole area of the chart may then be divided by radiating lines into several fields, each of which represents the limits of composition of materials melting, or rather bending and losing shape, at a definite temperature corresponding to a definite Seger cone.

The only method at present known of determining the heat-resisting power of a block or of a clay is to make a small pyramid of the same shape and size as a Seger cone, and heat it very slowly in a testing furnace alongside several Seger cones; great care being taken that the rise in temperature shall be steady—no sudden variations. The temperature at which bending occurs is taken as that indicating the limit of refractoriness, though it is often (yet quite incorrectly) termed the "fusing point."

To resist high temperatures, a clay must naturally be free from all materials which will unite with any of its constituents to form a fusible mass. The chief of these "fluxes" are lime, magnesia, and "alkalies" (a term signifying sodium and potassium compounds). But, as already remarked, the presence of a large proportion of silica must also be considered as detrimental; for, however refractory silica may be by itself, it is far less heat-resisting when it occurs naturally in admixture with clay. Iron compounds must also be absent as far as possible, as they cause discoloration (which is unimportant) and, in presence of reducing gases from the fuel, form slag-spots in the bricks or retorts.

Attempts have from time to time been made to fix a limit below which no clays or articles shall be regarded as refractory; and the standard generally recognized is that the clay or a piece of the article made into the shape of a Seger cone must not bend at a temperature less than that corresponding to the bending point of Seger cone No. 26. Some authorities prefer a somewhat higher standard, and suggest that cone No. 30 be taken as the minimum, as a number of only moderately good clays can satisfactorily pass the lower test. Owing to the action of heat on Seger cones and fire-clays not being strictly dependent upon the temperature, it is better to use an arbitrary standard which shall show the total heat effect, rather than employ an electrical pyrometer. If, however, the latter instrument is used, it must be carefully calibrated; otherwise, the objection sometimes urged against using Seger cones—irregularity in working—is equally applicable. Cones have, moreover, the advantage that they can be used by people possessing less dexterity in manipulating scientific instruments than is needed for an electrical pyrometer.

The details as to the best method of carrying out this test have not yet been agreed upon; so they need not be described here. It is sufficient to state that the heating must be very slow, or else the results will be false. For this reason, it is highly desirable that some standard method of carrying out this test should be adopted.

It is, however, seldom that mere resistance to a high temperature can be regarded as more than of secondary importance in a retort or fire-brick used in gas manufacture. What is really needed is some assurance that the article will withstand the action of a high temperature under the conditions of actual use, and these are often widely different from those under which the material is tested for refractoriness. Hence a single test of refractoriness is only useful in order to sort out the materials which are necessarily outside a predetermined limit. Many clays may pass the test for refractoriness and yet may fail when made up and used. This is not due to faults in the test, but to the much more trying conditions of actual employment. Thus a clay may, alone, be unaffected when heated to the bending point of cone No. 34, but if heated in contact with fine coke it will bend at a lower temperature than cone No. 28.

This difference in behaviour, due to contact with other materials, is often overlooked by both manufacturer and user; and in some instances sudden "misbehaviour" of a product which has previously been quite satisfactory is due to this cause. The refractory article may at times come into contact with harmful materials in the most unexpected manner; and it is then difficult to ascertain the true cause of the defect. Thus, the writer was asked to examine some retorts made by a well-known firm in the Midlands, and found that several of them were rich in "soluble salts," the

source of which it was difficult to explain, until a visit to the works showed that the retorts had been standing for some time on a floor newly-made of ashes. In wet weather, the rain had dissolved some salts out of the ashes; and these had been drawn upwards by capillary attraction into the lower ends of the retorts. The proof of the correctness of this explanation was shown by standing some fragments of retorts in water previously boiled with the ashes, when similar defects were noticed.

The action of gases produced from goods heated near to, or inside, the refractory articles is often important, and will be mentioned later. This action is specially pronounced in the case of new gas-retorts, though the deposit of carbon which is soon formed, rapidly diminishes their action, as it forms a protective coating so long as the material is not adversely affected by reducing gases. As the chief constituent of fire-clay affected in this way is iron, in one or more of its compounds (slags being formed by the action of reducing gases and the silica in the clay), it is important that the iron should be present in as small proportions as possible, and that it should be finely ground.

(To be continued.)

MAUGHAN'S "PEARL" GEYSER.

THE accompanying illustration shows a small and compact geyser which has been produced by the Parkinson Stove Company, Limited. It has been specially designed for providing an immediate supply of hot water in situations where only a small



quantity is required; and it is claimed for it that it will raise three quarts of cold water 40° per minute, or two quarts to scalding heat in the same time. Should higher temperatures even up to boiling-point be required, they can be obtained at a slower rate. Such a geyser is particularly well suited for use in kitchens, lavatories, surgeries, hair-dressing saloons, &c. It is simple in use—one lever turning on the gas and water taps, and a small pilot-jet lighting the burner. Consequently there is no risk of damage by careless handling.

The geyser is easily fixed by means of screws through the cast-iron bracket shown; and the outlet may be moved to either side, and used to supply two adjacent receptacles. It is made in copper throughout; the interior being tinned, and the exterior polished and lacquered.

Presentation to Mr. P. C. Holmes Hunt.

Our readers are aware that Mr. P. C. Holmes Hunt, the Engineer of the Melbourne Gas Company, is expected to arrive in England shortly on a professional visit. He left Melbourne on the 9th ult., and sailed from Sydney on the 11th in the Canadian liner *Makura*, as he is coming *via* Canada. Prior to leaving, he was the guest of the officials of the Gas Company in the Board-room, to wish him *bon voyage*, and also to receive at the hands of the Secretary (Mr. John Hinde), on behalf of the engineering and secretarial staff, a present for himself and Mrs. Hunt, to mark the occasion, and as a slight token of the esteem in which he is held by them. We are assured that the leading officials of the Gas Company and the members of the Victorian Gas Managers' Association, of which Mr. Hunt is the President, will watch with pleasure his mission to England and his appearance at the meeting of the Institution of Gas Engineers, and will await with keen interest his subsequent opinion on carbonizing methods, &c., in the British Isles and on the Continent.

The opening article in the current number of "System and Modern Business" is devoted to the Gaslight and Coke Company. It is entitled: "How an Old Organization Met Competition;" and the author—Mr. George Edgar—shows how, "through losing a monopoly, a firm developed aggressive methods in place of defensive, and in the face of keen competition increased its business." As a frontispiece, an excellent portrait is given of Mr. Corbet Woodall, the Governor of the Company, "who brought about the reorganization of the selling plan to meet changed conditions, and proved its worth by increased business;" and in the middle of the article is a portrait of Mr. Milne Watson, the General Manager, "under whose direction the reorganization of the selling plan was effected, and put on a profit-making basis."

THE EXTENSION OF THE ZÜRICH GAS-WORKS.

(Continued from p. 375.)

RETORT-HOUSE AND RETORT-SETTINGS.

THE earlier carbonizing plant at the works consisted of inclined retorts, which were considered to have advantages over horizontal retorts and have answered well for ten years. This style of setting has recently been superseded by the Dessau type of vertical retorts. When the extension of the works was first under consideration, it was intended to adopt settings of inclined retorts of greater length than those in the older part of the works; but the practical results obtained with vertical retorts afterwards led to the decision to adopt the Dessau system of setting. In the first instance, a retort-house for ten beds of vertical retorts was decided on. It consists of an iron frame-work filled in with walls half-a-brick thick. This method of construction is cheaper and

more suitable for gas-works than ordinary brickwork. The principal trusses are constructed with supports in which a certain amount of play is allowed, according to Drory's system. The roof is provided with a ventilating lantern 8 feet high; while there are, in addition, a large number of louvres in the walls of the house for the sake of ventilation. The roof is covered with grooved tiles. Of the thirteen main trusses, two in the middle are specially strong and carry the weight of the supporting framing of the two Bradley conveyors.

The length of the retort-house is 197 feet, and its height is 59 feet. It can be readily extended, when required, towards the east. The main trusses rest on large columns 10 feet deep. The foundations of the retort-house are carried on piles. The foundations of the two benches of retorts, and a portion of the retort-house

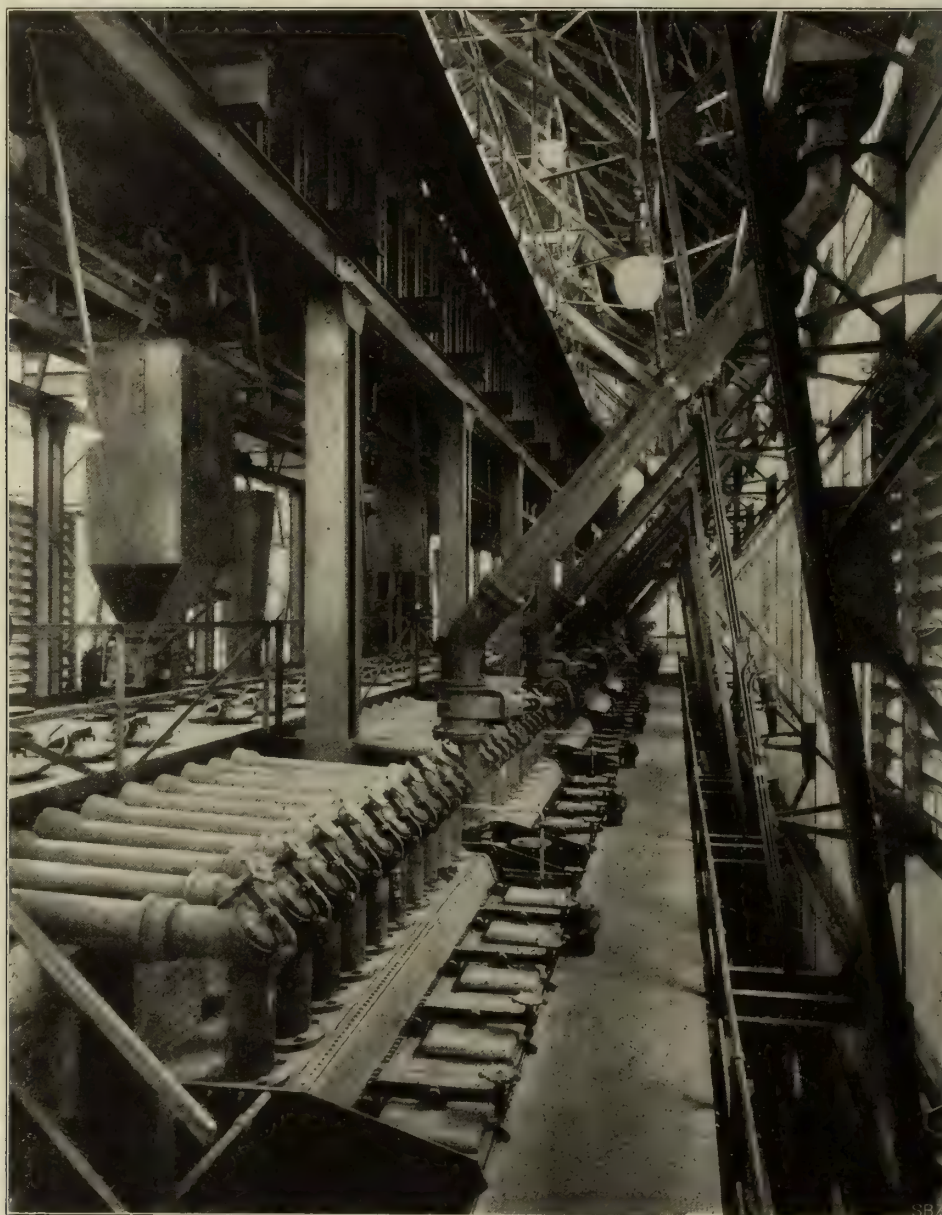


Fig. 7.—Horizontal Gas Take-Off Pipes, Hydraulic Mains, Connections to Foul Main, and Tar and Liquor Overflows.

and of the chimney, consist of very strong beds of concrete resting on a pile framing 16 ft. 6 in. long. In order to protect these foundation beds and the underground passages for the coke-conveyors from the pressure of the underground water, a Monnier construction has been adopted throughout. These extra foundation works involved an increased expenditure of over £1200.

The carbonizing plant comprises two benches of Dessau retort settings, each bench having its own chimney, 115 feet high. There are five settings, each containing ten retorts in the bench. The retorts are 13 feet long, and are built up from two sections. The retort-house and the conveying plant in it have been so arranged that vertical retorts 16 ft. 6 in. long can afterwards be introduced without structural alteration. Between the two benches is a clear space, 17 feet wide, in which are placed the two bucket conveyors, the transverse coke-conveyor leading from the settings to the coke-house, the steam escape shafts, the overhead tanks containing large coke and coke breeze, and the different staircases. The difficulties involved in disposing of these manifold descriptions of apparatus in a practical manner in the space

between the benches can only be realized by an inspection of the installation. The disposition of the apparatus in the central passage of the retort-house determined the width of the principal conveying passage in the coal-store.

The buckstays of the benches are very strong, and serve as columns to support the framing on which the coal and coke tanks and the overhead railway rest. The arrangement will be seen from fig. 7, which shows the top of one of the benches with the gas take-off pipes, hydraulic mains, &c. The overhead coal-tanks are 144 ft. 6 in. long, and of such capacity that they contain sufficient coal for 24 hours' working of an installation of ten settings of vertical retorts 16 ft. 6 in. long, which corresponds to about 30 hours' working of the present settings with shorter retorts. The benches and the coal and coke tanks are therefore quite independent of the structure of the retort-house. The travelling conical hoppers for large coke for charging the producers contain three-quarters of a ton. The coal-charging waggons of about half-a-ton capacity travel on a suspension line beneath the coal-bunkers, together with the breeze travelling receptacles, which

are furnished at the bottom with a measuring chamber. Fig. 8 is a view of the top of the benches, with the travelling charging waggons and hoppers. The gas take-off pipes are horizontal, as distinct from the vertical ascension pipes of the earlier types of settings. The gas passes from each hydraulic main through an 8-inch pipe to the 30-inch foul main. The tar and liquor pass through overflows and dips into a cast-iron main, which has a fall of 3 in 100 towards a collecting pit, from which they are pumped into the chief tar and liquor wells.

Steam is introduced into the vertical retorts during the last few hours of the time of distillation of the coal, in order to produce water gas from the incandescent coke. Since the vertical retorts therefore yield water gas as well as ordinary coal gas, the water-gas installation which was contemplated in the original scheme for the extension of the works has, for the time being, been dispensed with. The steam-pipes and accessory apparatus for the production of water gas are on the side of the settings towards the coal-store. The sight-holes for observing and measuring the temperature of the settings are on the same side. On the other side of the settings are the clinking doors, the regulating valves for primary and secondary air, and the sight-holes for observing the outgoing flue-gases. The large coke required for the producer, and the coke breeze which is put into the retorts before the charge of coal, are raised to the elevated tanks by means of an electric elevator. The motor and gear are placed in a corru-

gated iron shed supported on strong iron brackets on the specially strengthened central main trusses of the retort-house; so that they are easily accessible from the house.

COKE CONVEYING AND SCREENING PLANT.

The coke as discharged from the retorts is conveyed to the coke-shed and quenched at the same time by automatic sprinklers, in the same way as in the first section of the works. The De Brouwer conveying trough is used as before, as several years' working with the inclined retorts proved it to be thoroughly satisfactory. The channel containing the coke-conveyor is directly under the settings, and a large travelling funnel-shaped waggon serves to direct the coke from the bottom mouthpieces of the retorts into the De Brouwer conveyor. This waggon can be locked at any desired point on the line on which it travels. The disposition of the coke-conveyor beneath the settings affords an economy of space; but, on the other hand, it entails rather more outlay, because the channel in which the trough is fixed must be strongly constructed in masonry. Where space is available, it would be better to place the coke-conveyor directly in front of the settings. The channel is covered with moveable plates, which are taken up in turn to provide the opening for the hot coke to drop from the hopper-waggon into the conveyor. The discharge of the coke takes only a few seconds, and the opening is then closed again. The steam evolved by the quenching of the coke is

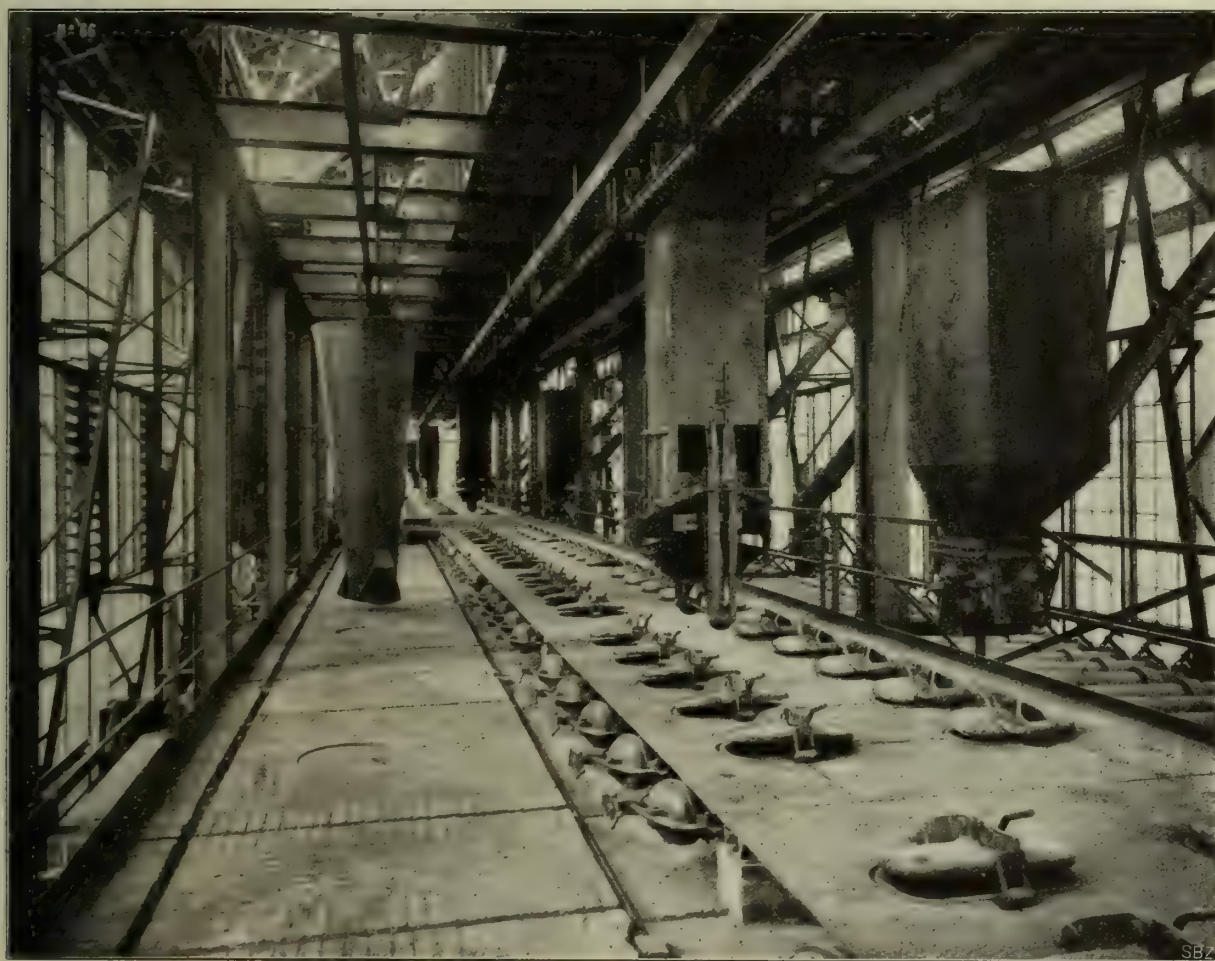


Fig. 8.—Charging Stage, Showing the Lids of the Vertical Retorts, the Gas Take-Off Pipes, and the Suspension Lines for Coal and Coke.

thus conveyed lengthwise through the closed channel into the open without incommoding the retort-house staff.

The conveying troughs in front of the two benches meet between the latter a transverse conveying trough 105 feet in length, which, as soon as it emerges from the retort-house, rises at an angle of 45°, and thus conveys the coke to the sorting and breaking plant. The new coke-sorting plant differs from the earlier only in its larger size. The iron tanks for containing the night output are of 6355 cubic feet capacity or sufficiently large to receive the whole of the coke produced at night time, in order that the screening and breaking plant need only be worked in the day time. The tanks are at such a height that the coke can be discharged direct from them into railway waggons or carts. The bottoms of the tanks are also provided with a number of openings for filling sacks with the coke. The same openings can be used for drawing the coke required for the producers.

SCRUBBING AND PURIFYING PLANT.

A wrought-iron main, 30 inches diameter and 540 feet long, conveys the crude gas from the new retort-house to the new apparatus house. There is a second wrought-iron main of 20 inches diameter and about 490 feet in length, leading from the old retort-house through the coke-shed into the new apparatus house. It has already been pointed out that the old retort-house is now

capable of producing more gas than corresponds to the capacity of the original apparatus and purifying plant. The new apparatus does not differ greatly from the older plant. The separate rooms for the condensers, exhausters, tar-extractors, naphthalene and cyanogen washers, final condensers, and ammonia washers are separated from one another by walls; so that the requisite temperature can be maintained in each room. There is a large door in the middle of the partition wall; and on each side of it is a window 16 ft. 6 in. high, so that the attendant can see all the apparatus from either end of the building, which is 213 feet in length and 46 feet wide. In the side of the building are windows from 16 ft. 6 in. to 28 feet high, with openings for ventilation; so that the lighting and ventilation of the building is excellently provided for. At the north end of the building is a laboratory, of which details are given later.

The apparatus is designed ultimately to deal with a daily output of 4,240,000 cubic feet of gas, but provisionally one set of apparatus of half this capacity has been provided. Atmospheric condensers have been dispensed with, in view of the cooling action of the long length of main through which the gas passes to the apparatus house. The apparatus is arranged as follows: (1) Two Bolz condensers, each with 1720 square feet of water-cooled surface and a capacity of 706,000 cubic feet per diem; (2), two exhausters, with governors, driven by special steam-engines,

each of a capacity of 10,600 cubic feet per hour; (3) two Drory tar extractors of 2,120,000 cubic feet capacity per diem; (4) one rotatory Bueb naphthalene extracting washer of 2,120,000 cubic feet capacity per diem, worked by an attached steam-engine; (5) one Bueb cyanogen extracting washer of the same capacity, and similarly driven; (6) two Reutter condensers, with 1720 square feet of cooling surface; (7) one "Standard" ammonia recovery washer of a capacity of 2,120,000 cubic feet per diem.

Roots blowers driven direct from the exhauster are used to pump air into the gas for revivification of the oxide in the purifiers *in situ*. The quantity of air admitted is measured by a special meter of 2120 cubic feet per hour capacity. In the cellar beneath the apparatus house there are two wrought-iron tanks, each of 15 tons capacity, for cyanogen sludge, which is pumped direct from them into tank-waggons. Underground concrete reservoirs alongside the apparatus house serve for storing anthracene oil for use in naphthalene extraction, and the saturated oil after use. The rooms of the apparatus house are heated with exhaust steam from the steam-engines; but in case this is insufficient, provision is made for steam to be taken direct from the boiler-house.

The purifier-house and revivifying floor are designed for a make of 2,120,000 to 2,825,000 cubic feet per diem. The purifiers are mounted on concrete foundations. There is a set of three purifiers, each of an area of 1550 square feet, fitted with ordinary grids. With a make of 2,120,000 cubic feet per diem, the rate of flow of the gas will be about 0.275 inch per second. If the grids are changed for a more modern pattern, the capacity of the purifiers can be considerably raised without increase of the rate of flow. The revivifying floor attached to the purifier-house has an area of 21,100 square feet. Travelling cranes are provided for lifting and removing the wrought-iron lids of the purifiers. A suspension line is used for conveying the purifying material. The waggons on this line can be raised and lowered to meet requirements. The revivifying floor is connected by a turn-table with the standard gauge railways of the works, so that the greater part of the new and spent purifying material can be directly unloaded from the waggons and loaded into them, which leads to considerable economy in wages. The disposition of the revivifying floor alongside the purifier-house is better, both in respect of supervision and working expenses, than the arrangement of the revivifying floor above or below the purifiers.

TAR AND LIQUOR WELLS.

The underground tar and liquor wells are constructed of rammed concrete, and differ from those of the first section of the works in that the roofs are constructed in cross arches, instead of as cylindrical vaults. The wells are situated between the apparatus house and the purifier house; and there is a passage round them for inspection purposes. The walls of this passage are formed, on the one side, by the foundations of the apparatus and purifier houses; and, on the other, by the outer walls of the tar and liquor wells. In addition to serving for inspection purposes, this passage accommodates a number of connections and pipes of all kinds which are thus readily accessible for observation and repair. The tar and liquor separating tank has a capacity of 40,737 gallons; the tar well, 117,807 gallons; the weak liquor well 41,838 gallons; and the strong liquor well, 165,150 gallons. The tar and liquor pumps are placed (as before) in the base of the water tower.

(To be continued.)

CALORIFIC VALUES AND HIGH TEMPERATURES.

By G. STANLEY COOPER, B.Sc.

IN these days of competition and controversy in the field of industry with regard to the relative values of gas and electricity from a commercial point of view, it is as well to know both sides of the case. One of the chief points which arise is the calorific value of the various competitors; but this can be safely left in the hands of those engaged in its industrial application. Now that the adoption of a calorific standard seems imminent, it will be useful to examine the causes of varying calorific value of coal gas and the application of this and other gases for heating purposes.

In order that a calorific standard test should be of any real value, it ought, in the opinion of the writer, to be a high one—certainly not less than 500 B.Th.U. In coal gas, the chief heating gases are hydrogen, marsh gas, and carbon monoxide; and it is therefore necessary to maintain a fairly high proportion of these gases, in order to maintain a high heating power. The calorific values of these gases per cubic foot are respectively—

| | Gross. | | Net. |
|------------------------|--------------|----|-------------|
| Marsh gas | 1024 B.Th.U. | .. | 919 B.Th.U. |
| Hydrogen | 326 " | .. | 272 " |
| Carbon monoxide. . . . | 323 " | .. | 323 " |

It is thus seen that marsh gas has by far the highest calorific value; and therefore as high a proportion of this gas as possible should be obtained in the gas. This is best attained by using high heats for carbonization. Again, carbon monoxide has a higher thermal value than hydrogen (net); and so the proportion of this gas might also be increased.

Another matter of some practical interest is the use of gaseous fuel for the production of high temperatures. For work at tem-

peratures of 2500° C. or thereabouts, the electric furnace is used. One objection—though, perhaps, a slight one—to the use of this apparatus is the production in some processes of large quantities of carbon monoxide which remains unburnt. The oxy-hydrogen blow-pipe or air-hydrogen pipe is often used for the production of fairly high temperatures. It is not generally known that by substituting carbon monoxide for hydrogen in the former a still higher temperature is attained. The following table gives the approximate temperatures:—

| | Deg. C. |
|--|---------|
| Flame of hydrogen burning in air | = 2024 |
| " " " " " oxygen | = 2844 |
| " " " carbon monoxide burning in air | = 1997 |
| " " " " " oxygen | = 3000 |

It will be seen that whereas the flame of hydrogen in air is hotter than that of carbon monoxide in air, yet when these gases burn in oxygen the temperature of the carbon monoxide flame is much higher than that of the hydrogen. Here we find a natural limit to the temperature obtainable by the burning of one gas in another. The lower hydrogen temperature is due to the partial dissociation of the water which results from the combination of the hydrogen and oxygen on combustion. It has been shown that when a mixture of hydrogen and oxygen in the proportion to form water—*i.e.*, 2 : 1—is ignited, the temperature produced by the combination of a portion of the mixture rises above that at which water vapour begins to dissociate; and consequently for a short interval of time a state of approximate equilibrium obtains, for as many molecules of water as are formed by the combustion are dissociated, owing to the high temperature. During this state, the temperature falls, and rapid combustion again proceeds. It will be seen, therefore, that the limits to the temperature which can be reached by combustion are influenced by the points at which the products of combustion undergo dissociation. The dissociation temperature of water is about 2890°C.; while that of carbon dioxide is upwards of 3500°C.—the approximate temperature of the electric furnace.

Further, too, for many industrial purposes a blowpipe is a handier form of heat supply than the electric furnace. In such operations as brazing, welding, &c., a blowpipe can be advantageously employed. A high heat can be obtained in a very short time with the expenditure of a minimum amount of fuel, and the heat can be applied locally. With regard to the gases to be used with the blowpipe, the foregoing table shows the relative advantages of different gases. Carbon monoxide and oxygen are one of the best combinations for high temperature work; but the former gas is not very readily obtainable on a commercial scale. Coal gas and oxygen form a very efficient mixture; and both of these gases are easily obtained at comparatively small cost. A combination that is used in many works in the North of England is acetylene and oxygen. The oxygen is bought in bulk compressed in cylinders, while the acetylene is generated on the premises from calcium carbide. This is made use of for completing a slightly faulty weld in tubing and in annealing; and it is easily and successfully manipulated. A white heat is obtained in a few seconds. In many such operations in iron-works and the like, a blowpipe is a useful instrument, and should be pushed by the gas industry.

Recent Wills.—Mr. Frederick Tendron, of the Manor House, Bishopsdown, Tunbridge Wells, the Deputy-Chairman of the Continental Union Gas Company, who died on the 14th ult., aged 76, left estate of the gross value of £57,236, of which the net personalty has been sworn at £56,927. The late Mrs. Caroline M. Townsend, widow of Mr. H. A. Townsend, for many years the Secretary of the Bristol Gas Company, left estate of the value of £19,790.

London and Southern District Junior Gas Association.—We learn from the Hon. Secretary (Mr. S. A. Carpenter) that the members of the Association will visit the Bromley Gas-Works next Saturday afternoon; the date having been altered from the 14th inst. to avoid clashing with the Whitsuntide holidays. The annual business meeting will take place at the Cripplegate Institute on Friday evening, the 27th inst., and will be preceded by a "coffee" meeting. The matters to come before the members include the election of Officers and Council for next session; the adoption of the report and balance-sheet; and the consideration of a report by a deputation on the subject of making the Westminster Institute the future meeting-place.

Manchester District Institution of Gas Engineers.—The next meeting of the Institution will be held at Burnley, on the 28th inst., when, by permission of the Gas Committee of the Corporation and their Engineer (Mr. J. P. Leather), the members will be afforded an opportunity of inspecting the installation of Woodall-Duckham vertical retorts at the gas-works, a description of which will be given in a paper by Mr. Leather. Another paper will be contributed by Mr. J. L. Hodgson; his subject being "Venturi Meters for Measuring Large Volumes of Gases." The other items on the agenda include the discussion of Mr. Kendrick's Inaugural Address, delivered at the meeting held in February; and consideration of the University scheme of the Manchester Junior Association, the education and authorization of plumbers, and the Institution of Gas Engineers and the work of the Commercial Sections. The Gas Committee will entertain the members at luncheon and "high tea."

THE SOUTHERN ASSOCIATION AT BATH.

Although the question of postponement was discussed, in view of all arrangements having been made before the great blow fell upon the Royal House and the nation, and in view too of the fact that prospective engagements would have meant an indefinite delay, the President (Mr. C. Stafford Ellery) and the Committee of the Southern District Association of Gas Engineers and Managers, with the endorsement of the Chairman (Mr. Albert Browning) and Directors of the Bath Gas Company, determined not to cancel the visit of the members of the Association to the historic city of Bath last Thursday; but to carry through the programme, knowing full well that individually members themselves would suppress as much as possible the holiday character of the "outing." That the Committee completely interpreted the feelings of the members was proved by the large number that assembled in Bath. There was a considerable contingent who made the Paddington Railway Station their starting-place at the early hour of nine o'clock; and by various routes a numerous supplement came from the south-western districts, among them may we specially mention—for right heartily welcomed were they—the two veterans retired from the active list, Mr. J. H. Cornish, sen., and Mr. James Lowe. The President of the Institution of Gas Engineers (Mr. James W. Helps) was there, as was also Mr. R. O. Paterson, of Cheltenham, as a guest. Mentioning Mr. Paterson's name reminds that the approaching transference of Mr. James Paterson, of Redhill, to Cheltenham, has prevented him taking up the duties of his recent appointment as the Hon. Secretary and Treasurer of the Association; and Mr. A. F. Browne kindly continued them until this meeting, and, with his old *bon-homie*, shepherded the members during the day, and kept an eye on strict adherence to programme.

The plans made for the visit by the kindness of the Directors of the Bath Gas Company, through the President, were complete in every detail, from the points of view of the technical interest imparted by works inspection, hospitality, and in providing the means for the members seeing something of the wealth of historic feature of the city. Arriving at the station, the members found tram-cars waiting to convey them to the gas-works; and there they were received by, in addition to the President, Mr. Browning and his colleagues, who are: Mr. P. K. Stothert, Mr. James Chaffin, Mr. E. Noke, and Mr. J. E. Commans. Mr. H. Shepherd, the Secretary of the Company, and Mr. J. Bingley, the Assistant-Engineer, were also present.

A SHORT BUSINESS MEETING.

Meeting in the Board-room, a short *agenda* engaged attention.

The PRESIDENT first introduced his Chairman to the members.

Mr. BROWNING, speaking on behalf of himself and colleagues, gave the visitors a very hearty welcome. He said it was indeed pleasing to them to see such a representative gathering of those connected with the gas profession. After they had inspected the Company's plant, he was certain their report would be that, under Mr. Ellery's judicious management, the works were quite up to date.

The PRESIDENT, in connection with references to the letters of apology for absence that had been received, mentioned, with special regret, that his Worship the Mayor was not well enough to attend.

NEW HON. SECRETARY AND TREASURER.

Mr. J. PATERSON (Redhill) said this meeting had been formally called for the express purpose of electing an Hon. Secretary and Treasurer. Owing to circumstances that had arisen since the last meeting, Mr. Browne had kindly consented to carry on the work of the dual offices until a successor was appointed, so as to obviate a double transference of duties in a short time.

The PRESIDENT said the Association were in the peculiar position of practically having three Hon. Secretaries at the present time. Mr. Paterson was appointed, but had not done his duty in the office, Mr. Browne had rendered yeoman service, and Mr. W. E. Price, of Hampton Wick, was burning to take up the work of the office. The Committee had looked round with some little anxiety—when it became evident that Mr. Paterson, by force of circumstances, must relinquish the office—to see who would follow on; and it was a great gratification to him (the President), to the Committee, and he was sure to the members generally, that Mr. Price had consented to shoulder the work. Following such an admirable Secretary as Mr. Browne, Mr. Price would have no small difficulty in keeping the efficiency of the Association at its best; but they knew Mr. Price's ability so well, that the future, they might rest assured, had in store as much success as the past. He moved that Mr. Price be elected Hon. Secretary and Treasurer.

Mr. J. W. HELPS (Croydon), in seconding, remarked that Mr. Price was one of their oldest members. He was not quite certain whether he was present at the birth of the Association; if not, his father was. The name was honourably linked, from the very first, with everything connected with the Association. Present in that room were, he believed, the whole of the members who had served in the position of Hon. Secretary. Fortunately, the Association had not had many of them; but if ever the history of the Association was written, it would be found there that they had had in Mr. Price a gentleman who had carried out the duties

of the office in a way that would stand comparison with the work as it had been done at any time before.

The motion was cordially carried.

A LITTLE HISTORY.

Mr. PRICE, in his acknowledgment, said it was very good of the members to give their unanimous accord to the motion. He hoped, in doing so, they had done the right thing—at any rate, no effort should be wanting on his part to make it so. He was, however, a little nervous of the path that had been laid down for his guidance. It was not a broad way, but a narrow and difficult one. The standard had been set so high by those who had occupied the position before, that he feared it would require of him no small amount of work to maintain it. His best endeavour would be to that end. When he knew this change was coming, he was interested in making research to refresh his memory as to what the Association had done; and to make himself rather more intimately acquainted with its early days. Probably there were members now present who were at the inception of the Association. The preliminary meeting to consider its formation was held at the Richmond Gas-Works, on Thursday, July 15, 1875. Some of those who then assembled had passed away; others were still with them. The names of gentlemen who were at the meeting in 1875 were Messrs. James Eldridge (Richmond), Farrand (Croydon), Packham (Kingston), Scott (Tunbridge Wells), Martin (Barnet), Wadeson (Windsor), and Chapman (Harrow). They welcomed Mr. Chapman that day. It was then resolved that an Association should be formed, and be called the Southern District Association of Gas Engineers and Managers; so that the name had not since altered. A Committee consisting of Messrs. Eldridge, Martin, and Chapman, were appointed to draw up regulations for the management of the Association. The first meeting was held on Sept. 16, 1875, at the Bedford Street Hotel; and the first members enrolled were: Messrs. W. H. Broadberry (Tottenham), J. H. Chapman (Harrow), J. Eldridge (Richmond), C. Farrand (Croydon), T. H. Martin (Barnet), T. May (Canterbury), H. F. Packham (Kingston), W. Parly (Aylesbury), A. F. Phillips (St. Albans), E. Price (Hampton Wick), G. Scott (Tunbridge Wells), J. Wadeson (Windsor), J. West (Maidstone), and A. H. Wood (Hastings). Mr. Wood was the first President, and Mr. Chapman the first Secretary. Though he (Mr. Price) was not one of the original members of the Association, he became a member in 1879. With this brief history of the inception of the Association (which he thought would be of interest), he would conclude by saying that he would in his new office do his best for the Association; and he knew that he might rely upon the individual assistance of the members.

SOME REMARKS BY THE PRESIDENT.

The PRESIDENT said he would like to express the hope that what they had done met with the approval of the members in not postponing the meeting that day. The Committee carefully considered whether the terrible calamity that had overtaken the nation by the death of the King should prevent them holding the meeting; but the general feeling as far as they could gather (and his Directors concurred) was that they should not postpone it. They had no excitements or festivities, but were just met as an Association. Had the visit not been made that day, he was afraid that, with the various engagements before them, it would have been impossible to have held it at all. He should like to say how pleased he personally was to see the Association at Bath. This was the third Association of gas men who had honoured them by coming there; and he saw many old friends among the company before him. Everyone was heartily welcome.

Looking round the works the previous day, it occurred to him that perhaps the spring was not the best time to have a visit of this sort. But the members all knew that the process of spring-cleaning had to be gone through; and they were that day in the midst of it. As all gas engineers had to do spring-cleaning, he knew they would recognize it was not being done here with an eye to the visit, but was just the ordinary routine of the works. Another point was that they could not invite the members to see works laid out on an extensive scale, so far as the ground site was concerned; but they could show them works one interesting point of which was that they could make from $3\frac{1}{2}$ to 4 million cubic feet of gas on a very restricted site. The whole of the manufacturing work was done on the north side of the river. He saw Mr. Caddick (who used to be with him) nodding his head; and that gentleman remembered some of the difficulties they had in consequence of this restriction.* He should also like to say a few words about the high-pressure plant for supplying gas to three villages about which he gave particulars at the annual meeting in London. He afterwards saw some criticism of his figures. He should like to say to those who were interested in the figures that, of course (it was almost unnecessary to tell a body of gas men), when one was measuring the passage of gas at pounds pressure, it was a very different thing from measuring at inches pressure; and he did not think the critic quite realized that one could not get, at the second when reading, the exact pressure

* The President no doubt had specially in mind the great flood of some years ago, when almost superhuman efforts were made to keep the furnaces going.—ED. J. G. L.

pound to pound as inch to inch. The meter was going at such a speed that it was impossible to obtain readings scientifically correct. The second point, as to the discharge of gas through pipes, was also a sort of stumbling-block in the critic's way. If he had properly read his remarks, he would have found that he (Mr. Ellery) gave the discharges through the pipe he experimented with, and for no other; his point being that they got irregular readings through pipes though of the same nominal size. There was such a difference in pipes that they had to be very careful not to accept theoretical figures—in other words, they had to be careful to bring a little commonsense to apply to theory. One other matter referring to the works was that among the shops would be found a room where tests of burners and mantles were carried out; and there were mantles there that had been running from 600 to 700 days.

At the last meeting in London, he (the President) said something as to municipal trading and public lighting. Since he made these remarks, as the members knew, after very careful investigation of the relative merits of electric lighting and gas lighting, some of the chief thoroughfares in London now lighted by electricity were, after a fair fight, to be lighted by gas—both because gas was considerably cheaper and the lighting would be much more efficient. He was sorry the members had had to come to a city where the local authority had failed to learn this lesson. He was sorry to say that it was not upon merits that the dear old City of Bath were doing what they were at the very time London was deciding that the better and cheaper light was gas. Their own city had decided—the reason being that they owned the electric light works—that they must put out the gas in some more of the thoroughfares and instal low-power electric lamps, which would also involve the scrapping of some high-power electric lamps and standards for which a considerable sum of money was paid not long ago. He pointed this out so that they might see the tendency of things. He was glad the Technical Press made such a good report of the actual facts and figures in London.

In conclusion, the President mentioned that Messrs. Stothert and Pitt (whose names would be known to the company as large engineers in the city) and Mr. Cotterell, the Manager of the Bath Stone Firms, had very kindly offered to entertain the Association and show them over their works; but the Committee, feeling the spring meeting was rather one to see the district than for visiting works, had been unable to avail themselves of these friendly offers. Knowing how very kind Messrs. Stothert and Pitt and Mr. Cotterell were, he moved a hearty vote of thanks to them for their invitations.

Mr. A. F. BROWNE (London), in seconding the motion, said it

would have been very pleasing to the members to visit the works of the firms mentioned had there been time. The name of Messrs. Stothert and Pitt had been known to them as engineers for many years, owing to the excellence of their work; and no doubt the work of the Bath Stone Firms was equally excellent.

The motion was unanimously carried; and the business proceedings terminated.

INSPECTION OF THE WORKS.

At the conclusion of the short business meeting, an inspection was made of the works under the guidance of the President, the Secretary (Mr. H. Shepherd), and his assistants (Messrs. Bingley and Pearce). The works, it may be explained, are situated just outside the present city boundary at Weston—about a mile from the Guildhall; and there is also a gasholder station with governor-room at Witcombe on the other side of the city (some 1½ miles from the works), to supply Box, Colerne, and other districts to the east and south-east of Bath. There is also here a compressing plant driven by a gas-engine for increasing the pressure (necessary at present for about one-and-a-half hours on Sunday mid-day, in the the summer time only) to one district about seven miles away. An interesting feature of the works is that the River Avon divides them into two sections—all the manufacturing plant being on the north side; and it is pretty safe to say there are few towns where plant for producing 3½ million cubic feet of gas per day is crowded into so small a space. The gasholders and sulphate of ammonia works are on the south side of the river, where also is stored the bulk of the coal.

It was seen that the retort-houses contain thirty-one settings, each comprising eight \square retorts, 21 in. by 16 in. West's manual stoking machinery, complete with breakers and elevators, is installed in each of the houses. The coke is removed from one of the houses by a conveyor of West's type, worked by 19-H.P. gas-engines in duplicate; and from the other house by a De Brouwer conveyor, operated by 21-H.P. gas-engines in duplicate. The plants are each complete with overhead screens and hoppers. The Midland Railway Company have a siding into the works and retort-houses; and the Company have also wharves on the River Avon, which (as just mentioned) runs through the works.

The gas travels from the retort-houses through water-cooled vertical, and air-cooled horizontal, condensers to the exhauster-room, which contains engines and exhausters in duplicate (one set of 250,000 cubic feet, and the other of 150,000 cubic feet capacity), engine and booster for sending gas to the Witcombe station when necessary, and also compressing plant in duplicate of a capacity of 15,000 cubic feet per hour (referred to in the President's

PLAN OF THE BATH GAS-WORKS.



address, see "JOURNAL" for March 15, p. 723), for supplying three villages west of the city. Adjoining, on one side, is the boiler-house, containing a battery of four boilers for general steam purposes; on the other side is the engine fitters' shop.

From the exhauster, the gas passes to a Livesey washer, which is used for extracting the naphthalene from the gas, by means of oil-gas tar. This was also a subject upon which the President dilated in his address. Three vertical scrubbers (which, it was learned, are filled with blocks of wood) stand on either side of the pump-house, which contains the pumps for both tar and liquor. The plant includes two washers—a 2-million "Cockey" for use in summer, and a 3-million "Kirkham-Hulett" for the heavier make in winter. In each of these, a compartment is filled with oil-gas tar for retaining any portion of naphthalene escaping the Livesey washer. The purifiers are all in the open; open sheds being used for covering the oxide of iron in process of revivification. The station meters and district governors are under one roof. The gas finally on the works passes through a 30-inch and a 24-inch main to the gasholders, situated on the south side of the river, where also is built a gatekeeper's house and a governor room—the governors being employed in regulating the pressure on the south side of the district.

Adjacent to the retort-house is the carburetted water-gas plant, comprising two sections, each of a capacity of 500,000 cubic feet per day, and erected in 1895 by Messrs. Humphreys and Glasgow, with engine-room and boilers. The carburetted water gas, after passing through a "Cyclone" tar-extractor, is purified and measured apart from the coal gas—mixing taking place at the outlet of the station meters. Here, again, is evidenced the restricted area of the works; and it is interesting to observe on how small a space it is possible to manufacture over a million cubic feet of gas per day.

Situated on the south side of the river is the sulphate of ammonia plant, which is equal to a production of about 4 tons of salt per day. The saturator, of the enclosed type, is erected on a platform, and discharges the salt to the ground floor, through a valve fitted on the under side. The waste gases are utilized for heating the acid and liquor, and are purified by passing through oxide of iron heaps, under a shed. Two boilers to provide the necessary steam are fitted in an adjoining room.

Near to the offices are the shops for repairing stoves, meters, &c.; and here also a room was found set apart for the testing of burners and mantles. An account of some of the interesting work done here, it will be remembered, appeared in the Presidential Address.

Among other items of gathered interest was the fact that last year the Company sent out about 642 million cubic feet of gas, through a total length of 131 miles of mains, from which were supplied 16,000 consumers. The price of gas is down to 1s. 11d. per 1000 cubic feet. The Company have show-rooms and offices in the centre of the city; and these (which were opened in 1906) have proved a great convenience to their many customers.

LUNCHEON AT THE ASSEMBLY ROOMS.

In one of the beautiful banqueting halls at the Assembly Rooms, the members were entertained at luncheon by the Gas Company; the Chairman (Mr. A. Browning) presiding. On his right-hand side was the President of the Institution and on his left Mr. Ellery. After lunch, the Chairman referred in words of deep regret to the death of King Edward; and asked the members to drink in silence to the "Health of King George the Fifth." This was done.

Mr. J. W. HELPS, in proposing "The City of Bath," said he had been intimately connected with the city of Bath all his life. He was born near to one of the parts of the gas-works visited that morning; and he was brought up in Bath until he was 21 years of age, and had visited the city frequently since. He regarded it as one of the most beautiful places in the Kingdom. He wished, and they all wished, prosperity to Bath and to its gas and other industries. He added that he received his education in engineering matters at Messrs. Stothert and Pitt's. Regarding the Bath Corporation, he did not know very much. But all present hoped that everything the Corporation undertook would prosper, and that anything they might do with regard to municipal trading might not unduly interfere with the industry the Association represented. All they asked for was for fair play. Given fair play, they could show that if they were not equal to all the demands of the city of Bath they were very nearly so. He had his own opinions on certain matters, but this was not the time to express them.

THE TOWN CLERK, in responding, said he recognized that they associated him with the toast in his official capacity as representing the Corporation, who had been referred to by Mr. Helps in terms which he fully appreciated. He came there quite prepared to find that the toast might be coupled with some few observations which at any rate would not leave him without a subject for reply; but the natural courtesy and good humour which pervaded their gatherings had prevented him having the opportunity for dealing with subjects that would require considerable time to put before them. He reciprocated very heartily the expression Mr. Helps had made use of—viz., that there should be fair play. Let them all have fair play; and he did not think there would be any reason for difference between them. He was pleased the Association had selected Bath as the place for their meeting; and they were proud to know the members had selected from Bath the President of their Association. He had had the pleasure, more particularly in recent years, of being closely associated with Mr. Ellery in matters of business; and he could not hope to be associated in such matters with anybody with whom he could expect to get on better than Mr. Ellery. He was one of those gentlemen with whom business matters could be discussed, and all individuality be sunk.

Mr. P. K. STOTHERT submitted "The Southern District Association

of Gas Engineers and Managers." He said the Directors of the Gas Company heartily welcomed the Association, and were glad that their Engineer was the President this year. The Directors of the Company prided themselves not a little on the position of the Company, because at the present time they were able to supply an illuminant at a cost comparable with that of almost any town in the Kingdom—and this in spite of the fact that the gas was tested by the old and not the No. 2 burner.

THE PRESIDENT, in responding, said it was a great pleasure to him to see so many of his professional friends in Bath; and it was a great gratification to see the Directors of his Company so warmly entering into the spirit of the meeting. He should like to publicly express his appreciation of the way in which his Directors at once entered into the desire for the members of the Association to visit Bath; and he personally thanked them for their kindness. He also highly appreciated the presence of Mr. Wardle. As to gas engineers' meetings, there were usually in a town several men of the same profession (such as lawyers or doctors), but only one gas manager; and if they did not meet occasionally as they were doing that day, for a little friendly intercourse, they would rust or go to pieces. In conclusion, he mentioned that next month he should have been in Bath 30 years; and he was very proud of the city.

Mr. H. W. WOODALL proposed "The Bath Gaslight and Coke Company," remarking that there were many reasons why the Company should be thanked. They had given the members an excellent lunch; and all the arrangements for the day must have involved a large amount of forethought and preparation. The Company had also given the Association their President for the year; and they could not have had a more charming, helpful, or fully-equipped President. From him the members had a valuable address; and on his works that day they had found many things of which to make note.

THE CHAIRMAN, in his response, said the Company had keen competition in Bath, and he had no doubt many of those present had to face similar competition. They knew what municipal trading was; but such meetings as this would bring the gas industry into the prominence it richly deserved.

THE PRESIDENT said there was one more toast, though not on the list, which they ought not to miss. It was to their late Hon. Secretary and Treasurer (Mr. A. F. Browne). The Association were deeply indebted to him. He was relinquishing office that day; and the members ought not to separate without expressing their appreciation of the services he had rendered to them individually and collectively. Mr. Browne ought to be proud that he was in possession of faculties that enabled him to do such splendid service for the gas industry.

Mr. BROWNE, in responding, said he felt he had been fortunate in having worked with their President for the year. He (Mr. Browne) had worked with four Presidents; and Mr. Ellery made the fifth. To be associated with their President had been a great pleasure. He felt that he ought also to acknowledge the generous way in which the Association had been received by the Bath Gas Company. There had been a great deal to do to bring such a meeting as this to a successful issue. Mr. Ellery introduced to the Committee a rich programme; and it was to the immense regret of the Committee that time would not allow of the whole of it being accepted. This was probably the last official act in his position of Hon. Secretary. It had been a pleasing office; and in it he had received the greatest kindness. Now that it had come to the end, he laid it down with some sense of loss. But if the members had asked him to continue in it, he would have had to say that he was unable to do so.

A DRIVE AND AFTER.

Subsequently, some of the members wandered through the magnificent Park and to see other sights in the city; while the majority went for a motor drive to the top of Beechen Cliff.

On returning to the city the members alighted at the Abbey; and a few minutes later were at the Grand Pump Room, where, with the old Roman Baths as a setting, they were photographed. Thus was secured a striking memento of a visit to a work of great historical and national value. Tea was afterwards served in one of the adjoining rooms. Mr. John Hatton, the Director of the Baths, did all possible to give his visitors interest to the full in the beautiful and wonderful establishment under his control; and after tea Mr. A. J. Taylor, M.S.A., kindly attended to give the members, at the side of the Roman Baths, a sketch of their history—covering the traceable facts as to their construction, and the cause of their loss for centuries, with particulars of their almost romantic discovery in the Eighties. The visitors examined with intense interest the work of those wonderful Roman builders; and not a little admiration was expended over a length of Roman lead pipe (still *in situ*) testifying to the remarkable fertility in resource of the early workers. The floor of the large bath, too, it was mentioned by Mr. Taylor, is entirely covered by lead weighing 40 lbs. to the foot. The water surface of the tank is 82 ft. by 40 ft.; and about 40 tons of lead was used in covering the bottom of the latter. After inspection of features of interest under Mr. Taylor's direction (he was warmly thanked at the instance of the President), a rapid survey was made of the modern baths, which are beautifully constructed and equipped.

Thus ended a most interesting visit—in fact, in such a centre of unique interest it would be a poor individual who did not find much to arrest his attention and to excite his imagination and appreciation. So from this scene of great past and present associations, the members passed their several ways to their homes—feeling grateful to all who had contributed to the day's interest and enjoyment. One thing that was informally done was an instruction to Mr. Browne to make his really last act as Hon. Secretary, the writing of a letter to the Chairman and Directors of the Bath Gas Company acknowledging the exceeding great kindness they had extended to the Association.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

Half-Yearly Meeting at Cardiff.

Amid ideal weather conditions, a large muster of the members of the Institution took place last Wednesday at Cardiff, where it had been arranged that the May meeting should be held. The city is, of course, a convenient centre for such a gathering; but we shall probably not be wrong in assuming that the satisfactory attendance was in part at least due to pleasant recollections of a former visit, when the Cardiff Gas Company, as last week, acted a part for which they prove themselves most excellently fitted—that of hosts. In spite of a disappointment—Mr. Thomas Acland, of Llanelly, was to have read a paper, but was unfortunately prevented by illness from attending the meeting—the day was a well-filled one. A paper by Mr. H. D. Madden, the Engineer of the Cardiff Gas Company, on the formation of classes for gas engineering and supply, was the main item of the business meeting; while luncheon with the Directors of the Company was followed by visits to the new Queen Street Show-Rooms and the Grangetown Gas-Works. The members were particularly gratified at the presence, during the discussion on Mr. Madden's paper, of the veteran Chairman of the Company (Surgeon-Colonel W. Taylor, M.D., J.P.) and the Deputy-Chairman (Colonel H. Oakden Fisher, J.P.), both of whom addressed the meeting.

The Meeting.

The members assembled at the Bute Terrace Offices of the Cardiff Gas Company, a room in which had been placed at the disposal of the Institution; and here the business meeting was held, under the chairmanship of the PRESIDENT, Mr. A. H. Brookman, of Tenby.

A WELCOME.

Mr. GEORGE CLARRY (the Manager and Secretary of the Company), before the commencement of the business proceedings, said that, on behalf of the Company, and especially on behalf of the Chairman and Directors, he wished to give the members of the Association a very hearty welcome. He did not intend in any way to interfere with the business of the meeting; but, on the other hand, his Company would endeavour to make the day as interesting as possible. Perhaps the best thing he could do at the moment was to retire, so that the members could commence the proceedings; and then the Company would take on matters again at a later stage. The Chairman (Surgeon-Colonel W. Taylor, M.D., J.P.) and the Deputy-Chairman (Colonel H. Oakden Fisher, J.P.) had both promised to attend during the proceedings at the meeting.

THE LATE KING.

The PRESIDENT said that his first sad task was to refer to the great loss which the nation had sustained by the death of their beloved Sovereign, King Edward VII. They knew that his late Majesty was keenly interested in all scientific matters. He felt that they should give expression to their deep sorrow and their sympathy with the Royal Family in their bereavement.

This the members did by rising silently in their places.

MINUTES OF THE LAST MEETING.

The HON. SECRETARY (Mr. Octavius Thomas, of Pentre) read the minutes of the last meeting; and they were confirmed.

NEW MEMBERS.

The following new members were then elected: Mr. George Clarry, of Cardiff; Mr. Edmund Petty, of the North Pembroke-shire Water and Gas Company, Fishguard; Mr. John Haydon Jones, of Dowlais; and Mr. Frederick C. Mortlock, of Whitland.

REPORT AND ACCOUNTS.

The HON. SECRETARY read the fifth annual report of the Council, which stated that during the year ten members had joined the Institution, two had resigned, and one had died—leaving a membership of 55 at the end of the year. The receipts amounted to £27 6s., and the payments to £28 7s. 2d. There was left, after deducting the deficit of £1 1s. 2d. from the balance of £22 7s. 10d. in hand at the beginning of the year, the sum of £21 6s. 8d. in the hands of the Treasurer.

The report and accounts were adopted, on the proposition of Mr. B. A. LEWIS (Carmarthen), seconded by Mr. A. W. BRANSON (Caerphilly).

ELECTION OF OFFICE-BEARERS.

The following were the officers elected for the ensuing year:—

President.—Mr. J. H. Canning, of Newport.

Vice-President.—Mr. E. H. Swain, of Pontypridd.

Hon. Treasurer.—Mr. Henry Morley, of Teignmouth.

Hon. Secretary.—Mr. Octavius Thomas, of Pentre.

New Members of Council.—Mr. B. A. Lewis, of Carmarthen; Mr. A. J. Ward, of Cardiff; and Mr. T. E. Franklin, of Barry.

Hon. Auditors.—Mr. J. M. Small, of Merthyr Vale; and Mr. F. C. White, of Treharris.

Alderman T. CANNING (Newport), in proposing the re-election of the Hon. Secretary, said the Association were under a deep debt of gratitude to Mr. Thomas; and, in seconding, the PRESIDENT remarked that the time had nearly arrived when they should express their appreciation in some tangible form. He merely threw this out as a hint, he said, for the Committee to deal with at some future date.

SUBSCRIPTION TO THE GAS INSTITUTION BENEVOLENT FUND.

The HON. SECRETARY said they had had a letter from Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers, calling attention to the financial condition of the Benevolent Fund, and asking for assistance either from the funds of the Institution or by procuring fresh subscribers. Mr. Thomas remarked that, as a member of the Council of the Benevolent Fund, he could say that they really wanted more money. Many deserving cases they were not able to help for want of funds. Less than one-quarter of the members of the Institution of Gas Engineers were subscribers at the present time; and he really hoped some of those in the room would assist. He proposed a donation of £2 2s. from the funds of their own Institution.

The PRESIDENT seconded the proposal, which was at once agreed to; and several members present also intimated that they would contribute privately to the fund.

THE PAPER.

The PRESIDENT remarked that Mr. Thomas Acland, of Llanelly, was to have given them a paper; but unfortunately he was prevented by indisposition from being present at the meeting. Neither had he been able to prepare his contribution. They would therefore have to pass this item. Mr. H. D. Madden had promised a paper on "A Need of the Gas Industry in South Wales;" and he would now call upon him.

Mr. Madden then read his paper, which, with a report of the discussion to which it gave rise, will be found on p. 434.

The PRESIDENT proposed, Alderman CANNING seconded, and the members heartily accorded, a vote of thanks to Mr. Madden for his paper; and Mr. MADDEN acknowledged the compliment.

PLACE OF NEXT MEETING.

The PRESIDENT said there had been some little discussion in the Council as to the place of next meeting. As they had already elected Mr. Canning, jun., as President for the ensuing year, he did not think they could do better than meet at Newport. He moved this.

Mr. BROWNING seconded the proposal, and it was agreed to.

Alderman CANNING expressed the hope that he would see the members at Newport, and said he believed his Board would be as pleased as he himself was to hear that the Institution were going to pay another visit to the town.

THANKS TO THE CARDIFF GAS COMPANY.

The PRESIDENT proposed a vote of thanks to the Chairman and Directors of the Cardiff Gas Company for their kindness in lending the room for the meeting, and for their hospitality. Had it not been for the help they had received from the Company, they would have experienced some difficulty in getting through the meeting.

Mr. J. H. CANNING (Newport) seconded the proposal, which was carried by acclamation.

Dr. TAYLOR said they were very pleased to see the members; and he thought that in going round the works presently they would notice some alterations. There had been an entire change in the organization. They had separated the commercial from the manufacturing element. They did not now manufacture at Bute Terrace at all. The whole of this work was carried out at Grangetown, where Mr. Madden, in succession to Mr. Morley, performed the duties of Engineer most efficiently. They had erected a drawing office there, and put in large and up-to-date purifiers. They had been in the habit of paying the Corporation between £800 and £900 a year for some 32 to 34 million gallons of water; but they had now had a well sunk on the works by Messrs. Isler & Co. When 400 feet down, they found water, which, however, contained a great deal of salt. It would do very well for quenching coke, flushing drains, and similar purposes; but it could not be used in the boilers. Cisterns had been erected to obviate the necessity of pumping all day long. The carburetted water-gas plant was not in action when the members last visited the works. It was now in full operation; and when required in foggy weather, they were able to use a fair proportion of this. It was a great stand-by.

THE LUNCHEON.

At the close of the meeting, the members inspected a Féry pyrometer, the operation of which was explained to them by Mr. Madden; and they then adjourned to the Board-room, where they were the guests of the Cardiff Gas Company—Dr. Taylor being in the chair. The toast list was not a long one.

The CHAIRMAN said they met under a great shadow; for the King was dead. He had reigned for but a short time; but during the nine years, he had endeared himself to all British people. And not only so, but he believed he had won the admiration of the whole world.

He asked them to drink in silence to the memory of King Edward VII. He next proposed "King George V.," and subsequently "Success to the Wales and Monmouthshire District Institution of Gas Engineers and Managers." He said it was extremely gratifying to himself and his Board to find the Institution so soon again visiting Cardiff. It conveyed the impression that they had been pleased with their previous visit. He offered them a hearty welcome. There was no doubt in his mind that organizations of this kind were of benefit all round. Young men were able to learn from the experience of their elders; and they all profited. Their great aim, as gas directors, gas engineers, or gas managers, was to put gas into their holders at as cheap a rate as possible. From small beginnings, gas had gone on until it had attained its present degree of usefulness. How far this usefulness might be still further extended in the future, it was, of course, impossible to say; but within the last few years, it had been extended in directions which they at one time never thought of. They had a great competitor. They were not competitors with the electric light; gas was in existence long before electricity was heard of. They heard sometimes that they were competing with the Cardiff Corporation electricity undertaking; but they were doing nothing of the kind. The Company had been in existence since 1837, and the electricity works he supposed for some sixteen or seventeen years. The latter had been doing a thing which to his mind was wholly illegal. A firm of gas-stove makers came to Cardiff a short time ago, and opened a shop. They applied for gas for lighting; and some high-power gas-lamps were fixed outside the shop. This was too much for the electric light people, who went to a shop next door and offered to wire and light it without asking for a penny. Was this fair competition? He thought it was very unfair; and it was at the expense of the ratepayers. It was known that the installation was not paying; and yet they gave current away in this manner. He was told it was illegal to supply wiring free; and recently these fittings had been removed. The Company had opened a show-room in Queen Street, where they sold gas-fittings and stoves, and explained the principles on which they were based. They were about to establish a course of lectures for ladies; and when stoves were fixed, the working would be explained to them. He hoped the Institution would continue their work, extend their usefulness, and carry into effect the idea Mr. Madden had put before them.

The PRESIDENT, in acknowledgment, remarked that, in coming to Cardiff, they felt that they were almost at home. He was sure of having a good welcome; but as so short a time had elapsed since their previous visit to the city, he hardly expected, when they decided to hold the present meeting in Cardiff, that they would be entertained in so handsome a manner again. He tendered to the Directors the hearty thanks of the members.

Alderman CANNING proposed "Prosperity to the Cardiff Gas Company," coupled with the name of the Chairman. It was, he said, a great pleasure to the members to be received in so hearty a manner by Dr. Taylor and those associated with him. Not only had they been well received, but the presence of the Chairman and Deputy-Chairman had given to the meeting a distinction which otherwise it would not have had. The Chairman was no novice in gas matters; and the management of the Cardiff Gas Company proved this. They all knew how progressive the Company was; and they were prepared to learn, as they learnt before, a great deal from the splendid manner in which the Company had laid down their works, and from the admirable way in which both the engineering side and the commercial side were managed. The Company were very fortunate in their officers. In Mr. Clarry and Mr. Madden, they had two of the best officials it would be possible to find.

The CHAIRMAN returned thanks, and admitted that the Company were in a happy position; for they sent out a good deal of gas at a very cheap rate. He wanted to keep abreast of the times; and if any improvement was heard of, he took Mr. Clarry or Mr. Madden and went to find out the truth about it. They had been to seek a motor-lorry to deliver their stoves; and they even wanted to find a little motor to carry the coppers from the slot-meters. There was daily collected something like 4 cwt. in pence. He agreed that they were exceedingly fortunate in having two such officers as Mr. Clarry and Mr. Madden; and then there was Mr. A. Williams, the Works Superintendent at Grangetown. The commercial and engineering departments had been separated, with beneficial results. He proposed the health of Mr. Clarry and Mr. Madden.

Mr. CLARRY, in acknowledgment, said nothing would give him greater pleasure than to further in some way the interests of the Institution. He would ask the members, before going to the works, to give some consideration to the sales department. During the last few years very great strides had been made in this direction; and he hoped that the efforts that the Company had been making would be of benefit to the members of the Institution as well as to themselves. People coming into Cardiff would see the new show-room; and he felt sure the members would find it an incentive in their different districts to make use of the latest methods of consuming gas. So long as they had Cardiff to watch over the interests of the industry, gas would not fall into the background, but, on the contrary, he believed would prosper even more than it had done in the past. They wanted to keep both themselves and their consumers abreast of the times.

Mr. MADDEN also briefly returned thanks, and said he had always found it a great pleasure to work with Mr. Clarry under such a Board as they had.

THE QUEEN STREET SHOW-ROOM.

A visit was paid to the Bute Terrace stores, where the members admired the ingenuity with which an old retort-house has been converted to a clean, well-lighted, double-galleried store for fittings required on the district. The building is specially fitted up for the purpose of concentrating under one roof the whole of the stores required in the Company's fittings department; and ultimately the stores will be sectionalized into prepayment, ordinary meter, services, and general fittings. At present the goods are delivered in the district by a spring cart; but the Directors have recently placed an order for an 18 H.P. motor-van.

Brakes were then requisitioned to convey the party to Queen

Street, where the new show-room was inspected with interest, under the guidance of Mr. Clarry. So handsome are the goods on view, and so tastefully is everything arranged, that it is difficult to suppose a consumer could look round the stock without feeling an almost, if not quite, irresistible desire to purchase or hire something. The premises, which have only been open a few days, are in every way excellently suited to fulfil their object of displaying to the best advantage the many uses to which gas can now be put in the household and for business purposes. The facilitating of the payment of accounts is another point. A counter is provided for this purpose, and—it is not near the door. The consumer has to traverse the length of the show-room—a journey which, as he looks about him, he will no doubt feel pleased that he has been obliged to undertake.

It may be remarked that the show-room is about 100 ft. by 20 ft., on the ground floor; and it has a large front window, the special attraction of which will be illustrative features in lighting and heating by gas. At the far end of the room is a small lecture or class room. This it is intended to utilize for the purpose of giving instruction to ladies upon the use of gas for cooking and domestic purposes. A qualified lady demonstrator will be in attendance daily; and classes will also be formed for giving instruction to domestic servants in the evening. The lady demonstrator will during the day visit the houses of consumers for the purpose of giving expert advice when required. Over the fascia, eight Keith high-pressure incandescent gas-lamps, each of 1500-candle power, have been installed, in addition to which two high-pressure lamps of 500 candles are fixed in the lobby. The compressor is placed in the basement. An automatic control is fixed; and all lights can be turned on and off from the basement. Ventilation of the show-room is carried out by means of a Keith-Blackman reversible fan, which enables the entire air of the room to be changed every fifteen minutes. The window can be lighted by means of switches; the board controlling thirty lights. The ceiling-rails are designed in oxidized silver tubing; and the show fires are connected up to flues—each fire being controlled by a switch-tap in the basement. A bath-room system has been fitted up with a "Lightning" Geyser, supplied with shower and lavatory arrangement, also a "Wilson" hot-water circulator, with tank. A Parkinson "Pearl" geyser is fixed for the lavatory basin; while provision has been made in the basement to supply hot water for kitchen and other purposes by means of Potterton's "Victor" gas-boiler.

AT THE GRANGETOWN WORKS.

After this practical demonstration of the progressive spirit of the Company, the drive was resumed to the Grangetown works, where the visitors were taken charge of by Mr. Madden, Mr. J. Parry, and Mr. A. Williams. Here, also, they saw that nothing is allowed to stand still. Short as was the time that had elapsed since the previous visit of the Institution, numerous additions were noted at the station, which covers 18 acres of ground, and is capable of producing 7 million feet of gas per day. On entering, the first additions seen were the new and roomy offices for the accommodation and concentration of the engineering staff; and the pump-house, tank, and machinery, which is now providing water, as had been stated by the Chairman during the meeting, from a well sunk 407 feet deep. Proceeding, the members came to a new mechanical screening plant for sorting breeze and working in conjunction with the existing coke-handling plant. This was made and erected by the Company's workmen, and delivers the screened sizes directly into carts or railway trucks.

There are at the works two large retort-houses. One of these has 35 beds of regenerators equipped complete with West's compressed air stoking machinery, coal-handling plant, hot-coke conveyors, coke-storage hoppers having a capacity of 400 tons, and a long gantry and travelling crane which is used for storing in the yard. Eight-hour charges of about 9 cwt. are worked; and they are found to give great satisfaction, not only from the gas point of view, but from that of residuals also. The members were able to see the operations of discharging and charging; and the evenness of the charges in the retorts was commented upon. Investigation is in progress as to the calorific value produced under different conditions of working with refinements to the dip-pipes and hydraulics, &c.

Just now this house is being extended to forty through beds of retorts; the walls, foundations, and settings being well forward. As was stated in the "JOURNAL" for the 5th ult., the Directors have, for this extension, placed an order with West's Gas Improvement Company for one of their new power stokers for horizontal retorts, an illustrated description of which was at the same time given (see pp. 24, 25), with coal and hot coke handling plants. As this machine—we understand the one at Cardiff will be the first of the kind installed—charges and discharges the retorts in one operation, the furnaces are placed on the one side.

The second retort-house contains 38 beds of retorts, hand-charged; but it is not now used. There is no doubt, however, that at a later date it will be converted to a modern system of carbonizing.

Some time was spent round the new purifying-house (one of four, each having six boxes), an illustrated description of which appeared in the "JOURNAL" for Nov. 23 last (pp. 526-9). The purifiers are fitted with Spencer's patent hurdle grids; and they are worked by means of two Pickering patent centre-valves, one of which controls the four larger boxes, and the other the two smaller ones.

At Grangetown, further suggestions can be had for the utilization of old retort-houses. The carpenters and pattern makers are accommodated in a roomy building which once formed part of a retort-house. Mechanical tools and power are well provided, and the engine-shops are being further equipped with modern high-speed tools, to cope with the necessary work. The Directors are—and rightly so—firm believers in being equipped with modern apparatus in every branch; and at the manufacturing station, as in the other departments, "Progress" is certainly the order of the day.

The carburetted water-gas plant is a still further instance of good use being made of disused retort-houses. The plant is accommodated in old converted retort-houses which are now, respectively, boiler-house, plant building, and engine-room. At the present time, two 1 million cubic feet per day sets, complete with machinery, are installed; but sufficient room is left, and the foundations are ready, to receive two more sets, should they be required. A feature of this carburetted water-gas installation, as has been pointed out on previous occasions, are the twin generators, which are found very useful. What has been done is to provide three generators for the two sets—that is to say, there is a spare one which is connectable with either set. It is, of course, in connection with the generator that most of the wear and tear arises; but by the adoption of the "twin" method, it is always possible to keep the two sets going.

The governor-house is being extended, and two new governors are being installed. One (a 24-inch) has just been brought into operation, in conjunction with a 24-inch trunk supply which is being carried out to the district; while the other (an 18-inch) is to act as a safety-governor between the inlet and outlet mains. Provision is also being made for excellent mess and bath room accommodation for the workmen.

Regarding sport, the works may claim to be the first in the Principality. Teams of riflemen and base-ball players form part of an institute of which Mr. Madden is President; and this year the teams have been most successful. They have won both the Senior and Junior Challenge Cups of the Cardiff and District Rifle Club, and last summer brought home the championship in the shape of another challenge cup for base-ball. To encourage further efforts, the Directors (as stated by the Chairman) have taken a 4-acre field adjoining the works as a recreation ground for the men; and, as will have been gathered, the Board give their wholehearted support to everything that is for the good of the working men co-partners.

At the conclusion of the inspection, tea was served in the old carpenters' shop, which is now given over to ambulance classes. This having been partaken of, the President called for three cheers for the Cardiff Gas Company and the staff. Dr. Taylor, in reply, said that the Company would do all they could to earn another visit from the Institution on a future occasion, when, he hoped they would find further improvements in the works.

The visitors were then driven back into the city, where they dispersed, after having spent what was generally agreed to have been a thoroughly successful day.

A NEED OF THE GAS INDUSTRY IN SOUTH WALES.

[A Paper Read at the Meeting of the Wales and Monmouthshire Institution, May 11.]

When this subject was brought forward and discussed at the last meeting of your Council, it was with some diffidence that I promised to carry out their wish to introduce the matter of the needs of gas education for the South Wales and Monmouthshire districts, as I felt it could have been more ably dealt with by other members of our Association. The object of your Council is to draw the members' attention to the fact that at the present moment no public tuition is available in South Wales for those who desire instruction and technical training in the subjects of gas engineering or gas supply; and it is felt that it is a matter that should receive our earnest attention, with a reasonable desire of a remedy and a hope that the gas industry will be well represented in the Technical Colleges of the district.

It is somewhat surprising that a large and populous district like ours, full of gas-works and coke-oven installations, should be entirely unrepresented and be without place in the curriculum of the Technical Colleges in the many towns of South Wales, especially so when one looks at the advantages enjoyed in other populous districts like the Midlands, Yorkshire, and London areas, where the industry has exceptional training classes available for gas men who desire special instruction in either manufacture or gas supply, with the sister handmaiden of chemistry and engineering. Locally, the mining and mechanical professions receive the full amount of attention they naturally merit in such an important mineral and industrial country as South Wales; and as twin brother to these, let us move forward and ensure like advantages, so that the gas industry takes a prominent place in the technical programme of education and receives the prominence that a scientific industry so naturally deserves.

It is, I feel, quite unnecessary to bring forward any plea in support of the advantages of technical education in gas matters, as one and all recognize that a thorough knowledge of the inner

truths of the science is becoming more necessary each day, and is vital to the well being of gas and its development. To-day the rule-of-thumb is gone, and science and a proper understanding of gas questions become more imperative, both on the works and with the distributing departments. Results and economies of production, with a consequent low selling price of the article we manufacture (the most important factor in the stability of the industry), can be materially assisted by trained minds engaged in the daily routine of our work. Work, enthusiasm, and systematic and intellectual thought on the complex questions are engendered and encouraged by properly applied technical classes, with a result that must be beneficial to gas undertakings and to the industry at large.

The value of the gas-preparation classes has been for years emphasized by our friends, the "JOURNAL OF GAS LIGHTING" and the "Gas World;" and I would draw your attention to some salient remarks on this year's examination and its value, taken from a leading article recently in the "Gas World": "There is a technic for both gas manufacture and distribution which can only be thoroughly mastered by practising it for a sufficiently long apprenticeship. The old hands in this service were prone to believe that nothing more was necessary. How narrow was their outlook may be perceived on inspection of their records, of their papers, and of so-called inventions which had no foundation in Nature. What has now to be done is to bend the general teaching in science, which is so readily available at the present time, to the elucidation and the guidance of the technic, which is also widening out and taking on developments utterly beyond the ken of the self-taught craftsmen of an earlier day. They were in many instances wonderfully good men, within their limits; but it is time to recognize that, speaking generally, the era of the self-taught man is past. There is far too much to be acquired in all arts for the ablest to have time for laboriously working his way unaided from the beginning to the front rank, where everyone wants to find himself, in good health and with plenty of open ground still before him. Not the least valuable office of these carefully prepared examination papers is the indication they supply of the right road for a student to pursue."

In other parts of the country where gas classes are held, the benefits conferred can be plainly seen in the able papers read and discussed by the Junior Institutions, that have their foundation and origin in the college classes which trained and educated them. The German gas-works have fully recognized the importance of being in earnest in this matter, and have provided most thorough courses of systematic technical training for all branches of employees, which has been carried out with characteristic thoroughness and borne fruit of the highest order in the scientific research and practical application of the truths discovered, to the great advantage of their gas undertakings. The gas industry cannot, and will not, stand still; and knowing and seeing the beneficial results of classes, as an Association morally responsible to our parent, the Institution of Gas Engineers, for the welfare and advancement of gas in the Principality, we cannot stand inert and allow the present condition of affairs to remain unaltered.

Without labouring the point, the suggestion I would respectfully place before you is that we, as an Association, might do something tangible, by practically promoting and assisting in the formation of classes for gas manufacture and supply in the South Wales and Monmouthshire districts, and do away with the necessity of our students travelling tremendous distances out of South Wales to obtain tuition, and to sit for examinations for these subjects.

Commercial knowledge and the gift of handling men cannot be taught in these classes. The works and the office must provide these lessons; but such lessons teach the theories which govern the laws of our daily work, and which, if properly applied, are so important a guide and factor in the successful issue of the same. Furthermore, to ensure practical success, I feel that we should follow the matter up, and continue to foster and watch over the courses of training given, so that overlapping is obviated and the curriculum arranged and guided, for systematic and progressive tuition, in each branch—viz., for the engineering and the lighting departments—in order that the fullest advantages may be provided and given to the different grades of students, and carry lasting benefits to the undertakings we are all proud to serve, and who, I am sure, would welcome and assist our Association in a project so closely allied to their welfare.

In a primary movement of classes—the ordinary stages only can be provided, the honours courses following in due sequence—the writer hopes that, by careful guidance of the Association, this may not be the end, and that ultimately we may see in our district the same provisions as are founded by the German gas organizations—viz., lectures in carbonizing technique and gas-fitting practice; so bringing the latter trade to a higher plane than it stands at the present moment. The day of the specialist is here; and provision must be made for it. The great forward movement of the outside department is a type of this same specializing in which, if men are to keep pace with the modern developments in the uses of gas, they must intelligently learn the fundamental laws of light, heat, and power.

If we, as an Association, put our hand to this business, let us make up our minds to do it with a thoroughness that cannot be mistaken, accompanied with an earnest desire to see the industry in South Wales at least as well provided technically as any other part of the kingdom.

Discussion.

The PRESIDENT said they would all agree that Mr. Madden's paper dealt with a subject of the utmost importance to the gas profession. The question of the importance of scientific training in connection with gas manufacture and distribution was one of the leading problems of the day. One point was the difficulty of getting technical scholars to pass examinations. For one thing in Wales the distance they had to travel was a great obstacle.

Alderman T. CANNING (Newport) (after remarking that he had waited to see if someone else would speak first who would probably be able to give a more practical and more definite idea of exactly what were the difficulties they laboured under than he might be able to give himself) said Mr. Madden was to be highly complimented upon his paper, which was a very suggestive one. He thought at the opening the author stated that no public provision was made in South Wales for the teaching of gas engineering and the principles of gas supply. There was no difficulty in having classes of this kind, especially in any of the technical institutes in the large centres. At the present time the position was that in this country education was free so far as it was elementary; but when they got above this stage, it was not free. When, therefore, application was made to a technical institute to found a new class, the committee desired to know first of all how many students there would be in the class, so that they could fix a fee accordingly, to cover the expenses of the teacher, &c. This was not a large sum. He did not know whether Mr. Madden's views were that their Institution should make some arrangements of this kind—that was to say, make provision, so to speak, for paying the very moderate expenses, after all, of the teaching, the opening of the classes, &c. Of course, these fees were in no instance heavy; being merely designed to meet current expenses. The use of the building and its equipment would be entirely free of charge to any students who came to the institutes. Next, he did not know who the students were that Mr. Madden intended should become recipients of this technical instruction. He did not know whether he meant those who had already finally made up their minds to carry on the work of the gas profession, and had entered on terms of pupilage, because he himself would certainly not recommend anybody to go to a technical school or to attend any public lectures in college or secondary schools with the idea of acquiring merely theoretical knowledge. Such classes ought to be attended by persons who were already engaged in the gas business. If they looked at the matter from this point of view, he was very much afraid that, unlike the Midlands or the North, they had no centre (except perhaps Cardiff) which would be able to supply the eight or ten pupils that the technical instruction committee would undoubtedly ask for before they would appoint a teacher. He thought that the committee would be well satisfied with an average attendance of six during the session. But in order to secure this, they must always have a larger roll of students. The matter was a very important one, and must be considered from the practical point of view, as well as from another aspect—the great need at the present day of having young men properly trained, and enabling them to compete with those who, as Mr. Madden had pointed out, were well trained in other districts. This was the hardship of the case. On the one side, there was the practical difficulty of getting a training; and, on the other, the absolute hardship of having young men brought up in Wales under somewhat inferior conditions to their more fortunate brethren elsewhere. He thought this was rather the point. Let them see whether there was also any other class. Mr. Madden referred to a second class, who, he said, were instructed in Germany—that was to say, those who had to do, not with the engineering pure and simple, nor with the distribution in its higher departments, but in its more mechanical application. They might consider for a moment or two the best way of meeting both these classes. First of all, he would speak of the higher grade—those who were destined to take up the occupations which the members of the Institution were themselves following; and then he would refer to the other grade—those who dealt with the every-day mechanical portion of the operations that had to be carried out on a gas-works or in connection with a district. It was not much use—in fact, it was no good at all—to send a young man to a technical school, if they wanted to make him an engineer, unless he had had previous good training. It was quite the same thing as putting corn seed on an unploughed field, to send a young man into a technical school, or any school of a technological character, without previous preparation. He would not understand either his teacher or his fellows. It was not to be expected, in a building of this kind, erected at very great cost, that the public should have to provide education which ought first of all to be furnished elsewhere; and a young gas engineer who became a pupil at a works, or started on a small salary in the office, before he went to the technical institute, ought to have reached about seventeen years of age. Since secondary schools were now to be had all over the country, he should have had some suitable training; and, in justice to the public he had to serve in the future, it was necessary that this training should be far and away beyond that provided in elementary schools. Personally, he thought such a young man ought to have a good knowledge at all events of English. He should be able to read it, spell it, and speak it; and he should be fairly well grounded in history and geography. He did not know whether at the present day Latin as a language was of great practical importance; but personally he considered it of vast importance as an educational instru-

ment in connection with modern languages. Therefore he would not entirely prohibit a boy from learning Latin—he would let him go a certain distance with it, at any rate. To his mind, it seemed that a youngster of seventeen, intending to take up the profession of a gas engineer, and to enter a technical school, should know something of French and German; while mathematics was another subject of which he should not be ignorant. Otherwise he would not understand the language in which the teacher would speak. Of course, the teacher would not go over the elements. Each particular department in the educational establishments nowadays should take up its own work; and a youth should be passed from one stage to another without the necessity of going back over anything that he ought to have learnt at a previous stage. As to the training of a young gas engineer, he would say that he ought, before going into one of these classes, to be also well up in elementary physics and chemistry. This he (Mr. Canning) looked upon as a *sine quâ non*. Drawing, too, was another thing. Of course, he was referring to young people who really intended to follow the occupation of gas engineers. He did not think for a moment that Mr. Madden intended they should send a boy out of the district to such an establishment (say) as Owens College, Manchester, and set him down to learn gas engineering theoretically.

MR. MADDEN: No.

Alderman CANNING (continuing) said that therefore there was no need to discuss this. Many of those present had sons in the gas profession. It had always been one of the prolific branches of the race; and there were invariably a great number of gas engineers about to be trained. He would assume that the foundation had been laid; that elementary physics had been learnt; but no mechanics. Mechanics taught at a school, from his own personal experience, proved a veritable delusion. They should leave it out of the elementary and secondary school, and trust to learning it in the technological institute. He did not think that when young lads came out of the secondary school at the present time there was any really satisfactory account given of them. There ought to be, where matriculation examinations had not been passed, other certificates—what might be called "Leaving Off Certificates," to show the advance that had been made by the pupil while in the school. To return to the subject of the paper, he wondered how they could get a sufficient number of students for what he called the higher programme. Perhaps in Cardiff Mr. Madden had enough round his own establishment; and if so, he imagined there would be no difficulty in getting the Committee of the Technical Institute there to arrange for a class—unless some reasons existed which he himself did not understand. In other places, however, they would have to combine. Take Newport for example, there would not be sufficient going in for gas engineering to warrant opening a class there. Students from that place would either have to come to Cardiff, or those from Cardiff would have to go to Newport. Probably Cardiff and Newport and neighbouring places might combine in this way; and with other towns it might be possible to do something of the same kind. Swansea, for instance, would be a grand centre. It had one of the foremost technical schools in the country. He was able to say, as a Governor of the University of Wales, that it was the only technological school that was affiliated to the University; and any student following courses of engineering there, or following out metallurgical studies, would be able, by passing his examinations there, to matriculate and to graduate in the Welsh University. In the neighbourhood of Swansea people could easily group themselves together, and send one or two pupils from one town and another. But now with respect to the attendance at the schools themselves. He did not think that the system they had been pursuing—because after all they had been pursuing some system in this matter—was altogether satisfactory. Young men should not take up too many subjects. There was a tendency to do this, but it was better to take up only two or three. Another thing that operated against these classes was that they were usually held in the evening. The students were at work during the day; and he said advisedly that, not only bodies who had charge of gas-works, but those who were in charge of mines, factories, &c., throughout the kingdom, should allow their pupils and apprentices a certain portion of each day's time to leave their work and go to the technical school to obtain another portion of their training. They should regard this as one of their biggest assets. It was a plan that had been adopted with most notable results in the case of those engaged at the Alexandra Docks, Newport. He hoped in time it would become universal, as after all the training of an engineer, and especially of a gas engineer, must be partly practical and partly theoretical; and it was advisable that they should run together in this country, because this was more in accordance with prevailing ideas. If they looked at Germany or America, they would see the student had first a one or two years' course in the workshops. Then he quitted them and went to the technical college for (say) four years, and then back to the workshops once more. But he thought they could scarcely hope to induce the British people to adopt this system. To attach too much faith to school—to believe too much in school—was not a characteristic of the Briton. He liked to see something practical done as well. This being so, he would say that employers of labour should not hesitate a moment before allowing the pupils in one department and the apprentices in another to attend at suitable times in order to obtain a theoretical and scientific knowledge of the business of which they were acquiring day by day on the works themselves an applied knowledge. For, after all, at the present day the work carried

must be scientific. Applied science was essential; and the question could only be dealt with in the way he had pointed out. Another side of the subject was the instruction that ought to be given—he was not now speaking of engineers or scientific men—to those who were employed on the works actually. First of all, would the rule-of-thumb man do any longer in the retort-house? In large works the changes made had been very great. The construction of the furnaces, for instance, had been complicated; and it was necessary to watch the furnace gases produced, and to be able to tell whether everything was right or not. When, also, they took into account the fact that there was a great deal of machinery in these houses, they would admit that the foreman should surely be a man who understood a little (if not much) about construction. He should at least know when to call the chemist's attention to the furnace gases in connection with the carbonizing, as well as be sufficient of a mechanic to comprehend the machinery under his control. It was unnecessary to go through every department of the works. The members realized that everything was changed. When they came to the engine-room, it was the same; and with the altered methods of distribution, with high-pressure gas and compressors, and with the new demands which called for such frequent changes of pressure, they required not only smart and sober men, but also instructed ones. When they came to the outdoor department, the case was even more pressing. A well-trained, skilled man was required in connection with all the modern gas-fitting. It was not the slightest use to hand over the maintenance of new incandescent burners to the old style of gas-fitter, for he was certain to blunder. He was either too proud to learn or so far petrified in his ways of working that he regarded with scorn whatever might be said to him. They could train a youth; but they would find great difficulty in training grown-up men, and making them understand that the very reverse process was taking place in the burner now to what used to be the case. Many a consumer was offended or lost from want of technical and practical knowledge on the part of those who were sent out even to attend to the small operations of fixing mantles and maintaining gas-burners; and the same thing with cookers and fires. This being the case, there ought to be started classes for this kind of instruction; and there should be no difficulty, for sufficient students could always be provided. At Newport, they had already classes for plumbing and things of that description. He would suggest gas-fitting, the study of the gas-engine, and the elementary principles of heat—sufficient to enable a foreman to know when to direct attention to things going wrong, and to give the gas-fitter a full understanding of the burners that he had to deal with. It was, of course, most important to have a good teacher; and also, as he had said before, to give their employees, be they few or many, sufficient opportunity for attending the classes, without taking up the whole of their evenings. It did not seem to him impossible to carry out the proposition Mr. Madden had shadowed forth. He was, however, insistent on the fact that, without the proper grounding for the knowledge he had mentioned—a good English knowledge, a good mechanical training, a knowledge at least of elementary physics and chemistry, and some acquaintance with modern languages—no young man ought to set out to take up the duties of an engineer or learn the business of an engineer. He was only prepared when he had started with this. On the other hand, he (the speaker) was equally convinced that until a little more training in applied science on its practical and elementary side had been given to the gas-fitters and others connected with both indoor and outdoor departments—with every operation, in fact, from carbonizing upwards—they would not be able to have about them men who could be really relied upon. A man who was a blunderer might work an undertaking irrevocable harm. He therefore trusted that the outcome of Mr. Madden's paper that day—which touched upon a very important matter—would be seen in a practical movement. Everything about them with regard to their working had within the past ten or twenty years absolutely changed, and had become scientific. Those who joined the profession in future must know that it was a complicated machine and no longer a plough to which they put their hands.

Mr. OCTAVIUS THOMAS remarked that the subject was interesting to him because he had a son starting in life, and also because he was very anxious that the gas-fitters should have some training. Really half the trouble of a gas manager to-day arose from the fact that people would not keep their burners clean or look after their engines or stoves. The winter before last, consumers in a portion of his district tried to worry the life out of him with complaints of bad gas, want of pressure, and that sort of thing. Actually about 99 per cent. of the complaints were due to neglect of the burners. It was difficult to train the old gas-fitters to thoroughly clean burners when they went round. Last winter, after looking to this matter, and with no more pressure on the particular district, he did not have a single complaint. When neglect of a gas-engine led to trouble, the first thing a consumer would do would be to send to the gas-works and ask for more pressure to be put on; and if this was not done, he would continue to worry. He (the speaker) had had several cases in which he had sent men to look at the burner of an engine. After five minutes' work it was going again; and then there were no more complaints for another twelve months. Alderman Canning had referred to the question of plumbing. There was a plumbing class at Pontypridd. Eight or nine of his boys went there twice a week; and to encourage them, he gave prizes himself. At the end of the session, the Master sent him on the books, so that

he could see what progress the pupils were making. He hoped something would be done to push on the same thing in connection with gas.

Mr. R. A. BROWNING (Neath) said the only remark he had to make was with reference to the gas profession, and the title of "engineer." They had lots of people who called themselves engineers but had no claim in any way to the name. He himself had been properly brought up as an engineer; and he had endeavoured to place his sons in the same position by giving them what he thought was the proper education. He put them in a first-class school, and then after that let them go through the whole course of engineering—through the workshops, drawing office, &c., right up. Then he gave them a thorough training in a large works. This was his idea. If they did this, they would raise the tone of the gas profession a good deal; and in his opinion it wanted raising. On the other hand, he supposed it was like other professions. They saw that people on the roads called themselves "surveyors." But he thought if they were careful to have a proper training for engineers, they would improve their position in every way.

Mr. A. W. BRANSON (Caerphilly) remarked that, to come to any practical conclusion with reference to the provision of better facilities for gas engineering training than already existed, it seemed to him that some committee or group of members should be appointed, and authorized to bring forward a plan of ways and means for the establishment of a school (say) at Cardiff. He knew several young fellows who were anxious to attend classes of this description; but they would have no opportunity of doing so unless the classes were established at Cardiff. It seemed to him that the number of students Alderman Canning had mentioned could be obtained in Cardiff; but without some committee to go into the matter, he was afraid the discussion would be to some extent wasted. He therefore proposed that a Sub-Committee be formed to try and arrange ways and means for these classes.

Mr. J. PARRY (Cardiff) thought this was a step in the right direction, and seconded the resolution.

Mr. BRANSON did not know whether it would be in order; but he would suggest for the Sub-Committee Mr. Madden, Alderman Canning, and the President.

The PRESIDENT, however, thought it would be best to leave the question of the constitution of the Sub-Committee in the hands of the Council. Of course, the resolution was the right thing; and it was just what he was going to suggest himself. It was such a weighty question that this was the only way of dealing with it.

Mr. BRANSON said the resolution should be: "That we authorize the Council to form a Sub-Committee to go into the question of ways and means for the formation of these classes."

The proposition was put and carried unanimously.

The PRESIDENT said the subject had been so fully dealt with that it left him little to say. He heartily endorsed the view that they should pursue the matter to an end, by the appointment of a Committee.

Mr. MADDEN, replying on the discussion, remarked that Alderman Canning had taken up the portion of the subject that he had particularly left out of his paper—the question of the general training of an engineer. Of course, this was very important; but it was really secondary in his mind when reading the paper. It was not so much the training of the engineer he had in view as that of the outside department, the work of which was very difficult. He quite agreed with a proper elementary training before going into the profession; and Mr. Browning had taken the same course. If they could get a proper course in some centre where engineering pupils could go, they might be able to do the same for the outdoor department, subdividing them into fitting classes and what might be termed inspectors' classes. Of course, there would be evening classes for students after they had finished their work, so that they could combine technical training with practical work. Alderman Canning said they should make some allowance to pupils, &c., who were serving their time on the works. Possibly his Chairman, Dr. Taylor, would later say a few words on this important subject, because there was a certain amount of tribute due to the Cardiff Gas Company. They had taken the initiative for some time in the question of the educating of fitters. At Grangetown they had some boys in the engine-shops who were the sons of men on the works. There were four of them; and the terms of their working there were that they served their time (four or five years), but they must attend courses of technical classes for mechanical drawing, steam, and things like that. The Company allowed them to go about an hour earlier on the class-nights; and they were well repaid. He thanked the members for the discussion, which had brought out what he particularly wished—that something should be done for instituting classes throughout South Wales. How the idea should be carried out, of course, would be for the Sub-Committee to determine.

Surgeon-Colonel W. TAYLOR, M.D., J.P., said this question had engaged the attention of himself and his Board for some little time, and they had formed classes on their premises for their young pupils and employees. They endeavoured to get them educated at the technical schools of the city; but from some little feeling of jealousy on the part of the Unionists, they had to withdraw the young men from there, and teach them in their own works. He felt confident that the result would prove highly satisfactory; and he quite appreciated what Mr. Madden and Alderman Canning had said as to the formation of classes. As to the working of his Company, last year he and the Board adopted the co-partnership

principle which was established a good many years ago by the late Sir George Livesey in London. He went up with Mr. Clarry to see Mr. Charles Carpenter and ascertain some of the results of the working of the scheme; and he was so impressed that its adoption at Cardiff was decided upon. They invited the men to meet them at dinner in three sections; and he explained, so far as he could, the benefits to be derived from becoming co-partners. There were a few of the men at Grangetown not entirely favourable to the idea; and he took up a very firm position with them. He told Mr. Madden if he had any trouble with the men to give them their proper notice and let them leave. They got rid of two the first week, and four the second week—making six in all. Some of the men at the Bute Terrace end, too, were not entirely favourable. One was the President of the local branch of the Gas-Workers' Union, and another the Secretary. About thirty were a little troublesome. When they were not invited with the first section to dinner, they asked why, and were told that as Unionists the Company did not think them fitted to come in as co-partners. Within two days, each one of them had resigned his position in the Union; and they went then to the second dinner. He could assure the members that the men who were at this time a little disagreeable had been the Company's warmest supporters ever after. Since the establishment of the scheme, there had been entire loyalty among the men, from one end to the other. The men were saving in every possible way. Things that were formerly thrown away and wasted were now carefully kept. He was satisfied; and the men would be satisfied, when they came to the second year's earnings. The Company were doing all they could to encourage and unite with their men. They had a very steady body of employees. They carried off prizes at the miniature rifle ranges; and they had also been victorious at baseball. A mess-room and bath-rooms were being put up at Grangetown to add to their comfort. The Directors had taken a piece of ground 4 acres in extent adjoining the works, on which the men could play at anything they pleased; and this was much appreciated. He felt convinced that the more they brought themselves in contact with their men, the greater would be the appreciation of them by the employees. As a Gas Company they were progressing very favourably in Cardiff. The manufacture of gas was a progressive science; and if they wanted to keep pace with the times, they must scrap a good deal of old material and get up to date. He travelled over the country with Mr. Clarry to see the newest plant. There were discussions on horizontal, inclined, and vertical retorts; and there was no knowing which was going to be the best. Engineers were now going away from small charges in the retorts to charges of 10 and 10½ cwt., and from six-hour to eight-hour charges—and with very good results. They obtained a better quality of gas and coke. He did not know whether they had yet arrived at the largest retorts. In the Cardiff district it was found that people were using 6½ ton charges of coal for manufacturing coke; and from these they obtained 5 tons of first-class coke, and also large quantities of tar. The gas they used for engines or other purposes, so that it was not wasted. In fact, he thought, though he was not certain, that they supplied gas to a neighbouring gas-works. Returning to Mr. Madden's paper, he was glad the Association had determined to appoint a Committee to inquire into the question of classes. It was a subject that must engage the attention of engineers. Everything was scientific now; and rule-of-thumb was nowhere. Complaints with regard to bad gas and defective pressure were due entirely to the consumers. If they did not look after the burners, they must expect to suffer.

Colonel H. OAKDEN FISHER, J.P., the Deputy-Chairman of the Company, remarked that he had really nothing to add to what had been said. The competition they had to put up with now was exceedingly severe. It was of no use for gas people to act on the defensive alone. They must be able to act on the offensive. They must get at the enemy, and beat them in every way they possibly could.

Water sterilization by means of the ultra-violet rays has been under investigation long enough now, "Engineering Record" says, to enable some general idea of its efficacy to be formed. The bactericidal action of these rays has long been known; and in treating water the experiments have generally been made by immersing some form of mercury vapour lamp in the liquid. The experiments of M. Victor Henri have shown that the voltage of the lamp and the distance from it to the place whence samples are drawn, have a marked effect on the result. For example, a Cooper-Hewitt lamp of 110 volts was immersed in water containing *B. coli*. The sterilization required an exposure of 300 seconds at a distance of 24 inches, of 180 seconds at 16 inches, of 20 seconds at 8 inches, and of 4 seconds at 4 inches. When this lamp was replaced by one of 228 volts, the time of exposure necessary to secure sterilization at a distance of 24 inches was 30 seconds, at 16 inches 20 seconds, at 10 inches 4 seconds, and at 4 inches less than 1 second. These results were obtained with comparatively clear water. Unfortunately, it has been found that clearness seems to be necessary for satisfactory sterilization in this way; for a turbid liquid can only be sterilized by passing it in very thin layers close to the source of the ultra-violet rays. It is understood that the results obtained are so encouraging that the Westinghouse Company of France are engaged in developing an apparatus for sterilizing small quantities of water, which can be substituted for the ordinary domestic filter in houses where the electric current is available.

ILLUMINATION REQUIREMENTS IN THE LIGHTING OF STREETS.

The "Journal of the Franklin Institute" for the current month contains a paper on the above-named subject, submitted at a recent meeting of the Institute by Mr. ARTHUR J. SWEET, Engineer of the Holophane Company, of Newark (O.). The following are extracts from the communication.

The problem of illumination is a complex "molecular" one rather than a simple "atomic" one. To be adequately studied, it must be split up into its constituent subordinate problems, and these considered separately and in their relations to each other. Among these problems, intensity and distribution are linked together as quantity factors. Distribution is simply the problem of relative intensities—of the proportion of intensities at different points. Diffusion and colour value are grouped together as quality factors, though each is, of course, independent of the other. Total light flux in the field of vision and shadow contrasts are two closely related yet separate factors affecting the efficiency of the eye, the receiving apparatus. Subordinate to the factor of total light flux in the field of vision, but of the most vital importance, is the factor of the intrinsic brilliancy of light-giving or light-reflecting objects in the field of vision.

The relation of the above analysis to the problems of street illumination becomes at once apparent. There are two results to be achieved in adequate street illumination which are both of such paramount importance that it is properly a matter for individual opinion as to which should be ranked first. These are the avoidance of glare effect and the obtaining of an approximately uniform degree of illumination at all points along the course of the street, with higher intensities at the street corners. One of these two results can only be obtained by the correct solution of the allied problems of intrinsic brilliancy, total light flux, and shadow contrasts; the other by the correct solution of the problem of distribution. Let us take up separately, in preliminary fashion, each of the results sought, and define it a little more exactly.

Glare effect results whenever, throughout any infinitesimal period of time, an amount of light continues to fall upon the actively visualizing portion of the retina of the eye sufficient in quantity to cause chemical changes more rapidly than the regenerative functions of the eye can keep pace with. Thus when an eye which has been exposed for some time to conditions of dark, with resultant pupillary expansion, is suddenly exposed to even a moderate light, glare effect results. An excessive amount of light reaches the retina through the expanded pupil, and the regenerative functions cannot keep pace with the chemical changes induced. Rapidly, however, the pupil contracts; the regenerative functions regain their normal control; and the glare effect passes away. If now the eye be exposed to still greater intensity of light, beyond the very limited capacity of pupillary contraction to compensate for, or if an even moderately bright light source is introduced near the centre of the field of vision, glare effect is again experienced; and this, after a brief period, reaches a certain state of equilibrium characterized by a quite definite reduction in efficiency of vision, which decrease thereafter increases in magnitude only rather slowly. We may, therefore, for convenience, designate a glare condition as casual, when it results from the inability of the pupil to adjust itself instantly to a changed condition of light intensity, and as fundamental when it results from a light intensity exceeding the contractive power of the pupil to compensate for, or when it results from a light source near the centre of the field of vision. The presence of strong shadow contrasts tends to produce a casual condition of glare. Objectionably-located shadow contrasts can only be avoided by the proper placement of the light sources; while the intensity of the shadow contrast can be decreased by using smaller lights placed closer together. The problem of shadow contrasts, while of considerable importance, is, however, one that must be solved for each individual case.

Brilliant high-power light sources in the field of vision—the usual practice in contemporary street lighting—produce a fundamental condition of glare, with resultant heavy decrease in efficiency of vision, with probably also a permanently injurious effect on the faculty of vision. This fundamental condition of glare arises from the intrinsic brilliancy and total light flux of the light units employed, and can only be avoided by the proper limitation of these. The study of the relations existing between intrinsic brilliancy and total light flux on the one hand, and glare effect on the other, becomes, therefore, one of the two chief purposes of an analysis of the illumination requirements of street lighting. The end sought should be to eliminate glare effect, or at least its reduction to such a permissible minimum as will not seriously decrease efficiency of vision or be sufficient to produce eye discomfort.

The derivation of the polar curves of light distribution which will give the proper relative intensity of illumination for points along the course of the street, is the second of the two chief purposes of an analysis of illumination requirements in street lighting. Here the end sought is the uniform illumination of all points along the course of the street. There is no reason, either in scientific fact or in common sense, why one point along the course of the street should be more brightly lighted than another, with the exception of street intersections and similar crossings.

The present almost universal condition of brighter illumination under and near the light unit is simply a concession to our present ignorance of how to obtain something better. There is, on the other hand, abundant reason to condemn this spot-lighting practice. At street intersections and similar crossings brighter illumination is needed, for obvious reasons. This should be of from four to eight times the intensity of the illumination along the main course of the street. Such brighter illumination is properly provided for by employing from four to eight light units, each having the same light distribution as the units used along the course of the street, or by one or two units of similar light distribution and larger size. The street intersection, therefore, presents no complication to our problem, and its proper treatment becomes merely a matter for adequate consideration at the time of installation.

The statement is often heard that in street lighting absolute uniformity of illumination is not required, and is of no particular importance. Taken in a very strict sense, this statement contains much truth. But it has been so very generally used as a refuge for loose thinking, by the scientific man as well as the layman, that it is worth a moment's careful consideration. It is true that a variation of two to one, taking the minimum intensity as unity, is only barely noticeable, and is entirely permissible. But let us invariably ask our friend who says uniformity is not required what numerical value he will assign as the ratio of maximum to minimum intensity. If he gives us four to one, or a less ratio, we will agree with him, and ask him to oblige us by keeping this ratio in mind in our further discussion. If he gives us eight to one or twenty to one, or some such figure, we will disagree with him; and we will propose a hopeless task to him if we ask him to justify, by properly established scientific fact, such a ratio as permissible from any other standpoint than that of our possible inability to obtain greater uniformity. At the same time, we may profitably point out to him that the ratio in present practice most frequently falls between 100 and 500 to one.

Another much-mooted question concerns the way in which illumination should be measured—whether horizontally or perpendicular to the ray of light. The latter method has been largely adopted in American practice, chiefly through the influence of the commercial interests concerned, who desire to make the minimum value look as large as possible. There is little to be said in favour of it, except that it may help us to remain in a "Fool's Paradise" concerning the satisfactoriness of the illumination we are getting. It is true that in street service illumination is desired at different times on almost every conceivable plane. But the best single measure of how well these many diverse requirements are met is the intensity of illumination on the horizontal plane. This, therefore, which is the accepted reference plane in interior lighting, is the logical and most satisfactory basis for street illumination measurements. The ideal to be aimed at in all styles of street lighting, as far as intensity is concerned, is uniform horizontal illumination. On this basis, we can proceed to derive the ideal curves of light distribution. These once derived, we may properly take into account the fact that absolute uniformity is not of importance; and we will only ask that the actual light distribution sought for as a practical ideal should show no greater variation from our theoretical ideal than four to one in the ratio of maximum positive variation to maximum negative variation as read in percentage values of the theoretical curve along the corresponding angles.

The nature of a street makes most natural a placement of light units as a line of single units extending along the street; the units being hung over the centre of the roadway or located alternately on either side. For all practical purposes, these two cases can be treated as one; the separation of adjacent units being taken as the straight line distance between the units, and the distribution curve derived being the correct distribution in a vertical plane passing through the unit concerned as well as the adjacent unit. There are an infinite number of light distributions which will give uniform illumination from a line of light units along a line extending immediately under those units. Other considerations than the obtaining of uniformity must, therefore, serve to enable us to select the most desirable distribution curve. Two such considerations are of importance and may be applied with especial propriety. First, we should seek such a distribution as will be best suited for actual practical attainment. This consideration is of the more importance because, as we shall find, even when maximum weight is given to it, our derived curve will present considerable, though by no means insurmountable, difficulties of practical realization. Secondly, the illumination at any point should be derived from a source as near as possible, in order to avoid both excessively long shadows and the glare effect which results from the high candle power made necessary by illumination at great distances.

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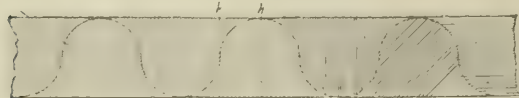


Fig. 1.

The curve which best meets the conditions imposed is such as is shown in fig. 1. It is formed by two circle quadrants com-

bined as shown. The corresponding distribution curve shows a low maximum which occurs at a slightly smaller angle than that subtended by half the separation of the units. It is also as well adaptable to practical realization as any curve obtainable. We have, therefore, obtained the ideal illumination curve from which the desired distribution curve can be easily derived. Our next task is to put these results into such form as to be easily applicable to practical conditions. The relation between any desired illumination results and the distribution required to produce the results depends, in the type of problem under consideration, on: (a) The distance between adjacent units; and (b) the height of the light unit above the street. That is to say, for any given separation of units and height above the street, we can easily calculate the distribution curve which will produce the desired illumination result.

It is obvious that any given distribution curve will show the same proportionate illumination results so long as the relation between the separation of units and the height above the street is kept constant; since so long as this relation remains constant the angular relations are unchanged. We can combine, therefore, the factors (a) and (b), and say that the distribution required to produce any given illumination result depends upon the relation between them. Let us call this relation M. Then—

$$M = \frac{\text{distance between adjacent light units}}{\text{height of the light unit above the street}}$$

For any value of M there is a given distribution curve which will produce the desired illumination result.

Present-day street lighting practice shows a wide variation in the value of M. The writer has recently addressed the managements of the central stations and gas interests in most of the large cities of America, and through their kind co-operation obtained an official statement in each case as to average, maximum, and minimum separations, and mounting height above the street. The values of M thus obtained (based upon average separations) vary from 5 to 31. The smaller cities would probably show, in general, a higher value than the large ones. All things considered, $M = 15$ can probably be taken as the most representative value of present-day American practice, with a marked tendency towards smaller values in the more recent installations.

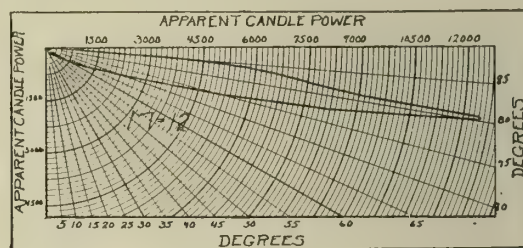


Fig. 2.

Fig. 2 shows the distribution curve required to produce uniform illumination when $M = 12$. Here we are at once brought face to face with the nature of the problem that confronts us. It needs no specialist to point out that such a curve as shown is impracticable for actual realization, and would be extremely undesirable, even if it were practical to obtain it, on account of the excessive glare effect resulting from the very high candle power maximum at a large angle. It will be observed that the maximum candle power is about 130 times the minimum, or zero degree, candle power. The diagram serves one most excellent purpose. It shows concisely and beyond argument that, with a value $M = 12$ or greater, any attempt at adequate street lighting is absurd. If ignorance and false economy compel an installation value of $M = 12$ or greater, the pretence of obtaining "street illumination" should frankly be abandoned. Instead, the lights should be installed on the basis of a system of street markers, and located where they will best serve in this capacity. In such case, maximum usefulness will be obtained when the candle-power values at the different angles are as close as possible to, yet not exceeding, the limits imposed by the avoidance of glare effect.

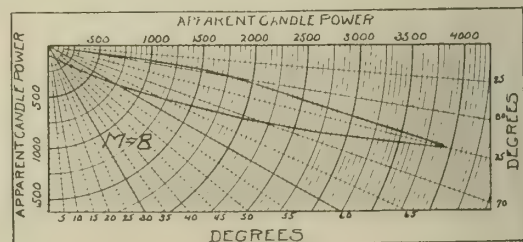


Fig. 3.

Fig. 3 shows the required distribution curve for uniform illumination when $M = 8$. Here we are beginning to approach a form of curve practical for actual attainment; but the still very high candle-power maximum is prohibited by the limitations imposed by avoidance of glare effect. Figs. 4 and 5 give the required distribution curves when $M = 6$ and $M = 4$ respectively. These distributions are entirely practicable for actual attainment. For instance, referring to fig. 6, the full-line curve shows the actual distribution of one make of arc lamp to-day on the market; while the dotted curve is the ideal curve for $M = 4$. It will be seen

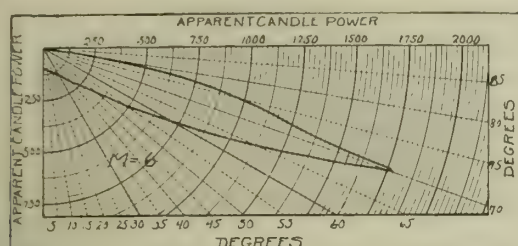


Fig. 4.

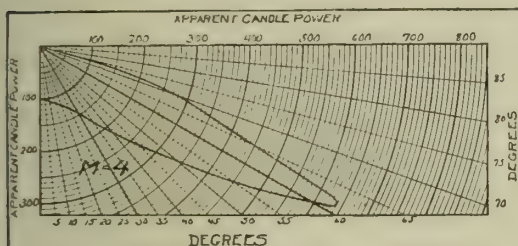


Fig. 5.

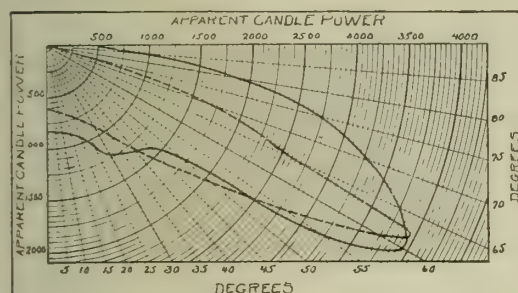


Fig. 6.

that the agreement of the two curves is admirable up to an angle of about 62° . The curves $M = 4$ and $M = 6$ would also be comparatively easy of attainment with the incandescent lamp or with the inverted gas-mantle. This is of special importance, since with these lower values of M such smaller units give amply sufficient intensity of illumination except in those business centres where night traffic is considerable. Smaller values for M than 4 would obviously fulfil all the conditions imposed by the requirements of good illumination. It will be shown later, by our study of glare effect, that a value $M = 3$ is necessary to obtain the best results whenever, on account of the shaded conditions of the street or other considerations, it is desirable to mount the units at a height of 15 feet or less above the roadway. Closer spacing of units than $M = 3$ entails a corresponding increase in installation and maintenance costs, and is not demanded by the illumination limitations of the problem.

Thus far in our discussion we have considered distribution only as referred to the vertical plane passing through the light unit and its adjacent unit. We will now consider the vertical plane perpendicular to the street line. In those rare instances where the width of the street from property line to property line is greater than the separation of adjacent units, the ideal distribution in this latter plane is similar, for the lesser angles, to the distribution required by the existing value of M . It continues, however, to a higher maximum, turning and receding rapidly to zero above the angle subtended by the distance from the light unit to the more distant property line. When the street width is not greater than the separation nor less than three-fourths of the separation, the distribution in the plane across the street should be approximately the same as in the plane through the light units. When the street width is less than three-fourths of the separation, the distribution in the plane across the street is similar, for the lesser angles, to the distribution required by the existing value of M . But in this case the maximum is lower; the curve turning and receding rapidly to zero above the angle subtended by the more distant property line. In oblique planes, the distribution values should be proportionately intermediate between the values in the two planes already considered. It is proper to note that the importance of obtaining correct distribution results in the plane perpendicular to the course of the street, and in adjacent oblique planes is rather one of obtaining maximum efficiency than of guarding against unsatisfactory illumination results.

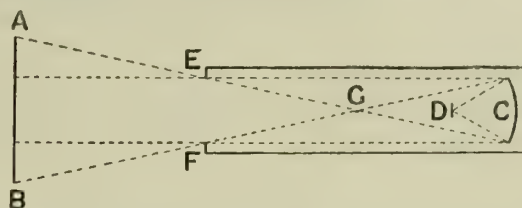
Summing up the previous paragraphs, the requirements of good street illumination, as determined by distribution considerations, are as follows: Uniform horizontal illumination is the ideal to be aimed at, and the approximation to this ideal in actual practice to within a four-to-one ratio of maximum to minimum may be taken as sufficiently close for all practical purposes. The most desirable type of curve for the illumination delivered by the individual unit is such as is shown in fig. 1. When the light sources are separated by a distance greater than six times the mounting height above the street, it becomes impracticable to design a unit giving such light distribution as would be required for a sufficiently close approximation to uniform illumination. When the light sources are separated by twelve times the mounting height or greater, the pretence of adequate street illumination

becomes an absurdity; and when ignorance of the factors involved has led to such separations, the best results can be attained by abandoning all pretence of street illumination, and by installing the light units as a system of street markers. Separations of three to six times the mounting height are required by distribution considerations.

(To be continued.)

A "FIXED FOCUS" RADIATION PYROMETER.

It is generally acknowledged that the "total radiation" pyrometer is preferable to the purely "optical" one for industrial work; but the instruments of this class hitherto made have needed accurate focussing in use in order to ensure their efficiency. This is especially the case when they have been put into unskilled hands. Recognizing this defect, Mr. Charles E. Foster devised an improved instrument, which is described and illustrated in the current number of the "Journal of the Franklin Institute," from which the following particulars are taken.



The casing has at one end an aperture $E F$, and at the opposite end is a gilded concave mirror C . One of a pair of conjugate foci of the mirror is at the aperture, while the other is on the sensitive device D . Therefore there will be thrown on D a focussed image of the aperture. Since the relative positions of these three essential parts are fixed, no focussing is needed in use. For this reason the instrument has been called the "Fixed Focus Pyrometer." The only condition that must be satisfied is that the aperture, as seen from every point of the mirror surface, must be filled by the hot body under test. This condition is satisfied if the hot body coincides with, or overlaps, any section of the cone $G A B$, or any extension thereof.

In the instrument exhibited on the occasion of the meeting of the Franklin Institute at which Mr. Foster described it, the position of the apex G is marked by the centre ring. The directions for use are that the distance from the hot body to the centre ring must not exceed a certain constant multiple of the smallest dimension of the hot body. In the case here the multiple is ten—that is to say, with a hot body whose diameter or other smallest dimension is 6 inches, the working distance, as measured from its surface to the centre ring, must not be more than 60 inches. Any smaller working distance will not alter the reading, provided the body is uniformly heated. The only result of bringing the hot body $A B$ closer would be that its outer edges would be out of the measurement; consequently the user is not called upon for accurate judgment or measurement of distance. For work on extremely high temperatures, the proportions of the cone $G A B$ can be altered so as to allow working at greater distances.

In the example shown, the sensitive device is a very small thermocouple. The heating of the junction where the two elements are joined together by the focussed radiation generates an electromotive force; and this, or rather the resulting current, is read on a suitable calibrated milliammeter. The calibration is made direct reading in temperature. Without involving inconvenient dimensions, the electromotive force developed at 2400° Fahr. exceeds that which would be given by a Le Chatelier thermocouple inserted directly into a furnace at this temperature. Since the thermocouple in the receiving-tube is of low and constant resistance, the rest of the circuit may also be of low resistance. This allows the use of an indicating instrument of very robust construction. Another advantage of this type of instrument is that the mirror is well protected from dust and fumes, because it is situated at the bottom of a long closed tube. As indicating the order of accuracy to be expected, a certificate issued by the Bureau of Standards, Washington, may be quoted. The instrument tested was one of the first of this type made, and no unusual care was taken in its calibration. The results were given to an accuracy of the nearest 20° Fahr. ; and at only two points at the top of the scale were there any corrections greater than this limit of test accuracy. In all cases the corrections were less than 2 per cent. of the temperature reading.

The "Bulletin de la Société d'Encouragement pour l'Industrie Nationale" for January contains two reports by M. Moreau on two forms of road-tarring appliances, due to MM. J. Lassailly and J. Vinsonneau respectively. The tar has to be extracted from the barrels, warmed to a temperature sufficient to reduce its viscosity and remove water, and applied to the road as uniformly and as rapidly as possible. In the first apparatus, all these operations are carried out by steam, and require a minimum of skilled control. The Vinsonneau apparatus warms the tar to 80° C. by a thermosiphon heated by a petrol burner, and distributes it by means of compressed air. Superficial tarring by either process costs 0.7d. to 0.8d. per square yard treated.

HIGH-PRESSURE GAS DISTRIBUTION PROBLEMS.

By L. H. JOHNSON, of Aurora (Ills.).

[A Paper prepared for the Illinois Gas Association.]

With the introduction of high-pressure gas distribution, there arose many initial problems, the solution of which assured the success of this system. With its adoption, however, there arose minor problems of construction and operation, which must be met by the distribution engineer in order to obtain entirely satisfactory results. These may arise from chemical, physical, or from mechanical causes. It is the purpose of this paper to direct attention to certain of the problems encountered by the Western United Gas and Electric Company in their high-pressure system, some of which it is believed have been successfully conquered, and others which are yet to be solved, in the hope that a discussion of some of these questions may be of interest and assistance to gas engineers who are engaged in, or are contemplating, high-pressure gas distribution.

Perhaps it would be well to give first a brief description of the Company's system. They supply gas to thirty cities and towns in Will, Du Page, Kane, Cook, and McHenry counties. The gas is delivered from four plants, located at Elgin, Joliet, Aurora, and La Grange. All the towns are connected by a high-pressure pipe-line; and the four plants pump into this line at pressures ranging from 40 to 60 lbs. The Aurora and Elgin plants send out a mixed gas, and the Joliet and La Grange plants "straight" coal gas. In the four cities in which plants are located, we distribute under low pressure direct from the holder; reinforcing the outlying districts from our pipe-lines by the use of district governors. Five of the other towns have low-pressure distribution systems, fed from the pipe-line through 4-inch district governors. In the remainder of the towns, gas is distributed under high pressure direct to consumers; Reynolds combination governors being used at each house.

The first problem we will consider is one which we have not yet solved—that of stoppages in main and service pipes. It is, strictly speaking, a manufacturing problem; but it must be considered by distribution men on account of its effects. The problem does not consist in the remedy, but in its prevention. As a general rule, it is comparatively easy to blow out any stoppage in a pipe where 40 or 50 lbs. of pressure is available; but this work always entails the cost of labour. There is also the constant danger of shutting off a consumer or consumers; so that satisfactory service can be obtained only through prevention. In our 8-inch pipe-line between Joliet and Aurora, we have encountered considerable trouble from a black powder which is deposited in the pipe-line itself, and in smaller mains and services branching from it. This can always be blown out by opening the ends of mains or services where it is giving trouble. There seems to be a danger, however, of the powder working its way into the meters and seriously affecting them. It also prevents satisfactory results from the gate-valves in the pipe-line. An analysis of the powder shows it to contain 40 per cent. of volatile and 60 per cent. of non-volatile matter; the former appearing to be made up of coal-tar pitch or some substance of similar nature. The non-volatile part contains 94 per cent. of iron oxide; the remainder consisting of carbon, part of which is a decomposition product formed during the determination of the volatile matter, though there is, without doubt, a small portion of free carbon in the original powder.

Last fall we had a more serious stoppage in the 4-inch pipe-line between Elgin and St. Charles, caused by a substance composed principally of the same compounds in different proportions. It had the consistency of pitch, and was formed in sufficient quantity almost to stop up the pipe-line. In endeavouring to clear out the pipe, we first tried to find a cheap solvent for the substance; but it was insoluble in hot water, benzine, gasoline, naphtha, kerosene, and alcohol. We found that it could be materially softened by steaming; so we hired a traction boiler, and steamed the main in sections of approximately 500 feet, disconnecting at the sleeves. When the substance was softened, we connected up the main at one end, and blew it out with gas. By this process we were able to get the pipe clear again. This deposit had a specific gravity of 1.38, and a melting-point of 70° C. (158° Fahr.). It had an ash of 16.4 per cent., which contained 90 per cent. of iron oxide. In its composition and properties the organic portion resembled pitch, which may have been formed by a polymerization of some of the constituents of the gas, and separated by the cooling it undergoes in passing through the pipes; or it may have been already formed, and may exist as vapour on entering the pipes, where it may have been deposited with the iron oxide, and as this settled the particles of iron oxide formed nuclei round which the pitchy matter deposits.

Near our La Grange plant, we have had but one instance of stoppage. This was similar to that found near the Elgin plant. Around Aurora we have had no trouble. Elgin is the only town in which we have encountered any of these deposits in our low-pressure mains. This one case, however, would seem to preclude any theory that high pressure has any bearing on the formation of these substances; but the fact remains that it has more serious results in high-pressure systems than in those in which gas is distributed under low pressure.

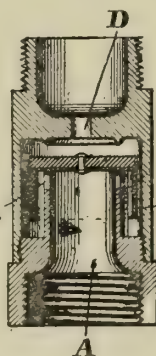
Having introduced the subject of deposits in high-pressure mains, I will pass on to one of its most troublesome results—viz., the effects on the efficiency of the valves. It is, of course,

obvious that with any foreign substance in the mains there is always the liability of some of this substance lodging under the gate of a valve, thereby rendering it ineffective. Because of this difficulty, we have experimented with globe valves. The question of their throttling effect was brought up; and, in order to determine how much reduction in pressure would be caused by one of these valves, we tested a 2-inch valve passing different amounts of gas at initial pressures of 10, 15, 20, 25, and 30 lbs. The quantity of gas passed ranged from 3900 to 11,700 cubic feet per hour. The greatest drop obtained was naturally found under the most extreme conditions—11,700 cubic feet per hour, with an initial pressure of 10 lbs. This amounted to 8 inches of water—an amount practically negligible when we are considering high-pressure work. We have had fairly satisfactory results with these valves, as far as shutting off the gas is concerned; but they have the disadvantage of being harder to pack than a gate-valve when there is pressure on the line.

The most important problem confronting gas engineers is that of safeguarding the consumers from any possible accident to life or property. In high-pressure distribution this is especially necessary; and with this end in view, the practice of installing safety-vents originated. This installation in itself, however, does not ensure safety. Experience has shown that it is necessary to have them inspected frequently, in order to see that they are not stopped up by ice, dirt, or by the consumer. Vent-pipes do not necessarily protect against accidents; and it is to this fact that I wish to call particular attention.

As previously remarked, we are using Reynolds combination governors in houses which we supply directly by high pressure. We have had two cases of explosions of meters caused by the diaphragms of the governors breaking. Fortunately both these cases occurred in summer, when there were no furnace fires in the cellars and the windows were open, so that it was possible to get the gas shut off before it became ignited. It can be readily seen, however, that very serious damage might result from an accident of this kind. An investigation of the governors revealed the fact that the diaphragm had split at the end of the casting. The rush of gas escaping through the inlet to the seal had sucked the leather across the hole, thus shutting it off completely. Above the top of the diaphragm there is a small air-vent, through which part of the gas escapes into the vent-pipe; but this is not sufficiently large to take the full quantity of gas. Later experiments have shown that in a case of this kind, with an initial pressure of 40 lbs., it is possible for the pressure on the meter to go as high as 25 lbs., which is far beyond the limits of safety.

The first remedy which we tried for this defect was to have the lower halves of the governors cast with two radial ridges, about $\frac{1}{4}$ inch high, one on either side of the opening; and it was hoped these would prevent the leather from closing off the hole. But they proved absolutely ineffectual, as the leather was sucked down between the ridges, and the hole closed off as before. Mr. C. W. Lockwood, of the De Kalb County (Ills.) Gas Company, then devised a vertical check-valve which we have adopted to prevent a repetition of the accidents. This valve, which is shown in the accompanying diagram, is placed between the lock cock and the regulator.



Its action is as follows: During ordinary consumption, the gas travels up through the passage-way A, out through $\frac{3}{16}$ -inch holes B down beneath the bottom edge of the brass cap C, and through the opening D. A sudden rush of gas, such as is occasioned by the bursting of a diaphragm, throws the cap C, which has a leather seat, upwards, holding it against a valve-seat, and sealing off the opening D. We are installing these check-valves on all services which carry our full line pressure. Wherever it is possible, we are putting in reducing regulators on the feed lines into towns, reducing the pressure to 10 lbs. Thus we are enabled to

transmit gas under 40 to 50 lbs. pressure, while we distribute under pressure low enough to ensure against accidents from exploding meters. This method of distribution has also the further recommendation of tending to reduce leakage. It seems to be ideal in every regard but one—it reduces the storage capacity of the pipe-line.

A question which frequently arises in connection with high-pressure distribution is as to the smallest main it is advisable to lay. In deciding it, leakage should be considered. If leakage in mains is proportional to their circumference, it would seem that we should lay as small ones as possible. Another point to be taken into consideration is connecting-up the services. Mains of 1 inch size or smaller can be cut and tees inserted; but this entails the cost of notifying other consumers on this main, and shutting off the gas. The smallest service clamp which will give satisfactory results is $1\frac{1}{2}$ inches. As the difference in cost between $1\frac{1}{2}$, $1\frac{1}{4}$, and 1 inch pipe is slight, we adopt $1\frac{1}{2}$ -inch as our smallest size.

One practice in high-pressure distribution that will be found in all extremes in different gas companies is the use of patent couplings for expansion joints. Many of the pipe-lines for natural gas have these couplings at every joint; and some companies distributing manufactured gas under high pressure have adopted the practice. Many companies place the couplings at various intervals; while some do not use any—making no allowance

whatever for contraction or expansion. In the past, the Western United Gas and Electric Company made a practice of placing expansion joints at intervals of 500 feet. Our experience, however, has been that in many cases there are no indications that these couplings have acted in the capacity intended, probably due to the fact that the friction of the ground prevented any noticeable movement of the pipe. In places where there has been any appreciable movement, we have encountered trouble from leaks, caused either by the rubber gaskets wearing or by their rolling. In the instances where no contraction or expansion is found, we have experienced no difficulty from the pipes pulling apart; and it is a question whether it is advisable to use this type of coupling, except in cases of constructional necessity. Is this not an opportunity to reduce some of the ever-present leakage?

MUNICIPAL & COUNTY ENGINEERS ASSOCIATION

A Home Counties District Meeting of the Association was held at the Town Hall, Chiswick, last month. Mr. W. NISBET BLAIR, M.Inst.C.E., the President, occupied the chair.

PUBLIC LIGHTING OF CHISWICK.

In a paper on Chiswick, Mr. E. WILLIS, the Engineer to the District Council, made the following reference to the street lighting of the district: The street lighting is effected by the Brentford Gas Company; the total number of lamps existing at the end of March, 1910, being 878—made up of ten 4-cubic feet flat-flame burners, 843 $\frac{3}{4}$ -cubic feet incandescent burners, one 7-cubic feet incandescent burner, and 24 10-cubic feet incandescent burners. Since last summer, the lighting of the public lamps has been effected by the Rostin automatic pressure apparatus; and though at times this system has appeared to be efficient, the author regrets he cannot express entire satisfaction with it. The principal difficulty, in his opinion, appears to arise through the divergence in the size of mains, which, even with power plant, does not allow for a wave of uniform pressure throughout the whole district. He is, however, satisfied that the Engineer of the Brentford Gas Company has made every effort to limit these defects, and has recently installed new machinery for increasing the pressure to such an extent as will practically guarantee the lighting of all lamps, including those upon the extremities of the district.

TOWN GAS FOR SEWAGE PUMPING.

Mr. J. H. ABBOTT, the Engineer of the Sewage Disposal Works, said the works were originally opened in 1879; and since then practically no alterations of importance were made until during the past five years, when the additions were somewhat extensive. They include the change from pumping by steam to pumping by gas power, the installation of a destructor, enlargement of the press house, and the addition of extra precipitation tanks and filter-beds now in course of construction. The total pumping capacity is 16 million gallons per day, and consists of two sets of 10-inch centrifugal pumps directly coupled to gas-engines of 20 B.H.P., and two sets of 15-inch centrifugal pumps directly coupled to gas-engines of 36 B.H.P. The total lift is 20 feet; and one of the 10-inch pumps can easily pump the dry-weather sewage flow in seventeen hours. Town gas is used throughout; and the engines are started by means of compressed air. In the engine-room there are also two four-cylinder single-stage air-compressors directly coupled to gas-engines of 16 B.H.P., each capable of delivering 50 cubic feet of free air per minute compressed to 100 lbs. per square inch. These supply compressed air for the sludge presses; and the engines are also utilized for driving shafting for the lime mixers, circulating water pump, and hydraulic power pump.

Mr. PHIPPS, referring to Mr. Abbott's paper, remarked that it seemed rather strange to find, a dust destructor having been installed, that the regenerator steam plant had been abandoned in favour of pumping by gas, and that the pumping was by town gas, and not suction gas. He would like to know the reason for this—whether the pumping by town gas proved to be cheaper than pumping by steam, and whether, if new steam plant had been put in, the cost by town gas would still be cheaper. He would have thought suction gas would have been used; but probably the town gas in Chiswick was very cheap.

Mr. ABBOTT, in reply, said the substitution of gas for steam engines had resulted in a saving of £600 a year. They might have used suction gas at a small saving; but the constant load was only a few horse power, and it was a great advantage, in a flat district such as Chiswick, to have a reserve power like the town gas, which could be turned on any moment when required.

BARNES, BARN ELMS, AND HAMMERSMITH STATIONS OF THE METROPOLITAN WATER BOARD.

Mr. H. F. RUTTER described the Barnes, Barn Elms, and Hammersmith Stations of the Metropolitan Water Board, which the members visited during the day. He pointed out that this group of stations forms only a small part of the Metropolitan Water Board system. It comprises subsiding reservoirs, filters, and a large pumping-station; the whole plant being capable of supplying from 25 to 35 million gallons of water per diem. The water from these stations forms part of the supply needed for the western district of the Board, the population of which is about 1,535,391; the aver-

age daily supply being some 55,775,110 gallons, or 36'33 gallons per head. About 25 per cent. is supplied by meter.

The latter portion of the paper consisted of particulars with regard to new plant designed and constructed by the author at the Hammersmith Pumping-Station. The new engine-house is 112 feet by 42 feet. Its foundations are carried down to the London clay. The brickwork up to the ground level is of Fletton bricks set in cement; and the superstructure is of Fletton brickwork in blue lias lime, faced on the outside with red Bracknell bricks and Portland stone dressings. On the inside, the walls are lined with glazed bricks with a tiled dado. The working floor is composed of concrete slabs reinforced with expanded metal, resting on rolled joists, and covered with red flooring tiles. As the basement floor is below the permanent level of the water in the ground, the building has been made watertight by a double layer of asphalt laid over the whole area of the foundation, and brought up to ground level outside the walls as a vertical damp course. A 12-ton traveller spans the house, and is approached by ladders leading to a gallery which extends the whole length of the east side of the house. There is a trussed roof cleaved with Canadian maple, lighted by a monitor glazed with wired glass.

The engines in this house are known as Nos. 14 and 15. They are identical in every respect except as to the size of the pump plungers. They are triple expansion inverted engines of the marine type, each with three double-acting pumps; the pumps being placed directly beneath the cylinders. Four side rods which straddle the crank-shaft connect each piston crosshead with each pump crosshead.

The cylinders are respectively 23 $\frac{1}{2}$ inches, 35 $\frac{3}{8}$ inches, and 60 $\frac{1}{2}$ inches in diameter, by 4-foot stroke. The high and intermediate cylinders are jacketed with full-pressure steam and the low-pressure cylinder with steam reduced to 50 lbs. pressure. The cylinders are supported at the back on cast-iron guide-frames, and in front by polished steel columns, each passing through, and secured to, a bracket cast on the cylinder casings. The guide-frames and columns are in turn supported by a cast-iron bed-plate bolted up in sections, on which also the bearings of the crank-shaft are cast. The connecting rods are 2 $\frac{1}{2}$ times the length of the stroke—viz., 10 feet long. There are two fly-wheels, each 15 feet in diameter, to each engine; and these are placed outside the bed-plate. Thus there are no overhung cranks. The crank-shafts are of forged steel, built up of three identical units coupled with taper bolts; the journals being 13 $\frac{1}{2}$ inches in diameter. A barring engine is fixed for starting each engine, and has an automatic throw-out, which disengages the gearing as the engine gathers way.

The steam-valves are drop valves with trip gear operated by a horizontal lay shaft, which extends along the front of the cylinders, and is rotated by bevel-gearing from a vertical spindle worked by spiral gear off the crank-shaft. The valves themselves are of cast iron working on cast-iron seats driven into boxes cast in the cylinder heads. These valves were adopted on account of the comparatively high temperature to which they will be exposed. The steam pressure is 150 lbs., and the saturation temperature is increased by about 120° Fahr. of superheat. A reheater is provided between the high and intermediate and between the intermediate and low-pressure cylinders. These are heated with full-pressure steam. The cylinders and reheaters are coated with 3 $\frac{1}{2}$ inches of carbonate of magnesia, and lagged with blue steel planished sheets secured with polished steel bands.

A governor is provided which, in case of a sudden increase of velocity due to a burst main, would immediately cut off steam to the high-pressure cylinder, and also open a valve to destroy the vacuum in the condenser. Gravity lubrication is provided throughout. The oil from a tank on the upper deck descends to each bearing through a system of oil-pipes. The flow is restricted only to the amount that each bearing can take; and the oil, after passing the bearings, is led by drain pipes to an oil-filter in the basement, from which it is again raised to the oil-tank by a small pump attached to the air-pump lever.

The pump cases are of cast iron, with a diaphragm in the centre of their length, through which is fixed a gun-metal sleeve for the plungers to work in. The plungers are of cast iron, 6 feet long, with hemispherical ends. The pump-valves consist of hard rubber discs, spring closed, arranged on diagonal grids in a casting which is bolted between the suction chamber and the pump-case as to the suction valves, and between the pump case and the delivery chamber as to the delivery valves.

The author's experience of the unsatisfactory results of long suction-pipes led him to design the pumps with suction pipes only 5 feet long. These each dip into a large suction culvert formed in the concrete foundations, which has been made air and water tight by cement rendering and asphalt. The water is led into each of these culverts from a channel running longitudinally along the west side of the foundations. The suction culverts are charged with water up to within 9 inches of the roof through which the suction-pipes pass. Attenuated air will fill this 9-inch space, which will act as a large suction air-vessel, and thus prevent shock, and consequent noise, in the pumps. The air space is connected by valves to the atmosphere and to the air-pump, so that the amount of air present may be regulated.

Of the three delivery pipes from each engine, one is connected to the condenser, so that one-third of the water delivered will pass through the condenser. The condensers have riveted steel bodies; and there are in each 768 brass tubes $\frac{3}{4}$ inch diameter. The three delivery pipes from each engine are merged in a 33-inch

steel main leading to the exchange mains in the pipe-chamber. [In order to allow of convenience in working the new plant, it became necessary to design a system of exchange mains outside the engine-house.]

The exhaust from the low-pressure cylinder passes first through an oil-separator to extract the bulk of the oil, then through an exhaust feed heater, where it gives up its remaining heat to the feed water on its way to the economizer, and afterwards to the condenser. The air-pump delivers the condensed steam to a Paterson oil-eliminator, in which the remaining oil is removed by the use of a coagulant, and by passage through beds of wood wool and quartz sand.

The boiler-house joins the engine-house, and contains four Lancashire boilers, each 30 ft. by 8 ft., having each two cylindrical flues 3 ft. 3 in. diameter. They are all designed for a working pressure of 155 lbs. per square inch above atmosphere.

Coal for the new plant is stored in five reinforced concrete bunkers adjoining the boiler-house; their aggregate capacity being 600 tons. They are filled by an extension of a previously existing Temperley transporter, by which the coal is unloaded from the barges in the river. The coal is transported in skips, each containing 23 cwt., which are lowered by the Temperley transporter on to a weighing platform. After being weighed, the skips are picked up by an electric transporter and run along a beam until the skip is over the bunker in which it is to be dumped. An automatic dumping block then tilts the skip, and its contents are discharged.

Horizontal valves, worked by rack and pinion, allow the coal to drop from the bunkers into the coal-waggons, which run on a 2-feet gauge track beneath the bunkers. The track extends into, and right through, the boiler-house; and the coal is lifted direct from the waggons into the furnaces. An extension of the track to the north of the boiler-house allows the clinkers and ashes to be run to the ash bin.

THE DESSAU SYSTEM OF VERTICAL RETORTS.

The recent visit of the members of the North of England Gas Managers' Association to the Ayres Quay Works of the Sunderland Gas Company, to inspect the first installation in this country of Dessau vertical retorts, under the supervision of Mr. Charles Dru Drury, the Company's Engineer, has aroused fresh interest in the system, and a desire for some general particulars. Very opportunely, therefore, the Vertical Gas-Retort Syndicate, of 17, Victoria Street, Westminster, of which Mr. Charles Hunt is the Consulting Engineer and his son, Mr. C. Holmes Hunt, the Secretary, have issued a very artistically got-up volume, in which the history and special features of the system, and the extent to which it has been adopted, are fully set forth. The text is illustrated by a number of photographic reproductions and line diagrams; and the book presents, in a form which is worthy of a place on a gas engineer's desk, all the information he needs as to the capabilities of the particular method of carbonization dealt with. When it is mentioned that 5238 Dessau vertical retorts have been ordered, and that the total productive capacity of the installations is upwards of 70 million cubic feet of gas per diem, it will be acknowledged, we think, that this system has already attracted a considerable amount of attention.

Increased Gas Profits at Bury.

At the last quarterly meeting of the Bury Town Council, the Mayor (Mr. S. Kay), in moving the confirmation of the minutes of the Gas Committee, said the draft balance-sheet for the past year had been completed; and, though it had not been audited, he had no doubt there would be little or no alteration in the result. The income from gas and residuals sold was less than in the preceding year; but this was compensated for by a correspondingly large decrease in the expenditure, with the result that the profits for the year were £7151, as against £5721 before—being an increase of £1434. He thought the Council would agree with him that the Manager (Mr. H. Simmonds), and all concerned were to be congratulated on so excellent a result. Mr. Bradley, in seconding the motion, said it came somewhat as a surprise to the Committee to find they had made a more handsome profit than they did twelve months ago. For the first time for some years, the consumption of gas had decreased in the borough; but they knew the principal reason for this was the short time that had been worked in the mills. They had more gas-boilers out and more new meters supplied during the past twelve months than had been the case for a considerable time. If trade improved, the Committee would naturally look for some improvement again in the consumption of gas. He thought the result reflected great credit on the Manager. Everything had been kept up to the highest pitch; and the works were in a splendid condition, and would compare favourably with those of any gas undertaking in the country. The minutes were confirmed.

Unprofitable Electric Lighting at Limerick.—At the last meeting of the Limerick Corporation, a resolution was unanimously adopted recommending that a competent expert, with a practical knowledge of the working of a successful electric power station, should be employed to examine and report on the plant and the working of the municipal electric light undertaking. A circular sent to each member by the Town Clerk shows that the actual loss on the concern up to the 31st of March last was £840, exclusive of bad debts; and the loss on the year's working to the same date was £1255, or about 4½d. in the pound on the rates.

REGISTER OF PATENTS.

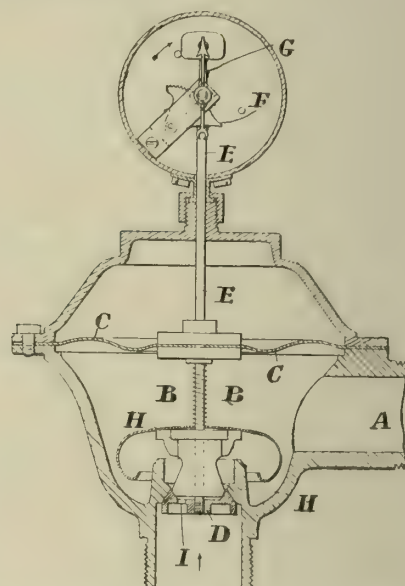
Governing or Regulating the Pressure of Gas.

CALDWELL, H. M., and SMITH, T., of Kentish Town, N.W., and ROSS, F. W. F., of Harley Street, W.

No. 284; Jan. 5, 1909.

This invention relates to the governing and regulating of gas pressure, either with or without an indicator.

The arrangement consists of the following, among other features: (1) A new form of inlet from the gas-main into the apparatus, comprising a coned or other valve seating. (2) The provision of a special valve controlling the inlet from the gas-main into the apparatus. (3) A baffle-plate or baffling device to act in conjunction with the special valve controlling the inlet from the gas-main into the apparatus. (4) A secondary valve or relief valve to act in conjunction with the special controlling valve; the valve being slidably mounted on the valve spindle which carries the special valve, or so mounted on the special valve that the two valves can be normally raised and lowered together, while also the relief valve can be raised and lowered on the spindle, or independently of the special valve. (5) Means for imparting varying pressure upon, or for differentially acting upon and in conjunction with, the valve controlling the inlet from the gas-main into the apparatus. (6) The provision of a weight or weights and spring or springs to exert constant downward pressure on the special valve, and also adapted to act on a septum or flexible diaphragm which divides the container into two compartments, so that one of such compartments (preferably the lower) is gas-tight.



Caldwell, Smith, and Ross's Gas-Supply Governor.

The operation of the apparatus shown is as follows: When all the lights are turned off or all gas consumption is stopped, so that the passage of gas through the outlet A is stopped, the pressure rises in the chamber B and forces upwards the flexible diaphragm C, and this and the pressure in the main forces the special valve D up against its seating and holds it there. The spindle is thus forced to its highest point, and the top end E, acting on the crank arm or lever F, forces the latter upwards until the upright weighted arm G is brought over its dead centre, in which position the pointer indicates on the dial that no gas is passing. If, now, one burner is lighted, this will reduce the pressure in B; and thereupon the reaction of the diaphragm C will tend to force the valve D downwards a slight distance, and thus move it a little off its seating. The downward movement of the spindle E allows the weighted arm G to rock a slight distance to the right (in the direction of the arrow). This brings the valve into a state of equilibrium; and it remains in this slightly-open condition until one or more further burners are lighted, whereupon it descends still further, so as to allow a proportionate further supply of gas to enter the apparatus. Simultaneously, the weighted arm will be moved a further distance in the direction of the arrow, and thus again establish a state of equilibrium of the valve.

In the event of any excessive pressure arising in the main above the normal pressure for which the apparatus is adjusted, the effect would be to force the valve D up against its seating, and hold it there until the pressure was again reduced to or below the normal pressure. During this period of excessive pressure, gas would be stopped entering the apparatus, and, consequently, the supply of gas to the consumer. To prevent this happening, and to enable the apparatus to work whatever pressure may occur in the main, the relief valve H is provided—being so weighted or regulated that while the pressure in the main remains at or below the normal pressure to which the apparatus is set, the relief valve will remain down upon its seating and keep closed the passage I through the valve D. But, on excess of pressure arising in the main, it will force the relief valve H upward off its seating, and admit gas through I into the chamber B, and thereby allow the apparatus to work, even when excessive pressure arises in the main.

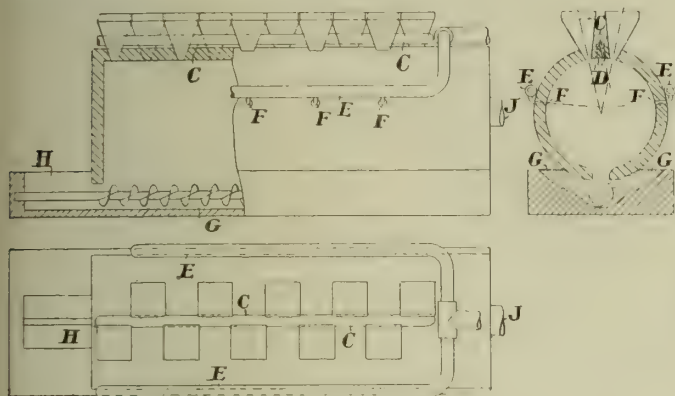
Production of Semi-Water Gas.

GOWER, J. E., of Walthamstow.

No. 7400; Oct. 27, 1909.

This generator for the production of semi-water gas is of the type in which powdered coal is dropped into a heated chamber, where it

meets with a mixture of heated air and water vapour or steam—combination taking place to produce a mixture of carbon monoxide, hydrogen, and nitrogen. The reaction is made practically an instantaneous one by highly heating the air (before introducing it into the generating chamber) to such a temperature that the powdered fuel, on dropping through the entering air-jets, is immediately attacked to form carbon monoxide. The now incandescent excess carbon particles react with the steam, water vapour, or water—introduced preferably at a lower level—so that, after passing through the entering layer of hot air, the remaining incandescent material falls through the water vapour and, combining with the oxygen to form more carbon monoxide, liberates the hydrogen. A slight excess of carbon is provided, to prevent the formation of appreciable quantities of carbonic acid; and this excess falls to the bottom of the chamber. But the reactions producing the semi-water gas are completed during the fall of the fuel through the atmosphere of the chamber; so that the mass of fuel involved is limited to that immediately taking part in the reactions.



Gower's Semi-Water Gas-Producer.

The illustration shows a side elevation of the generator (in this case cylindrical, and admitting the air and steam at separate orifices), a vertical section, and a plan.

The generating chamber is provided at the top with supply hoppers, through which the finely-divided carbon material is allowed to drop in thin streams into the interior. The hoppers are preferably staggered as shown; and the supply is directed towards the centre of the chamber. The heated air is supplied through the pipe C, with orifices D opening into the chamber between the hoppers and directed outwardly, so that the air-jets cross the falling powder and instantly attack it. The steam or water is supplied under pressure through the side pipes E with jets F, causing the water vapour to impinge from each side upon the falling carbon, which is now at a high temperature, owing to the partial combustion and the heat of the air-jets. The excess highly-heated carbon instantly attacks the water molecules, combining with the oxygen to form a further quantity of carbonic oxide; while the hydrogen of the water is set free.

Ash and any traces of unconsumed carbon that may be left drop into the water-seal at the bottom of the chamber formed by the recessed base G. This is provided with a screw conveyor carrying the residue to the open end H for removal. The semi-water gas is led off through the outlet J at one end of the chamber; the water-seal preventing any other escape.

Pressure Governors for Compressing or Exhausting Systems.

HODSON, H. M., of Herne Hill, S E.

No. 8431; April 7, 1909.

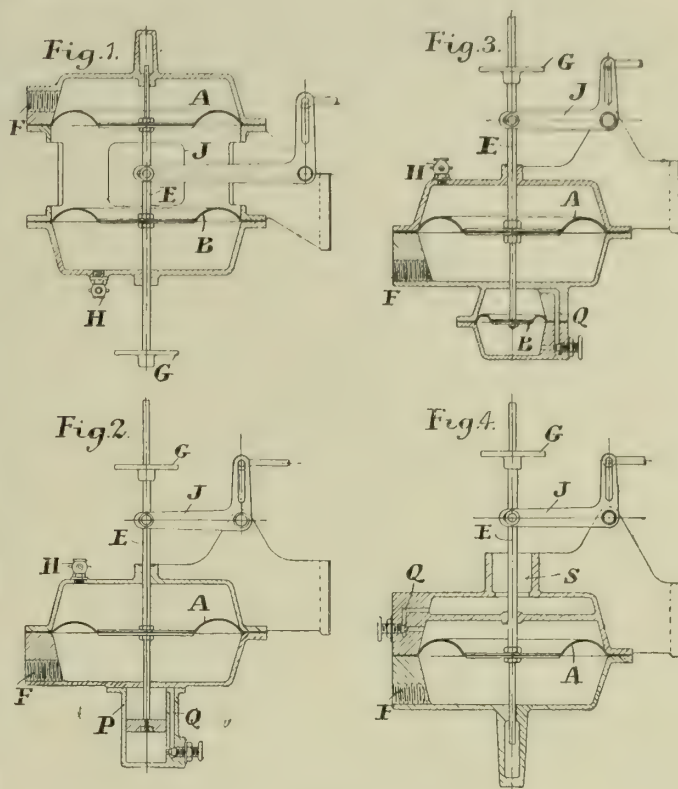
According to this invention, the governor comprises (in combination) a diaphragm acted upon by the fluid pressure of which is to be regulated; a system between the diaphragm and the motor-controlling device of the compressor or exhauster, and imparting movement to the motor-controlling device proportionate to the movement of the diaphragm; and a dash-pot arrangement for cushioning the movement of the diaphragm.

In fig. 1, the governor works with a vacuum. It comprises two diaphragms A B (for example, leather), arranged in adjoining casings, so that one central stem E is common to both. The upper side of the upper diaphragm is exposed to the vacuum maintained by the exhauster, by a pipe connection at F. The upward pull on the diaphragm is balanced by weights placed on the tray G. The lower diaphragm, in combination with its casing, forms an air-cushion; and a cock H allows air to pass in or out of the casing at such a rate that the movement of the diaphragm is regulated, and thereby any tendency to "hunting" of the engine is prevented. The diaphragm B and its casing with the cock H serves as a dash-pot to the governor. The motion imparted to the diaphragms by any change of vacuum on the upper diaphragm is transmitted through a bell-crank lever J to a rod K, which actuates the steam-throttle valve. A slot is provided in the lever, so that the movement of the rod K can be adjusted with respect to that of the lever. Any change of vacuum from that required to be maintained by the exhauster produces a corresponding change of speed in the engine driving the exhauster; so that the governor thereby tends to keep the vacuum approximately constant. When it is required to alter the vacuum to be maintained, this is effected by changing the weights on the tray G.

This form of governor can be used for regulating a pressure instead of a vacuum by inverting it, so that the upward pressure of the diaphragm A exposed to the gas is balanced by downward pressure of weights placed at the opposite side of the tray G.

In fig. 2, an alternative form of governor is shown—arranged for working with gas under pressure. By means of the gas-inlet at F, the diaphragm A has its underside exposed to the gas pressure, balanced by weights on the tray G. By means of a piston working in a dash-pot

cylinder P, and attached to the diaphragm stem E, the rate of movement of the diaphragm is controlled—the passage of gas from one side to the other of the piston through a bye-pass Q being regulated by an adjustable valve. If desired to use this governor with a vacuum, it should be inverted.



Hodson's Pressure Governors.

In fig. 3, the piston and cylinder forming the dash-pot in fig. 2 are replaced by a second diaphragm B in a casing attached to the main diaphragm casing. The passage of gas from one side of the diaphragm B to the other through a bye-pass Q is regulated by an adjustable valve.

In fig. 4, the cushioning effect of a dash-pot is secured by the formation of the casing above the diaphragm A, which is divided horizontally, by a division wall, so that two compartments result in restricted communication one with the other by way of a passage Q controlled by a valve. The diaphragm stem passes through a joint in the division wall, which need not be absolutely tight. The space above the diaphragm A can contain either air or oil, or other liquid suitable for the purpose. If air be used in one compartment, then the other compartment will simply act as an atmospheric chamber, and the working of the governor will be identical with that of fig. 1.

Coin-Freed Gas-Meters.

SHAKESHAFT, C. E. M., and CLARKSON, T. J. R., of Aston, Birmingham.

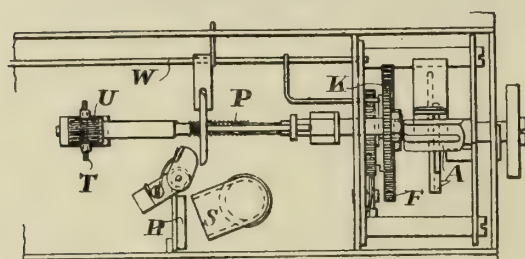
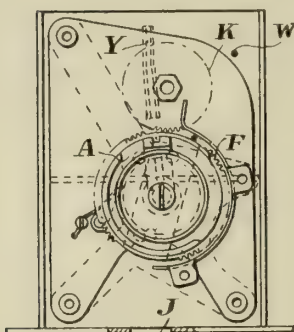
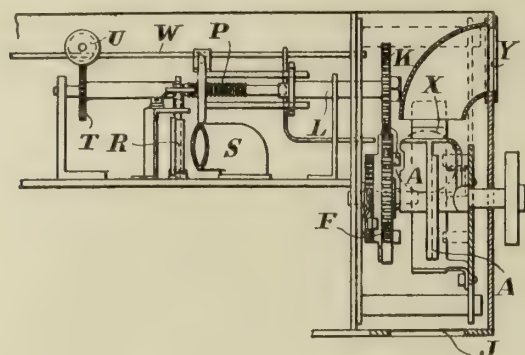
No. 24,292; Oct. 22, 1909.

This invention relates to the mechanism of prepaid gas-meters where a coin of prescribed size is inserted in a carrier capable of limited rotary movement, and adapted to lock the carrier to a wheel, which (turning with the carrier) operates mechanism for releasing a spring-controlled gas-inlet valve returned against the pressure of the spring by the ordinary measuring mechanism of the meter—p. 444.

The coin X, inserted through the slot Y, falls into the carrier A, rotatable by an exterior handle. The frame is provided with two stops which limit the rotary movement of the carrier. The example shows the carrier capable of a half-turn, which will deliver the coin, after the mechanism has been turned, to the opening J, from which it will fall into a coin-box. A change-wheel F, furnished with ratchet and pawl, so as to prevent reverse rotation, has upon its outer face two stops, against which the edge of the coin engages alternately when in the carrier for the purpose of turning the wheel F, the motion of which is transferred to the toothed wheel K, rigidly mounted on the spindle. The change-wheel has gaps, and by varying the number of teeth in it the wheel can be proportionately turned, and thus a larger or smaller quantity of gas delivered.

The spindle L has fixed to it a plate M, in which two holes are made to receive pins fixed to a nut disc mounted upon a threaded spindle P, one end of which rests in a recess at the end of the spindle L, and the other is supported by a bracket and has fixed to it a toothed wheel T, turned by the worm U, operated from the ordinary mechanism of the meter. The spindles L P rotate independently; and it will be obvious that the rotation of the spindle L will, through the medium of the pins, rotate the disc nut and draw it along the threaded spindle P, while (conversely) the rotation of the spindle P through the wheels U T will draw the disc nut back again.

A spring-controlled valve R is adapted to normally open the gas-passage S; but when the disc R on the spindle P is returned (due to it being rotated by the ordinary measuring mechanism of the meter), the disc nut is pressed against a projection and thereby turns the valve R and closes the gas-passage S, which can only be reopened by drawing away the disc nut through the coin-freed mechanism operating the spindle L. The disc nut is permanently arranged within a slot in a rigid arm extending from a sliding wire W, the movements of which coincide with those of the disc nut. This wire carries an arm, the end of which



Shakeshaft and Clarkson's Coin-Freed Gas-Meter.

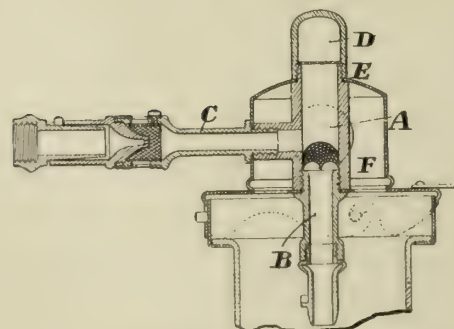
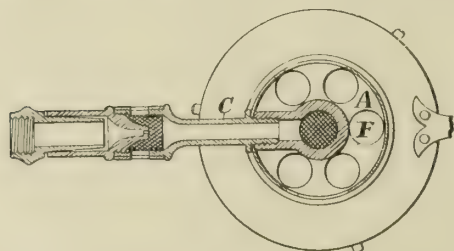
is adjusted in such relation with the change-wheel F that, when a maximum number of coins have been used, and the disc nut is at its furthest position from the valve, the end of the rod will engage the change-wheel and prevent its rotation—thus stopping the insertion of more coins. A second wire, extending through the side of the case in which the mechanism is arranged, is employed as a pointer over a gauge for the purpose of showing at any required time the amount of unconsumed gas which has been paid for.

Incandescent Gas-Lamps.

DARWIN, H., of Birmingham.

No. 24,367; Oct. 23, 1909.

This lamp has an expansion and mixing chamber in communication with a pressure-equalizing pocket or compensation chamber that "preserves a balance between the supply of gas and the delivery of combustible mixture to the burner and prevents any rise or drop in the gas



Darwin's Incandescent Gas-Lamp

pressure from producing a corresponding fluctuation in the flame in the mantle, from the fact that when the supply pressure momentarily rises its disturbing effect is taken up in the equalizing or balancing chamber to produce a corresponding increase of pressure therein, which is available to compensate for, or make good, any subsequent drop of pressure below the normal, such as usually follows each momentary rise."

The inverted lamp shown is generally of the type described in patent No. 3634 of 1909. It comprises an upright mixing and expansion chamber A, preferably of cylindrical form, and having the lower and open end leading into a smaller-bored depending burner-tube B, to which the nozzle is attached; while the chamber is supplied with gas and air by way of a horizontal branch or induction pipe C, furnished either with an ordinary coned gas-nipple and air-regulator (as shown) or with any other arrangement for delivering to the lamp gas and air in given proportions.

The horizontal induction pipe leads into the side of the expansion and mixing chamber at a little distance above the outlet end to the burner-tube; but the chamber itself is extended some distance above the point where the gas and air enters, and its upper open end is superimposed by, and leads into, a dead-ended cap or pocket-like attachment D, which constitutes the pressure-cushioning or balancing part of the lamp.

To ensure an effective cushioning action, the cap or pocket is partitioned horizontally from the upper end of the mixing-chamber by a perforated plate or diaphragm E. To assist the cushioning action, and also "to atomize and incorporate the gaseous mixture prior to combustion" a gauze diaphragm F may be located at the bottom of the mixing-chamber, between the gas and air supply branch and the burner-tube.

APPLICATIONS FOR LETTERS PATENT.

- 10,011.—KIRKEY, H. W., "Self-closing gas supply-valve for gas-fires." April 25.
 10,034.—DUBSKY, A., "Igniters." April 25.
 10,088.—HUMMEL, H. J. J., "Inverted gas-lamps." April 25.
 10,150.—BONE, W. A., WILSON, J. W., M'COURT, C. D., and DAVIS, H., "Gas-fires." April 26.
 10,156.—THOMPSON, H., "Gas cooking-ovens." April 26.
 10,226.—DAWSON, C. E., "Producing combustible mixture of liquid fuel and air." April 26.
 10,268.—MARTIN, D., "Conveyors for coal." April 27.
 10,322.—COATGOUEDEN, A. DE, "Carburetted air." April 27.
 10,343.—GLOVER, T., "Locking device for taps and cocks." April 27.
 10,346.—HANA, G., "Air-gas apparatus." April 27.
 10,357.—WHITE, M. & H. J., "Gas-generating plant." April 27.
 10,371.—GODELMANN, N., "Mantles." April 27.
 10,380.—PURVES, T. H., "Governor for gas." April 28.
 10,400.—CAMPBELL, H., "Suction-gas producers." April 28.
 10,401.—CAMPBELL, H., "Gas-engines." April 28.
 10,448.—TURNER, F., "Gas burners and fittings." April 28.
 10,451.—COLBRAN, J. B., "Regulating gas-nozzles." April 28.
 10,495.—HELPS, G., "Gas-lamps." April 29.
 10,536.—DEVOORDE, E. VON, and WILKENS, H., "Automatic lighters." April 29.
 10,581.—GLOVER, T., "Locking tap or cock." April 29.
 10,583.—BOOTH, H. C., "Air-gas apparatus." April 29.
 10,598.—TESSIER, A. C., "Manufacturing gas." April 29.
 10,641.—MARSDEN, H. R., "Gas cooking-stoves." April 30.
 10,642-3.—MARSDEN, H. R., "Stop-taps." April 30.
 10,667.—PRATT, W. E., "Incandescent gas-burners for billiard tables." April 30.
 10,784.—DANAHER, J. W., and SLAGHT, E. E., "Gas-meters." May 2.
 10,802.—PALMER, W. V., "Prepayment-meters." May 2.
 10,806.—BROADBERRY, A. E., and GLOVER, T., "System of gas lighting and ventilating rooms, shops, and like places." May 2.
 10,827.—NOBBS, F. W., "Plate warming-fitting for gas-stoves." May 2.
 10,888.—NETHERCLIFT, E. H., "Mixing air and gas." May 3.
 10,894.—BOLLÉ, C., "Gas-turbines." A communication from Akt-Ges. der Maschinenfabriken von Escher Wyss et Cie. May 3.
 10,931.—MAJOR, J. L., "Manufacture and production of oils from coal tars and the like, and also a pitch free, or relatively free, from uncombined carbon." May 3.
 10,932.—WEEKES, R. W., "Combined installations for power generation and industrial heating." May 3.
 10,967.—DEFRIES, J. W., "Plate-rack support for gas-stoves." May 3.
 11,004.—BURRIDGE, W. R., "Artificial fuel." May 4.
 11,029.—WHITEHEAD, H. F. C., "Valves." May 4.
 11,117.—BRAYSHAW, E. R., "Gas melting-furnaces." May 5.
 11,144.—GÖTZE, L., "Automatically operating the stop-cocks of water-pipes." May 5.
 11,149.—STILL, W. M., AND SONS, LTD., and STILL, E. H., "Lighting and extinguishing lamps." May 5.
 11,150.—STILL, W. M., AND SONS, LTD., and ADAMSON, A. G., "Mantles." May 5.
 11,173.—FERGUSON, F. H., "Inverted gas-lamps." May 5.
 11,230.—EISNER, A., "Self-igniting incandescent mantles." May 6.
 11,258.—SOMERVILLE, J. M., "Inverted gas-lamps." May 6.
 11,264.—PILLIVANT, F. T., "Boxes for mantles." May 6.
 11,268.—KEITH, J. & G., "Controlling the ignition and extinction of gas-lamps." May 6.
 11,269.—KEITH, J. & G., "Pressure-regulating devices for controlling the supply of gas to burners." May 6.
 11,308.—CLAUGHTONS (LEEDS), LTD., and AUSTIN, E., "Automatic gas-controllers." May 7.
 11,320.—RICHMOND GAS STOVE AND METER COMPANY, LTD., and SHERBURN, W. H., "Grilling or like cooking apparatus." May 7.
 11,347.—PLOWMAN, T. A. B., "Pneumatic apparatus for the control of gas-burners." May 7.
 11,357.—GLOVER, T., "Fuel for gas-fires." May 7.
 11,362.—DELAGE, M., and WOOG, P., "Electrically lighting gas-burners." May 7.
 11,364.—FALDING, F. J., and CATHCART, W. R., "Recovery of valuable constituents from gas liquor." May 7.

The Local Government Board have sanctioned a loan of £6748 for carrying out alterations at the Portmadoc Gas-Works.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Coalite Patents.

SIR,—In your issue of the 10th of May we observe statements in regard to the Coalite patents, which we ask you to be good enough to correct in your next issue.

You state that the Coalite Company have been unsuccessful in defending their master-patent, and their claim to a monopoly has been knocked on the head.

These statements are absolutely untrue; and we ask you to be good enough to correct them.

27, Chancery Lane, W.C., May 14, 1910. EDWARD EVANS AND CO.

[The chief interest of the foregoing letter lies in its brevity. We do not know by what right or authority Edward Evans and Co. send a letter asking us to be "good enough to correct" certain statements in regard to the Coalite patents. There is a little bit of bounce about this. The second paragraph of the letter does not contain even the gist of what we said in our last issue. Our words were (and we reproduce them) that "it was a significant piece of news that was published by the 'Iron and Coal Trades Review' to the effect that the Coalite Company had been unsuccessful in defending what they are pleased to regard as their master-patent by"—Edward Evans and Co. purposely overlooked these qualifying words—"opposing the application of a Glasgow Syndicate for a patent for producing (presumably by a low-temperature process of carbonization) a smokeless fuel." Is this the statement that is "absolutely untrue?" If so, in what respect is it untrue? We must really have a little more explanation from our correspondents before we can comply with the request repeated in the above eight-lined letter to be "good enough to correct" the statement. By the way, we have not seen any explanation or correction of the original statement in the "Iron and Coal Trades Review." Unless there has been some inadvertent missing on our part of such explanation or correction in our contemporary, Messrs. Edward Evans and Co. have lost an opportunity of getting a little advertisement for Coalite into its pages. We shall be glad to have an extended explanatory statement from them, and then we shall be in a better position to judge of what we shall be "good enough" to do.—ED. J.G.L.]

Burner Maintenance.

SIR,—I would like to draw your readers' special attention to your leader on "Burner Maintenance," because without a doubt the whole future of gas for lighting purposes depends on the attitude of gas administrators to this matter. You truly say at the outset, "We have, in household lighting, every advantage on our side but one; and the exception is that incandescent gas-burners do require, to maintain their highest efficiency, more attention than the newer forms of electric lamps." It is good for the gas profession to have this truth stated so plainly by you. In past years, gas folks recognized and met the opposition which arose; and their vigorous attitude then put their business on a more stable basis than it had ever possessed before.

Your difficulty seems to be as to the position of maintenance work amidst the multifarious duties of a gas man; and I do think it is just here that a suggestion might be offered. Why make it gas engineers' at all? Why cannot the gas engineers combine and form a strong company to do, at a profit—a profit limited to (say) 5 per cent.—what they are attempting to do spasmodically and in a great variety of ways. If the gas engineers cannot see their way to undertake such a company-promoting scheme, perhaps I might suggest that one or two incandescent mantle makers will see sufficient in the idea to take the matter up and exploit maintenance work as an adjunct to their ordinary business lines.

The views of Mr. Goodenough, Mr. Lewis (of Newcastle), and others who may occur to you, as to the scheme, would be interesting.

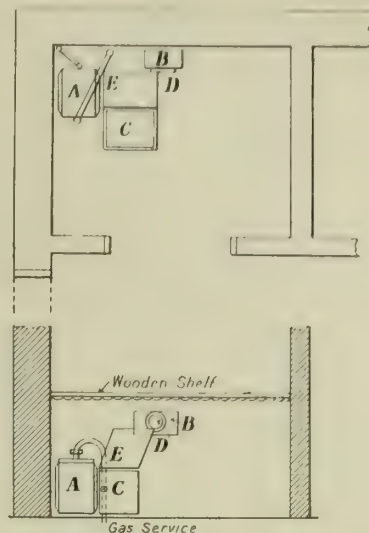
May 12, 1910.

METHOD.

[We are pleased to receive this letter on the subject of "Burner Maintenance," in connection with which a second article is published in our leader columns this week. The question is one that requires to be thoroughly threshed out, and dealt with by the gas industry on well-considered lines. From any one concerned—and particularly from those with special experience and opportunities for forming judgment—we shall welcome correspondence. "Method" names Mr. Goodenough and Mr. Lewis (of Newcastle). Contributions from them would be of considerable interest to our readers; and gas managers and the superintendents of most distribution departments could contribute from their experiences much that would be helpful. Wisdom is not confined to any one quarter; and from a good accumulation of views and experiences, there may be extracted valuable guidance. There is no use in being reticent over a popularly recognized fact. It has to be dealt with; and the question is, Which of the various ways suggested and practised is the best, or is there a still better method? Our correspondent makes a suggestion as to an independent scheme of maintenance, so relieving the gas undertaking of the duty. Upon it we will not express an opinion at the present stage; but those who may take part in the discussion of the subject are invited to do so.—ED. J.G.L.]

Electrical Dangers—A Caution.

SIR,—I herewith forward you a print which illustrates the danger of the escape of electric current from defective fittings to gas pipes and fittings.



A, Gas-Meter; B, Electric-Meter; C, Coal-Vase; D, Leaky Dial Electric Meter; E, Inlet to Gas-Meter. The escaped current from the leaky electric-meter, at D, burnt a hole in the gas-pipe at E; and the current was conveyed from D to E through the lid of the coal-vase touching at both points.

From the plan you will see that the electric-meter B was fixed in close proximity to the gas-meter A, and that an iron coal-vase C had been placed between the two. When the lid of the coal-vase was opened and thrown back, it touched the dial of the electric-meter, and the inlet to the gas-meter. The dial was defective, and the electric current was conveyed to the inlet pipe of the gas-meter, which was fused, and a flame from the gas-pipe was produced quite 2 feet long. This occurred at 9.15 in the evening, and was fortunately discovered. Had it occurred a little later, when the family had retired to bed, the house must have been burnt down, and no one would have discovered the cause.

May 12, 1910.

H.

LEGAL INTELLIGENCE.

LIQUIDATION OF THE KENT COUNTY GAS COMPANY.

HIGH COURT OF JUSTICE—BANKRUPTCY DIVISION.

Monday, May 9.

(Before Mr. Justice PHILLIMORE.)

In re W. Darby, ex parte Official Liquidator of Kent County Gaslight and Coke Company, Limited, v. E. L. Hough, Official Receiver, Trustee.

This was an appeal from the Trustee disallowing the claim of the Official Liquidator to prove in the bankruptcy of Darby for a sum of £14,000 odd (being the balance of a larger sum), undisclosed profits made by him as promoter of the Kent County Gas Company, on the sale of the property to the Company.

Mr. FRANK RUSSELL, K.C., and Mr. COLDRIDGE appeared for the Official Liquidator; Mr. JENKINS, K.C., and Mr. GREER, on behalf of the Trustee, resisted the claim.

Mr. RUSSELL said the proof lodged was in respect of two matters—the first, a sum of £1278, balance of moneys due by the bankrupt on his guarantee to pay a dividend (and this the Trustee had allowed); and the second, for damages for breach of trust as promoter of the Company. The damages were measured by the amount of profit Darby received; but credit was given him for the money spent in the promotion, and also for what he had paid on account of dividend. The facts were briefly as follows: On April 17, 1906, an agreement was made between Messrs. F. C. Lawson and Co. and Charles Archer, as Trustee for the intended Company (Lawson and Co. being only another name for W. Darby and H. W. Gyde). It recited that Lawson and Co., the vendors, were possessed of certain freehold property at Goudhurst, in Kent, and were there carrying on a gas manufacturing business; and it provided for the sale to Archer, as Trustee for the Company, of the property, plant, &c., for £21,800—20 per cent. in cash down, and the balance in cash or shares at the option of the vendors, who were to pay the expenses of the incorporation—and by another clause guaranteed a dividend. On the 2nd of May, the Company was incorporated; and on the 14th the prospectus was issued. This set forth that Lawson and Co. were the vendors and promoters; but there was no disclosure of the profit they were making on the sale. The 20 per cent. was paid on the 23rd of May, and the balance in cash on the 11th of June. It was discovered later that on the 13th of March (rather more than a month before the sale to the Company) Darby and Gyde purchased the property for £2350 only; the vendors being the Goudhurst Gas Company and certain other parties who were evidently mortgagees. The Trustee had rejected the proof on two grounds—first, that there was no evidence of non-disclosure; and, secondly, that there was no

legal liability to refund this profit under the circumstances, even if there were no disclosure. He submitted that the promoter was in a fiduciary position towards the intending shareholders, as had been decided in the Olympia case (2 Ch., 1898) and in that of the Leeds and Hanley Theatre of Varieties, Limited (2 Ch., 1902); and was therefore liable to repay the secret profits he had made. He did not suggest for a moment that a promoter could not make a profit; on the contrary, he might buy property for £5, and sell it to a company for £50,000, provided always that he disclosed the fact. Counsel cited passages from the cases to which he had referred in support of the proposition he had put forward.

Mr. JENKINS said the amount concerned was large; and as there were many other claims, the Trustee felt bound to take the opinion of the Court upon the question. His main point was that the promoter was not in any sense the agent of the Company or of the intended Company when he acquired the property; and this being so, the only remedy open to the Company, when they discovered that the property had been purchased by the vendor for a small sum, was to repudiate the contract and rescind it. But here they had retained it. The Liquidator had, in fact, since sold it; and the authorities showed that in such circumstances they could not claim the secret profit. He cited the case of the Cape Breton Company (29 Ch.D.) and *Ladywell Mining Company v. Brook* (34 Ch.D.) to show that the present case was distinguished from those mentioned by his learned friend.

At the conclusion of his argument, without calling for a reply, Justice PHILLIMORE gave judgment. He thanked Mr. Jenkins for the way in which he had arranged and analyzed the cases, and said that, in his opinion, the decision in the Leeds and Hanley case might have put the coping-stone on an alteration of the law, which was gradually being built up from the time when the House of Lords criticized the judgment in the Cape Breton case. He could not speak positively on this point; but once one was clear what the decision in the Leeds and Hanley case meant, one could not suppose it was intended to overrule previous decisions. At any rate, he thought that case was conclusive of the present. The facts here were very short. Some time before Nov. 30, 1905, Darby and Gyde, as they then called themselves, purporting to form a firm of Darby and Co., contracted to buy the *locus in quo* on which these gas-works stood, with the plant, &c. On March 13, 1906, they bought it from the mortgagees and personal representative of their original vendor. On April 17, the same people, purporting to carry on business under the name of F. C. Lawson and Co.—an unexplained change—purported to sell it to a Trustee for a Company to be formed, which Company was formed, and its Liquidator was making the present application. The Company was incorporated on May 2; and on May 14 the prospectus was issued. The agreement was confirmed on the 31st of May; and on June 11 the balance of the purchase-money was paid and the conveyance taken. On March 13, Darby and Gyde paid £2350 for the property, which on April 17 they sold for £21,800; thus making an enormous profit. This they were quite entitled to do, because they were not buying as agents or trustees for the then non-existing Company whose Liquidator was now suing. The point put against them was that they were bound in this case, being also promoters, and having issued a prospectus, to make it reasonably clear on the prospectus that they were doing something of the kind. The prospectus stated that the Company was formed to acquire as a going concern from Lawson and Co. the old-established freehold gas-works at Goudhurst, including the benefit of existing contracts; and there was a clause stating that the agreement of April 17, 1906, had been entered into. It would not be a very harsh thing to say that in this there was a *suggestio falsi*, because, referring to this as an old-established business, and mentioning no title or date by which Lawson and Co. had acquired it, it certainly would lead an ordinary careless person to assume either that Lawson and Co. were carrying on an old-established business, or at any rate that they were the people who succeeded to it, and were not making a claim as speculators to sell at a profit. He would not, however, rest his judgment on this, but would assume that there was nothing, so far, which could be said to be fraudulent. Then came the question as to whether these people, having bought with the intention of establishing a company and reselling as soon afterwards as they did, were not bound to disclose so large a profit as they were making. Of course, common sense must be applied to these transactions; and when a man said he was a promoter, one expected that he would get a profit. If he were selling his own business, he would probably put a sanguine estimate upon it. If the original owners had been selling, and had worked out the price by capitalizing the value of the contracts, without making sufficient deductions for repairs or uncertainty, or taking too many years' purchase—all these were matters one would expect, and against which intending investors must protect themselves. Again, if one knew or suspected that the vendors were not the people who had carried on the business, they would be expected to put a reasonable profit on the turnover. Such cases must be dealt with on common-sense principles; and any claim founded on them would probably be discountenanced. But here were people who within a few months were buying at £2350 and selling at £21,800; and if ever there was a case in which an undisclosed profit ought to be disclosed, this was one. Most of the cases cited by Mr. Jenkins were cases of misfeasance against directors, and did not touch the matter at all. The principle was this—that where people promoted a company and invited corporators to join, by this mere fact they entered into a fiduciary relation with these corporators which imposed upon them certain duties. It was for this reason that they were bound to disclose the profits; and if they did not do so, the profits so made might be taken from them. As was said in one of the cases cited, it was analogous to a trust for unborn children; and in respect of such a breach of trust they might be called upon to pay damages, the measure of which was the amount of profit they had taken. He therefore thought that the claim was made out, and that it was provable in the bankruptcy; and therefore the proof must be allowed.

Mr. RUSSELL asked for his costs out of the estate.

After some discussion, these were allowed. With regard to the costs of bringing up Darby and Gyde in custody to give evidence, if necessary, his Lordship said that this was a matter for the Taxing Master to deal with.

AFFAIRS OF THE MID OXFORDSHIRE GAS COMPANY.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, May 11.

(Before Mr. Justice SWINFEN EADY.)

Bernstein v. Mid Oxfordshire Gaslight and Coke Company, Limited.

This was a motion for the appointment of a receiver and manager of the Company.

Mr. CHRISTOPHER JAMES appeared for the plaintiff; Mr. RICHARDS represented the Company.

Mr. JAMES said the Company was a limited liability concern, without any statutory powers, and they and the Trustees of the debenture deed consented to the motion. But there was a little difficulty on one point. The plaintiff sued on behalf of himself and all other holders of debentures entitled to the benefit of the particular deed under which his debentures were issued, which contained a charge on the property and undertaking of the Company in Chipping Norton, and also one on the whole assets of the Company. But there were other debentures which contained a specific charge on the property in other towns, as well as a general floating charge on the whole assets. As the plaintiff was suing on behalf of the holders of one series of debentures only, he felt a little difficulty in asking for the appointment of a receiver and manager of the whole undertaking, because the holders of the other series of debentures had rights *pari passu* with them over the general assets, and specific charges on the gas-works at Bicester and other places.

Mr. RICHARDS said notices of motion had been received on behalf of two other debenture holders, which would come before Mr. Justice Parker next day.

After some discussion,

His LORDSHIP said it was very undesirable to have separate actions proceeding in different branches of the Court. He suggested that the writ should be amended so that the plaintiff might sue, so far as the floating charge was concerned, on behalf of all persons entitled to the benefit of that charge. He (his Lordship) could then appoint a receiver of the particular undertaking at Chipping Norton, and also of the floating assets. When the other motions came before Mr. Justice Parker, an arrangement could be made for transferring the actions to him, or the present action to Mr. Justice Parker; and one order could then be made in the three actions.

It was agreed that this should be done; his LORDSHIP pointing out that separate accounts would have to be kept of the different undertakings. He appointed the gentleman named; but he was not to act as manager beyond June 30 without further leave.

Thursday, May 12.

(Before Mr. Justice PARKER.)

Mr. JAMES this morning brought on the motions in the other two actions, when it appeared that in each case the plaintiff was Mr. Bernstein, who was the holder of debentures in the other two series, one of which was charged primarily and specifically on the Bicester Gas-Works, and the other on the electric light undertaking at Chipping Norton, which was also carried on by the Company. Counsel explained the circumstances, and stated the nature of the order made by Mr. Justice Swinfen Eady.

Justice PARKER thought the best thing to do would be to appoint the same gentleman receiver and manager of all the undertakings and assets of the Company, but to manage separately, and keep separate accounts of the undertakings and property respectively mortgaged by the three several indentures. Then the two actions before him should be transferred to Mr. Justice Swinfen Eady; and the order would be drawn up as one order in the three actions. Meanwhile the receiver and manager would act on the plaintiff undertaking to be responsible to the Court for his receipts.

Mr. PATTERSON, who appeared for the Trustees of the deed affecting the Bicester undertaking, said it was important that separate accounts should be kept, as, having regard to the terms of his deed, he thought questions of priority might arise.

His LORDSHIP said the order would direct separate accounts to be kept.

Position of the Beaufort Gas Company.

At the Tredegar County Court last Tuesday, an application was made, before his Honour Judge Hill Kelly, for the winding-up of the Beaufort Gas and Lighting Company, Limited. Mr. A. J. Parsons (instructed by Messrs. Vaughan and Harris, of Brynmawr), who appeared for the petitioning creditor, applied for an adjournment, as he anticipated that the matter would be arranged. There was no general body of creditors to oppose or support, and the application was adjourned to the next Court.

Meters Limited.—The accounts of this Company for the year ended the 31st of March, which will be submitted at the ordinary general meeting next Tuesday, show that the trading has resulted in a gross profit of £33,017, which is reduced by general management expenses, Directors' fees, legal charges, expenses on patents, income-tax, and depreciation of buildings, machinery, and plant. A sum of £3078 has been spent out of revenue on repairs and renewals. After providing for interest on debenture stock, the net profit amounts to £22,732, which with £2461 brought forward makes £25,193, out of which interim dividends at the rate of 5½ per cent. per annum upon the preference shares, and at the rate of 4 per cent. per annum upon the ordinary shares, were paid in November last. The Directors now recommend that further dividends be paid at the rates of 5½ and 8 per cent. per annum (making the ordinary dividend 6 per cent. for the year), that £6000 be added to the reserve fund, raising it to £66,000, and that the balance of £2796 be carried forward.

MISCELLANEOUS NEWS.

BOMBAY GAS COMPANY, LIMITED.

An Interesting Retrospect.

The Ordinary Meeting of this Company was held last Thursday, at the London Offices, No. 6, Drapers' Gardens, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. A. Dickson, jun.) read the notice convening the meeting and the certificate of the Auditors; and the Directors' report and accounts (a notice of which appeared in the "JOURNAL" for April 19, p. 192) were taken as read.

The CHAIRMAN said they were met under the shadow of a great national calamity. They had lost their King and the Emperor of India, where they carried on business. In him they had been deprived of a great King and a great friend of his people. He was sure it would only be in accordance with the shareholders' feelings if he proposed a resolution offering their respectful sympathy with the Royal Family, and pledging their devotion to the present King and Emperor of India. He therefore begged to move: "That the shareholders of the Bombay Gas Company, a British Company trading in the Empire of India, desire to place on record their deep sorrow at the death of their gracious King and Emperor of India, their thankfulness for the blessings arising from a beneficent reign, and their sympathy with the Queen Mother and Royal Family in their bereavement; and also desire to express their loyalty to King George V."

This was seconded by Mr. CLARK, and carried by the shareholders rising silently in their places.

The CHAIRMAN (proceeding) said the Company had a very encouraging, perhaps a brighter outlook than had been the case since he had had the pleasure of sitting at the Board. There was a very satisfactory development in the sale of gas (which followed upon an increase which he announced at the last meeting). The increase was 9.6 per cent., of which private consumers yielded an increase of 12.4 per cent., and public lamps 5.8 per cent. So satisfied were the Directors with the strength of the position, that they had given a further reduction in the price of gas of 4 annas per 1000 cubic feet from July 1 next. They had for some months past been giving a supply at a reduced rate for power and manufacturing purposes. If they could secure the increase they had been getting apart from such a stimulus, beyond doubt with the stimulus of the lower price this increase would be still further augmented. The increase which had come had brought out a highly satisfactory profit, which enabled the Directors to give the shareholders a dividend of 7 per cent. for the year. This they were able to recommend with the greatest confidence, because the profits had only been arrived at after the most drastic and thorough attention to the upkeep and development of the Company. The undertaking had been a good many years in existence now, and was founded on rather a large scale. Bombay was a very important city, and would make a big hole in a Metropolis like London. But such were the habits of the natives, and so slow were they to adopt the modern practices of the European tastes and fashions, that the concern did not for very many years grow up so as to use its plant with much profit. Now, for the last four or five years, they had reached—he would not say the whole power of the plant, because the engineer who designed the works laid down a very fine arterial main, which would last a great time, and a good deal of solid building; but, at any rate, they had required a large amount of reconstruction (because things were rather antiquated) and also some extension. And inasmuch as their business on the whole, after all this development, was not so great as to justify the calling-up of new capital, the Directors had had to devote all they could secure from the earnings to carrying out these reconstructions, repairs, and improvements, so as to meet as far as possible the extra strain that had been thrown upon the works, and to provide something for the future. Looking at the accounts, they would see that there was a gross profit of £18,411, which was £2312 more than in the previous year; while the income from the sale of gas was greater by something like £3997 in private rental, and £1104 for public lighting. Then there were some small variations. The rental of gas-meters was larger—showing that a greater number of meters were in use, and more consumers of gas. He would like to be able to tell them how many consumers had been added; still he thought the shareholders would acknowledge that the form of accounts during the past few years was a great improvement on the old style. The receipts from coke were somewhat smaller, owing to the price having come down. While the income on revenue account was £4930 more, the net profit was larger by only £2312; and the proprietors would naturally ask what had been done with the other £2618. Of course, they could not sell more gas without making it; and some of the money had had to go in extra coal, wages, &c. But the explanation was largely—and this was his pride—that there had been a great outlay on repairs and maintenance of works and plant (£6481), and on repair, maintenance, and renewal of mains and services (£6009). Altogether something like £12,500 had gone in repairs, &c. These two items—one was rather less, and the other somewhat larger, than in the previous year—accounted for a considerable proportion of the £2618. The dividend, therefore, had not only been earned, but it had been earned after they had had the satisfaction of spending the large amount on repairs to works and mains to which he had just referred. This showed how well the undertaking was working. The amount of gas brought into account was satisfactory, and as good as in many of the works in England. The working was, in fact, quite up to date, and reflected the greatest credit upon their Engineer (Mr. A. R. Burch) and on his Assistant (Mr. W. T. Lane). It was about 1893 that he (the Chairman) first came into the Company's service as a Director. From 1892 to 1895, the price of gas averaged 76d. per 1000 cubic feet, and the profit was 31½d.—it amounted to £14,439 on the average of three years; while the repairs averaged £4014. In the last three years, the price had been reduced to 73d. per 1000 cubic feet; while the profit, being earned on a much larger volume, was 24½d., or 7d. per 1000 cubic feet less than before.

The profit amounted to £16,400 on the average of the three years; and the repairs averaged £13,000—that was to say, the outlay appeared under the head of repairs, but it was really very largely for reconstruction and bringing things up to date. If he added to this a figure which they had applied in this way from another source, it came to £15,600 a year. While, therefore, they had been spending four times the amount on their works, they were getting an equal dividend out of a smaller profit per 1000 cubic feet, and a lower price for gas. Then a matter which should interest them very much indeed was the growth of development. The sale of gas in 1892 was 107 million cubic feet; whereas now it was 177 millions. In 1892, the public lighting amounted to 59½ per cent. of the whole (and the loss of this single contract would have meant the loss of 60 per cent. of the trade); the balance of 40½ per cent. being private lighting. Last year the figures were 59 per cent. for private lighting, and 41 per cent. for the public lighting. Mr. Burch, in his last report, stated that the private lighting was going on increasing at the rate of 16 per cent. at the present day. With reference to the public lamps, a self-intensified inverted lamp of the Graetzin type had been adopted; and the extension of present lanterns and "C" burners had been stopped. Certain streets had, with great success, been lit with three-light lamps of this type suspended in the centre of the road. At the last meeting, he expressed the opinion that the future development of public lighting ought to be in the direction of the inverted burner, which threw its light downwards, and not the perpendicular one, which threw its light to the sky. He trusted their representatives would take care to keep Bombay as it had some years ago been said to be by an Australian engineer—"the best lighted city he had seen" either in Asia or Europe. There was a large business being done in piping and fitting for private lighting. They had just had their Assistant-Engineer, Mr. Lane, over here; and he assured them that they really could not get on fast enough with this work. He suggested facilities in the way of motor-cars for getting the men about quickly; and this was having consideration. In fact, the natives were learning to use gas in an up-to-date manner, as demonstrated in the show-rooms of English companies, which the Bombay Gas Company had copied. They had moved their offices to one of the chief positions in the city, and had show-rooms where the public could see how to utilize gas in every way to the best purpose. This was a policy which was bringing "grist to the mill" of all the English companies; and it had proved to be as successful in Bombay as in London, Eastbourne, and Wandsworth. These were very inspiring facts. They gave him an amount of satisfaction which militated against putting into operation an intention he had formed a year or two ago of retiring from the Board, and surrendering his place to someone younger and better able to fill it. Another matter he must mention was that the Board had as far as possible recognized the good work of the staff and employees. They had spent a large sum of money in improving the housing accommodation in connection with the works. There had been a good deal of sickness; and the Board had given assistance to the sufferers and their families. They had also increased the salaries of the officers. The cost of living, &c., had gone up immensely in Bombay. The Company were benefiting from a great boom in business, which was also at the same time tending to make the city an expensive place for the staff to reside in. Unless they paid attention to the comfort and health of the staff, they could not hope to secure the best exertions from them. They were getting this; and the officials were entitled to the highest praise that could be given them. He was therefore sure the shareholders would approve of the course the Board had taken. As he had said, the Company had reduced the price of gas; and they believed that this course would almost inevitably lead to an improvement in the dividend, if all went well, though he did not like to make any definite promise on this head. There was one little matter which the Board wished put in order. Until a question arose, the Directors' income-tax on their fees had always been paid for them. The former Secretary, Mr. Perrins, said he distinctly recollected a resolution to the effect that this should be done; but the resolution could not be found. For some little time, the Directors had paid their own tax; but they now asked the shareholders to re-affirm the former position. He concluded by moving the adoption of the report and accounts, and that a dividend be paid of 4 per cent., free of income-tax, making 7 per cent. for the year.

The DEPUTY-CHAIRMAN (Mr. W. G. Bradshaw) seconded the resolution.

Mr. CUFF congratulated the Board on the excellent report, and asked what was the price of gas.

The CHAIRMAN replied that the charge to ordinary consumers was as nearly as possible 6s. per 1000 cubic feet now.

Mr. H. R. SIBSON also expressed satisfaction at the condition of affairs. There was, he said, no doubt that the prosperity of India at the present time was superior to what it was some years ago; and the Company would have their share of this prosperity. Perhaps the Board might consider it desirable to describe the "Reserve Fund" as the "Reserve Account." Undoubtedly the money was better invested in the business than in Consols, or securities of that kind.

Mr. CLARK congratulated the Board on the accounts, and suggested that, having regard to the temperature of Bombay, the reduction in the quantity of tar in store was eminently satisfactory, because the tar became liquefied, and there was bound to be a considerable loss, even with the best barrels. He noticed an item of £6000 temporary loan, and thought the capital available from the partly-paid shares should be called up. The capital would still, he urged, be very low, having regard to the large sums of money spent out of undivided profits.

Mr. A. W. OKE felt sure many shareholders would like to see a portion of the reserve fund invested in gilt-edged securities.

The CHAIRMAN replied that they could not afford the luxury of investing money in Consols and getting 3 per cent., when they could put it in the business and make it earn, as working capital, a very much larger return. Nor could they afford to call up further capital on which they would have to pay 7 per cent., while their bank would oblige them with loans at a much smaller rate of interest. He could not agree that the capital of the Company was so very moderate. Some of the Directors were connected with undertakings where the capital was in a much more satisfactory ratio to the business than in the case of the Bombay Company. The amount, apart from working

capital, actually expended on plant, mains, machinery, and buildings, was now in excess, to a small degree, of the amount of capital called up; and for working purposes they were obliged to have money which they thought it best to secure in the shape of advances when required. Perhaps for only half the year they would be paying this $3\frac{1}{2}$ per cent. interest on loan—or $1\frac{1}{2}$ per cent. a year—whereas when all the capital was called up, they must pay interest, whether it was in use or not.

A SHAREHOLDER: Is electricity likely to be a severe competitor in the near future?

The CHAIRMAN said that undoubtedly electricity was a competitor for what he called the more luxurious sort of lighting—theatres, big restaurants, &c.. He was afraid that, no matter how cheaply gas was sold, they would always have electricity with them. Fortunately, the rate of growth of the gas supply in Bombay had almost always been so satisfactory that they were losing nothing whatever to the enemy. In fact, he did not know whether "enemy" was the right word to use, because electricity had led people to demand more illumination, especially in open spaces, than they required before. Thus he had often found it had had the effect of increasing the demand for gas light.

The resolution was then put and carried unanimously.

On the proposition of Mr. S. SPENCER, seconded by Mr. OKE, it was agreed that the remuneration of the Directors and Auditors should be paid free of income-tax—this to apply to past as well as to future years.

The retiring Directors (Mr. H. E. Jones and Mr. Louis Penny) were then re-appointed, on the motion of Mr. BRADSHAW, seconded by Field-Marshal Sir EVELYN WOOD; and the Auditors (Mr. S. Gore Browne and Mr. J. Hill Perrins), on the proposition of Mr. CUFF, seconded by Mr. SIBSON.

Mr. F. R. SMITH proposed a hearty vote of thanks to the Chairman, Directors, and staff.

Mr. OKE seconded this; and it was cordially passed.

The CHAIRMAN, in acknowledgment, said the staff had had a very uphill time of it; but everything was now in order, and the necessity for the Secretary to make a biennial visit no longer existed, as it did before. He was certain no company ever had a more capable and devoted servant than Mr. Burch. He was realizing results in carbonizing, keeping everything up to the mark, and getting new consumers, in a way that proved the Board did most wisely in choosing him for the post.

WELSBACH INCANDESCENT GASLIGHT COMPANY.

The Mantle and Metallic Filament Lamp Businesses.

Although the proceedings were of a protracted character at the ordinary general meeting of the Welsbach Company last Tuesday, there is not a great deal referring to commercial matters (with which we are only concerned) calling for note. Lord Weardale presided; and he divided the business before the meeting into two parts—taking first of all the report and accounts, including the Austrian position, and secondly the reorganization proposals. In his remarks, he said the figures before the shareholders showed, for the first time since the reorganization of the Company in 1903 (although before that period similar instances had occurred), a loss on the English business—a loss which was due, he regretted to state, partly to decreased and less remunerative trade, and partly to increased expenses. The hopes the Directors entertained a year ago that the general trade depression might disappear had unfortunately not been realized, more particularly with regard to the mantle trade, while the fears they had as to increased competition had been more than realized. He thought it right to give a hint last year to the effect that the Board had their eye on the electrical business, but that nothing satisfactory had then been put before them. In August of last year, they had the opportunity they had waited for, and worked for; and it was now a matter of history that the Company's metallic filament lamp was put on the market in September, and was most favourably received by every one other than their various lighting competitors. It was also a matter of history that they were attacked by the existing sellers of electric lamps, who carried the Company into a police court, on the ground that the Company were not entitled to their own name and trade mark on their electric lamps. This represented a considerable waste of money and valuable time in the midst of the season. While the Directors did not pretend to be unduly optimistic with regard to the future of the electric lamp, nor would he attempt to predict what that future would be, they were satisfied that they made a wise move in entering into the electric business. In the opinion of the Board, there was ground for hope that some of the lost profit in the mantle trade might be recouped. During the past season, they could not get delivery of electric lamps in sufficient quantity; but the Board believed that the arrangements made in regard to the future would prove satisfactory. They had no intention of being kept out of the electric market by futile litigation. With their perfect trading organization, there was a large business to be done; and they meant to have their full share of it, whatever it was worth. Meantime, the Company had been committed to no capital expenditure whatever in connection with the new business. The expense, however, had been considerable; and the whole cost of the special propaganda had been borne by the year under review. Respecting the mantle business, he observed that the market was there, and could be held if the Company were prepared to do the business at the price.

Concerning the accounts, he said the net result of the trading was a loss of £6000 on the English business. The difference between last year and the previous one was due largely to special reasons. There was a decline of 10 per cent. in the number of mantles sold; this being largely owing to the fact that they had not seen their way to accept many large orders which, on the face of them, would have shown a working loss to the Company, and no adequate profit on the other goods in which the Company dealt. But these orders for mantles had been snapped up by their competitors, with the object of keeping their factories running full time. They had also foreign competition to contend with. But subject always to prime quality, it must not be concluded that their competitors could manufacture or buy more cheaply than the Company. They dared not, however, reduce in anyway the well-known Welsbach

quality; and, as the shareholders would understand, the Directors had to deal with the position as they found it from day to day. The dividend declared by the Austrian Company had again been 20 per cent.; so that the Company received cash and credit in the current year upon their holding in the Austrian Company to the amount of £24,600.

The motion for the adoption of the report and accounts having been seconded by Mr. W. W. Wright, there was considerable discussion, in the course of which certain shareholders appeared to think that the management and the business methods of the Company were largely to blame for the loss of business; and that the Welsbach Company ought to have no difficulty in beating their competitors out of the field by supplying the class of mantles that the existence of these competitors showed the public required. In the course of his reply upon the discussion, the Chairman mentioned that the Company have now to face in their mantle-business a class of electrical competition that was unknown when the Company were originally formed. It was also pointed out by the Managing-Director (Mr. L'ce Fletcher) that the Company had always endeavoured to treat retailers in a generous manner, and at present were allowing cash discount up to three months. The pushing of German and other mantles by the retail trade was at the present time receiving the closest attention from the Board.

The scheme of reorganization of the capital (*ante*, p. 386) was next placed before the shareholders by the Chairman, who moved a resolution approving it. In the course of his remarks, he said it would be within the recollection of the shareholders that, when the last reorganization of capital was effected, the primary object was to enable the Company to divide profits. That was seven years ago; and profits had been received and divided. In 1903-4 assets were handed over to the new Board, the net balance-sheet valuation of which was round about £450,000. Since then the preference shareholders had received nearly £220,000, and the ordinary shareholders £157,000—or about £377,000, of which a material portion had been subscribed by the Austrian Company, while the balance-sheet value of the assets to-day showed that they had not been wasted in any way. The object of the last reorganization had thus been successfully accomplished. Since then they had gradually passed step by step to a period of the severest competition, which extended now to practically every article they sold. Based upon the present outlook, there was little prospect of the Company being able to pay a dividend of 6 per cent.—amounting to £36,000—on the present preference capital, while the ordinary shareholders had no present hope of any kind either as to capital or dividend. There had been some question of postponing the scheme; but one among other reasons that led the Board to disagree with such a course was that the Managing-Director (Mr. Fletcher) had intimated to the Board that, unless the business was relieved of its present dead-weight of capital, he could not see his way to renew his agreement with the Company, which would expire at the end of next season. There was an animated discussion; and a proposal was put forward that the consideration of the scheme should stand adjourned to Feb. 10 next year. Incidentally, it was gathered that the proxies held by the Board were nearly double those in favour of the amendment. It having been elicited that Mr. Fletcher was willing, if the proposal as to adjournment was favoured, to remain in office in the meantime, so long as it was clearly understood that the responsibility for the step taken was upon the shareholders and not upon himself, it was agreed to defer the consideration of the matter to the date named.

SEQUEL TO THE BERMONDSEY EXPLOSION.

At the Meeting of the London County Council last Tuesday, the Main Drainage Committee reported that, as a result of a serious gas explosion which occurred in Grange Road, Bermondsey, on Dec. 30, 1908, several actions for damage and personal injury were commenced against the Council, the Metropolitan Water Board, and the South Metropolitan Gas Company, including one by the Bermondsey Metropolitan Borough Council for reinstatement of the roadway, &c. It was very difficult to decide as to the party responsible for the explosion; and as it was considered undesirable to expend public money in obtaining a decision of the Courts in the matter, the Council decided to enter into an agreement with the Water Board and the Gas Company by which the cost of settling the several claims and actions was to be divided among the three contracting parties in an agreed proportion, and each party released the other from all claims which they might have against each other arising out of the explosion. An account had been received from the Bermondsey Borough Council in respect of the reinstatement of the roadway, &c.; and the amount chargeable in connection with the repair of the tramway track was £528 15s. 9d. Under the terms of the agreement, this sum was payable by the Council; and the Highways Committee were of opinion that the cost should be charged to the main drainage account. The reporting Committee concurred in this view; and, as there was provision for the expenditure in the maintenance vote for 1909-10, they recommended that expenditure not exceeding the sum named be sanctioned for repairs to the tramway track. This was agreed to without discussion.

The Smoke Nuisance.—At the annual meeting of the Coal Smoke Abatement Society on the 4th inst., the Chairman (Sir W. B. Richmond), in moving the adoption of the report, said that during the ten years the Society had been in existence it had made rapid progress in London and many provincial towns. The London County Council were alert and the Borough Councils were beginning to view the smoke nuisance as an unnecessary evil. In consequence of this change of opinion, fogs caused through smoke were becoming more rare. Municipalities in all parts of the kingdom were awakening to the necessity of coping with the smoke evil; and the Committee were constantly asked for the advice and assistance which the experience of the Society enabled it to afford. The London County Council were trying to get the word "black" deleted from the Public Health Act of 1891, because some Magistrates had held that they could not convict of a nuisance unless they were satisfied that, in a literal and technical sense, black smoke was emitted.

BIRMINGHAM CORPORATION GAS DEPARTMENT.

New Secretary and Manager—Annual Accounts.

In the report which the Gas Committee of the Birmingham Corporation will present at a special meeting of the City Council to be held next Tuesday, reference is made to the appointment of a Secretary and Manager of the Gas Department, in succession to the late Mr. G. Hampton Barber. The Committee state that the vacancy was not advertised; but its existence was widely known throughout the gas industry, as well as locally, with the result that upwards of thirty applications were received. Many of the applicants were interviewed by the Sub-Committee appointed to deal with the matter; and the Committee unanimously recommend the Council to appoint Mr. R. S. Hilton to the position, at a salary of £1500 per annum [not £1000, as stated in the "JOURNAL" last week], rising to £1600 on the completion of twelve months' service. Mr. Hilton is thirty-nine years of age, and is at present General Manager of the Clay Cross Company's Collieries, near Chesterfield. The Committee are confident that, in addition to his intimate knowledge of the coal trade—having been responsible for dealing with the entire output from collieries employing more than 3000 workpeople, as well as the production of coke and residuals from their coke-ovens and recovery plants—Mr. Hilton possesses the highest credentials, and the necessary experience in the organization and control of a large department such as the gas undertaking; and that he will prove a valuable and capable officer of the Corporation.

Accompanying the report are the accounts of the Gas Department for the year ended the 31st of March last. They show that a sum of £48,278 was spent on capital account (£24,929 of it being for extension of buildings, £5143 for new mains, and £17,402 for new meters not in place of old ones); bringing up the total expenditure to £2,524,602. Deducting the value of buildings and plant abandoned, £63,636, a sum of £2,460,966 is produced, which is £447,983 less than the total receipts (£2,908,949). The receipts from the sale of gas amounted to £702,873, compared with £698,712 in the preceding year; while residual products realized £231,445, against £228,082. The total receipts were £947,459, compared with £935,636. On the other side of the revenue account, under manufacture, coal (including oil, carriage, unloading, and all other expenses of depositing same on the works) cost £372,759, against £369,642 in the preceding year; purifying materials and wages, £8199, against £6824; wages at works, £76,888, against £78,253; and repairs, maintenance, and renewal of works, plant, retorts, machines, apparatus, and tools (less old materials sold), £147,415, against £157,091. The total cost of distribution was £63,505, compared with £57,734; and the remaining items brought the expenditure up to £750,525, against £745,335 in 1908-9. There is thus on the present occasion a balance of £189,934 to be carried to the profit and loss account, compared with £190,301 in the previous year. After meeting interest and other charges, there is a net balance of £72,491, which compares with £71,459 last year.

The quantity of coal carbonized in the past twelve months was 568,733 tons, and of gas oil used 2,933,035 gallons. The gas sold and used on the works amounted to 7,205,806,700 cubic feet. The average net price of gas was 1s. 11½d. per 1000 cubic feet, compared with 2s. 0½d. Coke and breeze realized £139,210; tar, £38,734; ammoniacal liquor, £53,394. The estimated quantities made were: Coke, 309,018 tons; breeze, 65,236 tons; tar, 6,756,143 gallons; ammoniacal liquor, 23,654,698 gallons. Of coke, 224,027 tons were sold, and 82,086 tons used.

The following are some statistics of the gas undertaking for the years ended March 31, 1909 and 1910:—

| | 1909. | 1910. | Increase. | Decrease. |
|---|---------------|---------------|-------------------------------|-----------|
| Gas sold (cubic feet) | 6,977,793,200 | 7,205,806,700 | 228,013,500 = 3'27 per ct. | — |
| New services laid. | 8,117 | 7,937 | — | 180 |
| Cooking and heating stoves sold | 643 | 572 | — | 71 |
| Number of cookers supplied to prepay- ment consumers at March 31 | 48,444 | 56,046 | 7,602 | — |
| Number of cooking and heating stoves on hire, do. | 7,351 | 9,724 | 2,373 | — |
| Number of prepay- ment meters fixed, do. | 62,431 | 69,028 | 6,597 | — |
| Coke, breeze, and coke dust in stock, do. (tons) | 6,417 | 8,301 | 1,884 | — |

The contributions of the Gas Department for public purposes during the year were—

| | |
|--|---------|
| In aid of the improvement rate | £72,492 |
| Interest on reserve fund | 4,000 |
| In aid of public lighting within the city | 9,159 |
| In aid of court lighting within the city | 2,069 |
| In aid of public and court lighting outside the city | 4,304 |
| | £92,024 |

Exhibitions of Gas Appliances.—Under the auspices of the Alton Gas Company, an exhibition of gas appliances for cooking, heating, and hot-water supply, manufactured by the Parkinson Stove Company, Limited, of London and Birmingham, was held in the Assembly Rooms in the above-named town from the 3rd to the 6th inst. Cookery lectures were delivered twice daily by Mrs. C. F. Pitcher. A similar exhibition has lately been held by them, under the auspices of the Gas Company, in the Floral Hall, Ashby-de-la-Zouch. It was carried out under the superintendence of Mr. G. H. Matlock, the Company's Manager, was largely attended, and was in every way successful.

BURTON-ON-TRENT GAS UNDERTAKING.

The Annual Accounts.

At the Meeting of the Burton-on-Trent Town Council last Wednesday, the accounts of the gas and electricity undertakings of the Corporation for the year ended the 31st of March were presented. The following particulars relate to the first-named undertaking.

The amount received for gas sold for public and private lighting was £42,793; meter and stove rents produced £1048; residuals, £12,990; and fittings, interest, &c., made up a total revenue of £58,218, compared with £57,183 for the preceding year. On the expenditure side of the revenue account, coal and benzol cost £18,618; stokers' wages, &c., £5082; maintenance and repair of works, £3265; interest, repayment of loans, and contributions to the redemption and sinking funds absorbed £6993; and other items made up a total of £45,825, against £48,450 before. The surplus, which is £12,393, or £3660 in excess of that for the year 1908-9, has been disposed of as follows: New prepayment meters, £612; replacement of retorts in No. 5 house, and new subway, £2512; new prepayment stoves, £154; governors and tar-towers, £66—total, £3344—general district rate, £7000; reserve fund, £2049. The quantity of gas made was 357,884,000 cubic feet, of which 330,787,400 cubic feet were sold and 3,223,800 cubic feet used on the works, &c.; leaving 23,872,800 cubic feet unaccounted for, or 6·67 per cent. of the make. The coal carbonized was 33,479 tons; the make of gas per ton being at the rate of 10,690 cubic feet, of which 9880 cubic feet were sold. The coke sold was 13,236 tons; tar, 401,912 gallons; and ammoniacal liquor, 650 tons—being at the rates respectively of 7·8 cwt., 12 gallons, and 42 lbs. per ton of coal. The number of consumers at the close of the year was 10,342; being 4834 ordinary and 5508 prepayment.

Alderman LOWE, in moving the adoption of the Committee's report, referred to the fact that the Burton Brewery Company some time ago made experiments with regard to the use of ordinary coke and coke breeze for their firing; and he learnt that the experiments proved a great success. The firm had been offenders as regards the smoke nuisance; and with the view of trying to abate it, these experiments were made. The result was that they found they had been able to fire their boilers and their coppers thoroughly satisfactorily, quite as cheaply, and at the same time had succeeded in practically doing away entirely with the smoke nuisance which they had been permitting in the past. The Brewery Company had entered into a contract for the purchase of a considerable amount of coke from them; and this showed their confidence in the advantage to be obtained by the use of coke. He mentioned the matter with the view of bringing it to the notice of other large firms in the town who might make similar experiments. This would, he believed, be an advantage to them, an advantage to the people living in the district, and an advantage to the town as a whole, as it would mean the sale of more of their coke in Burton. With regard to the accounts, during the sixteen years he had been on the Council he had heard nothing like so satisfactory a report on the finances of the Committee as the one he was presenting that day. He would go further than this, and say there had never been a report so pleasing since the Corporation had owned the works—for, after all, they were in the position that they had a larger surplus at their disposal this year than ever before, and in face of the fact that they had sold gas at a cheaper rate than ever before. After the whole of the working expenses and debt charges had been paid, they had a handsome surplus of nearly £12,400. He was glad to say that, though he felt it his duty to offer a protest a month or two back, they were able to provide £7000 towards the rates. And they were able to do a little more—viz., to put a considerable sum towards the cost of the extension of the works which they had in hand at the present time. This had been brought about, not entirely from the good management, but largely owing to the fact that the consumers had for a good many years been paying a fair price for their gas; and he hoped (he was not going to pledge himself or the Committee) that after the coal contracts had been placed, they would come to the Council and offer another concession to the consumers. During the year they had paid debt charges amounting to something like £7000; whereas only a few years ago it was as much as £10,000. They would observe also from the report that, though the consumption had been a little down on the ordinary meters, they had a very considerable increase in the sales to prepayment consumers. This was mainly brought about by the policy of providing stoves for these consumers free; and the Committee proposed to develop this policy, and hoped to meet with the same satisfactory results—a continued increase in their sales. With regard to the reserve fund account, they had decided to merge the deterioration fund and the reserve fund into one, and call it the renewal fund. At the present time, this stood at something like £26,000; but they had had heavy liabilities, and had entered into considerable contracts for the reconstruction of their works. When these contracts were completed and paid for, they believed they would have about £10,000 left in the reserve fund.

Alderman THOMPSON congratulated the Committee on their successful financial position. With regard to the Chairman's statement on the use of coke and breeze, he would like to recall the fact that some years ago, during the arsenic scare, it was found that the Corporation coke was so heavily impregnated with arsenic that its use was discontinued by the firms in the town. If the Chairman could assure them that it was now without arsenic, no doubt it would be used again.

Mr. HUTCHINSON joined in the congratulation, saying that, though wont to criticize the price of gas, he had never found fault with the management. He was glad to hear the assurance regarding the reduction in the price; for by the good luck of a new invention the electric light consumers were having a great reduction in their bills, and they ought to give gas consumers the benefit of possible concessions.

Mr. KING emphasized the value of the Burton Brewery Company's testimonial to the coke and breeze, saying that their thanks were due to them for the excellent service rendered by proving to manufacturers that its use was worth trial. No doubt it would be more economical to the purchaser and better for the finances of the town; and so far as the health of the town was concerned, it would be quite a step in the right

direction. Burton's death-rate stood very low; and if they could do away with the large volumes of smoke it would be lower still.

Alderman ROWLAND also congratulated Alderman Lowe upon the Committee's position, saying that they were beginning to reap the benefit of the policy of the last nine years. When Alderman Lowe took up the duties of Chairman, the position was not satisfactory; but the Committee adopted a businesslike attitude, and looked well ahead, with the result that to-day they could congratulate them upon having dealt with the renewal of plant. The time was now come when the ratepayers could look forward to the realization of what the Chairman had foreshadowed as to a reduction in price. He considered the report was extremely interesting. With regard to the works loans, their net debt was £36,000, against which they had in the reserve fund £34,000, so that the undertaking was almost out of debt.

Mr. WARDLE said that, while he was a member of the Committee, he would oppose any further grant to the relief of the rates above £7000. The latter was 3½ per cent. on the value of the undertaking, and was quite enough. He hoped the Chairman of the Committee would strongly oppose any further grant, as the consumers ought to be considered next. The staff deserved a great deal of praise.

Mr. AUSTIN pointed out that 6.67 per cent. of the gas was unaccounted for—an increase of 1 per cent. over the previous year.

Alderman LOWE, replying, said that theoretically there ought to be no waste of gas, but practically there was. In 89 towns, the average unaccounted-for was 5.9 per cent. All the gas made passed through the station meter; and it was easy to have a slight difference, when compared with all the meters in the town. Their meter was not nearly large enough for the work; and shortly the Committee would bring forward a proposal for a new meter-house and governors. With regard to Alderman Thompson's query, the coke and breeze was not used for making purposes. Whether their coke was more free from arsenic than other people's, he could not say; but he had an idea it was. At any rate, they were doing what they could to meet the difficulty. The matter mentioned by Alderman Lathbury should have further consideration. He could also assure Mr. Hutchinson that when he said "the near future" he meant it. They entered on their new coal contract in June; and the matter would then come up for consideration. He entirely agreed with Mr. Wardle that £7000 was enough to give to the rates. Gas consumers now paid 5d. per 1000 cubic feet towards the rates; and it was as much as ought to be paid.

The report was then adopted.

GAS COMPANIES (STANDARD BURNER) BILLS.

Continued Opposition by the Exeter City Council.

The question of continuing the opposition to the Gas Companies (Standard Burner) Bill No. 3 was discussed at some length at the meeting of the Exeter City Council last Wednesday.

The Parliamentary Committee reported that the Bill came before a Committee of the House of Lords on the 7th of April, and its consideration, with the other two Bills with which it was associated, occupied three days. The Town Clerk (Mr. H. Lloyd Parry) had attended a meeting of the local authorities concerned in opposing the Bills to receive a report on the proceedings, and to consider future action; and a resolution was adopted that the conference considered that the opposition should be continued to the Bills in the Committee of the House of Commons. The Parliamentary Committee recommended that the Council's opposition should be continued.

Approval of the recommendation having been moved, Mr. Lucas said he thought the Council should proceed no further in the matter; remarking that they had already thrown away £100, and did not know how much more it would cost if they continued their opposition. He moved, as an amendment, that this paragraph in the minutes should be deleted. Mr. Depree seconded the amendment. He said when the question of joining the opposition to the Bill was discussed, he was told that the probable cost would be £10 or £12. He then pointed out that the Council were not likely to gain very much by opposition, while other councils had decided that it was not worth while to oppose the Gas Company, who were not bringing forward the Bill, as some people asserted, for the purpose of robbing the public. The Council had had the guidance of other municipalities in the matter. He maintained that the money already spent had been absolutely lost. Mr. Glanfield supported the amendment, and said that nearly all the corporate bodies who owned gas-works had taken the lead in trying to get what the Bill provided for. It was not likely that the Exeter Gas Company, who had the competition of the electric light to consider, would do anything to upset their customers, the consumers of gas. Mr. McGahey said it was proved before the Committee of the House of Lords that the new standard burner would succeed in allowing companies to supply gas of a much cheaper quality. The Bill was an important one for the city; and if the Council did have to pay £150 in opposing it, the consumers would soon make up the money. Mr. Ross said he could not agree that the efforts of the Council had been wasted. It was true that the cost had been more than they anticipated; yet it was a very important matter, as it was more than ever probable that they would find it necessary to adopt gas as an illuminant to a very much greater extent than at present. It was apparent that a very much lower standard of gas was intended, both in connection with lighting and heating. The Town Clerk said the Council were striving not so much to oppose the Bill as a whole as to secure protective clauses, in order that they might be in a position similar to that at present occupied should the standard burner be introduced.

After some further remarks, the amendment was defeated by 24 votes to 10, and the recommendation of the Committee was adopted.

The estimates of the Bury and District Joint Water Board for the year ended the 31st of March next were submitted at the last monthly meeting of the Board; and it was stated that the deficiency in the period named might be £14,081.

GAS-METER TESTING IN MANCHESTER.

Further Particulars of the Index Test.

The Official Inspector of Gas-Meters in Manchester (Mr. S. Dyson) has lately presented to the City Justices his seventeenth annual report, dealing with the work done in the year ending the 31st of March last. It furnishes the following particulars.

The number of meters tested was 41,997; showing an increase of 3438 compared with the previous year. The fees received amounted to £1670; being an increase of £134. The amount expended on equipment for the year was £51; and this, together with the ordinary expenditure of £2033, makes a total of £2084. There were 1786 meters rejected, or 4.25 per cent. Of the total wet meters tested—viz., 9278—253, or 2.71 per cent., were rejected; and of 32,719 dry meters tested, 1533, or 4.68 per cent., were rejected. The number of meters rejected increased from 509 to 1786, compared with the previous year, or from 3.30 to 4.25 per cent. This was owing to a number of old meters being tested which had been in use for a good many years.

For the last eight years, the "index test" has been applied, with satisfactory results, to all meters belonging to the Corporation. There are no statutory powers for this test; and it was on the recommendation of the Justices' Testing Committee that it was instituted—the Manchester Corporation consenting to pay an additional fee so that all their meters should have the indices tested, for the protection of the gas consumers. Several gas companies and corporations also send meters to be tested; stipulating that the "index test" shall be applied. During the past year, 13,304 dry-meter and 5266 wet-meter indices were tested, and 56 of them were rejected as incorrect, from the causes shown in the following table:—

| | |
|--|----|
| Upright shaft out of action with drum-shaft | 9 |
| Incorrect number of teeth in index-wheels | 5 |
| Defective front plates and inaccurate maring | 21 |
| Damaged fittings and wheels | 5 |
| Index wheels out of action | 9 |
| Incorrect gearing | 2 |
| Indices transposed | 5 |

The most serious cases of error were found in five meters, particulars of which are appended. The first three had been repaired by the manufacturers, and before being put into use again were submitted for testing; while the other two—viz., the 10 and 50 light meters—were both owned by the consumers, and had been in use on their premises.

| | |
|--|--|
| 5-light, registering 100 per cent. fast. | |
| 3 " " 50 " slow. | |
| 5 " " 25 " fast. | |
| 10 " " 150 " " | |
| 50 " " 150 " " | |

Mr. Dyson says it is important to mention that all the above meters were found correct when tested by the dial, which is in accordance with the provisions of the Sale of Gas Act, 1859, and the only test in general use throughout the country, except in Manchester and Liverpool. He points out that no general charge of carelessness can be attributed to an inspector for stamping such meters under the limited test of the measuring chambers. The defect is attributed rather to the state of the law, and the absence of compulsory powers as to the full testing of the indices or registering apparatus as well as the measuring chambers of gas-meters.

The Manchester Corporation during the past year submitted for testing 1449 meters which had been in use for 10 years and upwards, nearly all of them being owned by the consumers; and 356 of the number were found correct and 1093, or 75.4 per cent., incorrect.

Reference was made in last year's report to the testing of gas-meters for internal soundness, and to an arrangement which the Official Inspector had installed so that this and registration testing could be carried out simultaneously. Mr. Dyson says that the new system has worked very satisfactorily, and is a great saving of time as compared with the old system of using the standard holders for both tests. The chief cause of objection to this testing of gas-meters is stated by him to be the length of time occupied in carrying out the work efficiently; and some of the inspectors advocate its abolition as regards new meters. Objections will, however, he thinks, be overcome by the adoption of the improved system. To gas manufacturers, the internal soundness test of meters is of much importance; and Mr. Dyson points out that the subject has recently been dealt with in the Presidential Addresses of Mr. Kendrick and Mr. Ellery, showing the necessity of this test from the gas sellers' point of view.

Mr. A. P. Trotter, the Electrical Adviser to the Board of Trade, and Mr. S. L. Pierce, the Electrical Engineer to the Manchester Corporation, visited the office early in the year, to make inquiries regarding the testing of gas-meters under the provisions of the Sale of Gas Act, with a view to framing rules for the compulsory testing of electricity meters. Mr. Dyson is of opinion that the present system, under which the producers of electricity for sale test their own meters, is not a desirable one, but that this duty should in all cases be undertaken by an independent authority, as is already the case in the County of London and the City of Liverpool.

In July last, an Engineer of the Birmingham Corporation visited the office for the purpose of inspecting the method of index-testing; and he was so satisfied with its efficiency that he has decided to recommend its adoption in Birmingham. The Manchester and District Junior Gas Association also visited the office on the 6th of November last. The members present (numbering about 70) were much interested in the equipment and testing arrangements, and were of opinion that the "index test" should be made compulsory.

Appended to the report are photographs of the various working departments, together with the usual tabulated statistics.

The profits of the gas undertaking of the St. Helen's Corporation for the past financial year amounted to £9300; and the Gas Committee have decided to devote £5000 to the relief of the rates.

MUNICIPAL AND HEALTH EXHIBITION.

There was very little to notice, so far as readers of the "JOURNAL" are concerned, at the Second Municipal and Health Exhibition, which was held at the Royal Agricultural Hall, Islington, last week. The most important stand was that of Moffat's Limited, at which there was an excellent show of upright and inverted incandescent burners and Lucas lamps specially adapted for public lighting. Adjoining their stand was one at which Messrs. S. Cutler and Sons exhibited a number of photographs of the works carried out by them, with lists of their gasholders and water-gas plants, and where could be seen in action the "Automaton" lamp-lighter, which was fully described and illustrated in the "JOURNAL" for the 3rd inst. At a small stand not far from those just referred to visitors could see the Praed patent safety gas-producing plant, which is said to be suitable for the supply of gas to buildings beyond the reach of ordinary gas-works. The gas is produced from petroleum vapour and air; and it can be used for lighting, heating, and cooking.

The various forms of road making were features of the exhibition; and in this connection mention may be made of the "Rapid" tar-spraying machine, of 320 gallons capacity, shown by the Phoenix Engineering Company, Limited, of Chard. It was fitted with a patent pump, worked by gearing on the side of the machine, for spraying, and had attached to it 20 feet of armoured hose and a spray-pipe and nozzle. It was mounted on four wheels and provided with horse shafts. A hoist was shown for lifting barrels full of tar on to the machine for filling.

Messrs. W. Weeks and Sons, Limited, of Maidstone, had on view a small hand-spraying machine, and a new horse-drawn automatic pressure tar-spraying machine; the chief advantage claimed for the latter being that it can be set to spray tar on the road surface at any desired rate, and will do it uniformly, irrespective of the speed at which it is drawn. Messrs. Henry Balfour and Co., Limited, of Leven, Fife, showed a reversible mixer, which could be used either as a concrete mixer or as a tar-macadam machine. The firm state that they have had it under test for both purposes, and that in each case it suited the work admirably.

GAS-PRODUCER POWER PLANTS IN AMERICA.

According to a report by the United States Geological Survey, more than 500 gas-producer power plants, ranging in size from 15 to 6000 H.P., are in operation in the United States. About 88 per cent. of these plants are running on anthracite coal, a few on anthracite or coke, and the remainder on bituminous coal and lignite.

In a bulletin on the recent development of gas-producer power plants

in the United States just issued by the Survey, Mr. R. H. Fernald states that the internal-combustion engine has already become a serious rival of the steam-engine in many of its applications, and that the development of the large gas-engine within the last few years has been extremely rapid. Only nine years ago, a 600 H.P. engine exhibited at the Paris Exhibition was regarded as a wonder; but to-day four-cycle twin tandem double-acting engines of 2000 to 3500 H.P. can be found in nearly all well-equipped steel plants, and some contain several units rated at 5400 H.P. each.

This rapid advancement of the large gas-engine was made possible by improvements in the manufacture of cheap gas directly from fuel by means of the producer. A few scattered plants were installed for power production in the United States before 1900; but the application of engines of this type to the production of power in any general sense has been developed since that date. During the first few years of this period of development, anthracite coal, coke, and charcoal were used almost exclusively. It remained for the Survey, in its testing plants at St. Louis and Norfolk, to demonstrate the possibility of using in such plants practically all grades of fuel of any commercial value, without reference to the sulphur or tarry matter they contain.

The tests made by the Survey—168 in all—included 138 on bituminous coals, 9 on sub-bituminous coals, 10 on lignite, and 11 on miscellaneous fuel. The average consumption of fuel for a brake-horse-power-hour was 1.36 lbs. of bituminous coal, or 1.99 lbs. of lignitic coal; the minimum consumption being 0.84 lb. and 1.48 lbs. respectively. Comparative tests of 75 bituminous coals under a water-tube boiler and in a gas-producer showed that the average fuel consumption per brake-horse-power in the steam plant was 2.7 times that in the producer plant. Several low-grade coals and lignites that were of little value, or even worthless under the steam-boiler, gave excellent results in the producer. Other low-grade fuels—such as roof slabs, culm, and washery refuse, and even a bone coal that contained 44 per cent. of ash—have been used to advantage in the producer under proper commercial conditions.

Professor Fernald solicited the views of the principal manufacturers of gas-producers on the present status of these plants as sources of power, with particular reference to the special conditions that oppose or make for their introduction. In addition, he or his assistant personally visited 63 different plants that furnish power for a great variety of purposes, to determine their economy and reliability under average conditions. After this inspection, Professor Fernald decided: (1) That the plants as a whole are giving remarkable satisfaction in view of the brief period of development. (2) That the most serious difficulty seems to arise from lack of competent operators to run the plants, though there are many more competent operators to-day than there were three years ago. (3) That the situation regarding misrepresentations and misunderstandings resulting from incompetent salesmen has with the stronger companies greatly improved. (4) That the situation regarding trouble due to manufacturers neglecting plants that have been installed and paid for has changed decidedly for the better within the last few years.

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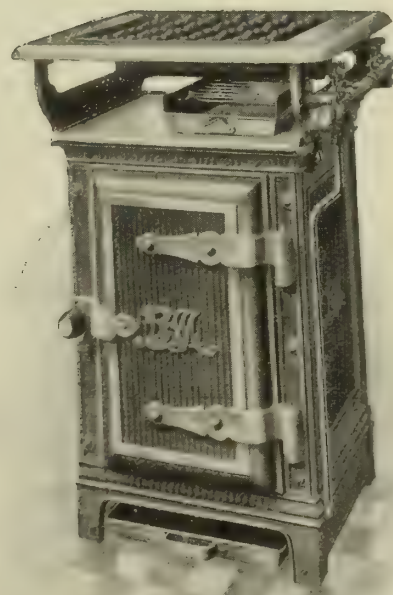
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METROPOLITAN WATER BOARD.

Estimates for the Year 1910-11—Large Deficits.

At the Meeting of the Metropolitan Water Board last Friday week, the estimates for the year 1910-11 were under consideration.

Mr. A. H. TOZER, in submitting the estimates, said that last year his predecessor, Lord Welby, stated that, so far as could be ascertained, the deficiency for the year ended March 31, 1909, would probably be £28,000. The final accounts showed the actual deficiency to be £25,280. The accounts for the year just closed (to March 31) were not completed; but he could say that the approximate result would be a deficiency of £61,084, compared with the estimated deficiency of £75,700, or an improvement of about £15,000. It was extremely satisfactory to note that while the estimated expenditure for the year was £2,963,560, the approximate actual expenditure was only £2,937,494; showing a saving of £26,000. On the other hand, the net income from water-rental was £2,759,370, compared with the estimate of £2,788,650—a decrease of £29,000. Other items of income, however, showed an increase of nearly £18,000; so that the actual falling off in income was only £11,000. Deducting this figure from the saving on expenditure (£26,000) would account for the net reduction of £15,000 in the estimated deficiency for the year. Turning to the estimates for 1910-11, the gross water-rental was estimated at £2,957,500, compared with £2,954,430 for last year. The comparison, however, would be better appreciated if based on the net rental. This was estimated for the current year at £2,788,500, compared with £2,759,370 for last year; showing an increase of £29,000. With regard to the Charges Act, criticism was sometimes made to the effect that the people of London were paying more for their water than they paid under the Companies' scales. It was quite true that, by the process of equalization, some consumers had had their rates increased; but the number who were asked to pay less, and also those whose rates had not been disturbed, far exceeded that of the consumers who were paying more than formerly. As a matter of fact, the number who had had to pay more was less than one-third of those who had either had their rate reduced or had had it left undisturbed. Taking the average over the whole of the Board's area, the income per supply, on the basis of the estimates now submitted, worked out at £2 10s. 5d.; whereas in the last year of the Companies' scale (1907-8), the average was £2 11s. 6d. From other calculations which had been made, it was clear that, instead of the Charges Act resulting in an increased income to the Board, they had really suffered loss by it. The causes appeared to be three—the increasing amount of allowances in respect of empty properties, depression in the building trade, and reduction resulting from the operation of the Charges Act. The decrease in the number of supplies laid on compared with four years ago was roughly between 6000 and 7000 per annum. His own view was that this could be largely accounted for by the change in the mode of London life. A considerable number of persons were taking up their residences outside the Board's area; and this change, he was inclined

to think, would be accentuated in the future. Consequently, the Board would have to look for a decreasing income on this account. During the past four years, they had suffered from the prevalence of empty properties. The allowance last year was £140,000; and in the current estimates £147,000 was submitted. The question was serious, and would have to be dealt with. Proposals would be submitted with a view to exercising still more effective control over this matter, which had so far-reaching an effect on the Board's income. To sum up the figures given, the estimates showed a total income of £2,897,460 and expenditure amounting to £2,977,402; leaving an estimated deficit of £79,942. Passing on to refer to the working of the Board during the period of its existence (6½ years), Mr. Tozer said that in the 3½ years to March, 1908, there was a net surplus of nearly £30,000. The year 1908-9 showed a realized deficiency of £25,000, the year 1909-10 an approximate deficiency of £61,000, and the year 1910-11 an estimated deficiency of £80,000; so that the net deficiency on the 6½ years' working was £136,000. In the same period, the contributions towards the redemption of debt amounted to no less than £208,000. Large sums had been charged to revenue which the Water Companies would have placed to capital—viz., proportion of salaries of engineers, £94,500; costs of Acts, £19,500; sundry items for works, £13,000, making a total of £127,000. Another abnormal payment was in respect of compensation—£170,000—making in all £505,000. In other words, the Board had to pay upwards of £500,000 which the Companies would not have been called upon to defray. Was it not fair, therefore, to say that, had the Board been in the same position as the Companies, they would have shown a surplus of between £150,000 and £200,000, instead of a deficit of £136,000? Surely the Board might fairly congratulate themselves upon the position. With regard to the debt, it amounted to £48,788,524—a decrease of £83,539 compared with the year 1908-9—in addition to £740,697 of unfunded debt.

The estimates were subjected to a good deal of criticism; but eventually they were received.

This being the last meeting of the Board for their present period of office, the Chairman (Mr. E. B. Barnard) offered a few remarks on the subject of the magnitude of the undertaking of which they have the control. He mentioned that they supply daily 7 million people with water, and employ 4000 officers and workmen. In June, 1904, they had 57 storage reservoirs; whereas this number has been increased to 62, and they have reservoir supplies of 9000 million gallons.

Votes of thanks were accorded to the Chairman and Vice-Chairman (Mr. G. S. Elliott, J.P.), as well as to the Clerk (Mr. A. B. Pilling) and his staff, for their services during the year.

Valuation of the Board's Undertaking.

A conference of the Appeal and Assessment Committee of the Board with representatives of the London rating authorities and the London County Council, on the subject of the quinquennial valuation of the

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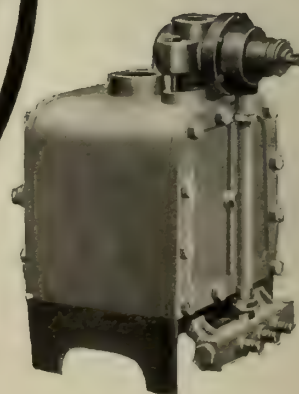
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Board's undertaking, was held on Monday last week. Representatives of 26 out of the 35 public authorities invited were present.

Mr. E. B. BARNARD, the Chairman of the Board, who presided, said that upon matters of rating—where, if there was a deficiency, the Board would have to call upon the Borough Councils to provide it—it would be singularly inappropriate that there should be controversy and litigation; and the Board were ready and willing to work in a friendly and harmonious way with the Assessment Committees. The rating authorities outside the Metropolis, but within the Board's area, had not been invited to send representatives because they were not subject to the quinquennial revaluation.

Mr. C. G. MUSGRAVE, the Chairman of the Appeal and Assessment Committee, said they had come to the conclusion that an independent valuer should be appointed by the President of the Surveyors' Institution, and that he should value the property of the Board on the principles adopted in the year 1907 by the Court of Quarter Sessions in the action brought by the City of London Assessment Committee against the Board, and determine what part of the total valuation should be apportioned to each metropolitan rating authority. He moved—"That, with a view to avoiding litigation and the expenditure of public money, it is expedient that the valuation of the undertaking of the Metropolitan Water Board as a whole should be made by an independent valuer, acting on behalf of the Metropolitan Assessment Committees and the Water Board."

Mr. G. S. ELLIOTT (the Deputy-Chairman of the Board) seconded the motion.

Mr. W. F. DEWEY (Town Clerk of Islington) moved, and Alderman CROLE-REES (Islington) seconded, an amendment to substitute for the words "Metropolitan Assessment Committees" the words "the rating authorities within the Water Board's area." It was defeated, as was also a further amendment to adjourn the meeting and request the Board to invite the attendance of representatives from the Assessment Committees in the Board's area beyond the Metropolis.

In the course of the subsequent discussion, several members said it would be waste of public funds for the Metropolitan Assessment Committees to spend money on an independent valuation such as was proposed. In the result, it was agreed to omit all the words in the resolution after the word "valuer;" and the motion as amended was agreed to by 20 votes to 17.

Mr. G. W. PRESTON (Finsbury) moved, and Mr. BATTERSBY seconded, a motion requesting the Board to obtain the valuation alluded to in the resolution, and supply to the rating authorities of each of the parishes and places comprised within the water area the values of the portions of the undertaking comprised in such parishes and places.

This was rejected, and the proceedings closed.

The Ceará Gas Company have declared a dividend of 3 per cent. (6s. per share), free of income-tax, on the ordinary shares for the past half year.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Glasgow Town Council on Thursday sat in private to consider as to the procedure to be followed with regard to the Corporation Gas Consolidation Bill. At the close of the private sitting, the representatives of the Press were informed that the minutes of the Parliamentary Bills Committee, and of the Special Sub-Committee on the Bill, were submitted to the Corporation, in fulfilment of the promise given by the Convener of the Parliamentary Bills Committee some time ago. In these minutes, it was recommended that the Corporation should proceed with the Bill in the House of Lords. The members were informed that they were free to discuss the minutes, or to move any amendment which they might think fit. Mr. J. Macfarlane, the Convener of the Parliamentary Bills Committee, moved that the minutes be approved of. Mr. Barrie seconded. There was no amendment; and the motion was unanimously agreed to.

The appointment of Mr. A. Morton Fyffe, Assistant Gas Manager at Dundee, to be Manager of the Corporation Gas-Works at Nelson, Lancashire, will give much satisfaction in Scotland, where he is recognized as a very able engineer. It is also a further tribute to the good work which is being done by the Junior Gas Association. Mr. Fyffe was President of the Eastern District of the Scottish Association in 1908-9. Experience has shown that the holding of the office of President is almost invariably followed by the obtaining of a managership. Mr. Fyffe's advancement has come to him a year after demitting office. His successor—Mr. H. Rule, of Falkirk—obtained his advancement almost simultaneously with his going out of office.

Last week I referred to the movement in Dundee for procuring an amalgamation of the city with the burghs of Broughty Ferry and Monifieth, and gave some of the reasons put forward in support of the proposal. On Monday evening the Town Council of Broughty Ferry considered the subject, and resolved to refuse a request by the Corporation of Dundee for a conference. The amalgamation, it was hinted, was being proposed with a view to restoring Dundee to the position of the third city in Scotland. This position is now held by Aberdeen.

An explosion of gas occurred in a grocer's shop in West Maitland Street, Edinburgh, on the morning of Saturday last, which did considerable damage to the property, and burned and injured three of the employees. Gas was found to be escaping in the back premises. It is surmised that, on the opening of the shop, the gas which had been accumulating was carried by the draught into the front shop, and was there ignited by the pilot-light of an incandescent gas-burner.

In Blairgowrie, on Tuesday evening, there were two explosions of gas at the same place. A traction-engine had broken a gas-main, and the escaping gas accumulated in a manhole. Boys playing with matches set fire to it. The manhole cover was blown off with great force, striking and injuring one of the boys. The cover was replaced; but shortly afterwards it was blown off by another explosion.

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CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, May 13.

There has been a better demand this week for early delivery, which has not only been sufficient to arrest the decline in values, but has also, towards the close, brought about a slight recovery from the lowest point reached. Requirements for home consumption have been few, but for export all available supplies have been more eagerly sought after, and the quotations now are £11 16s. 3d. per ton f.o.b. Hull, £11 17s. 6d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. For July-December delivery, makers are still asking £11 15s. to £11 17s. 6d. per ton f.o.b., according to port of shipment; but buyers are very apathetic regarding the distant months, and no new business is reported.

Nitrate of Soda.

The position of this article is unaltered; the market continuing quiet at 9s. 4½d. per cwt. for ordinary and 9s. 7½d. for refined quality, on spot.

Tar Products.

LONDON, May 13.

The markets for tar products remain firm, especially pitch, which has slightly improved in price. Creosote is steady, though the volume of new business is not great. Benzols and naphtha remain firm; but there are no changes in prices. Crude carbolic acid is a peculiar market at the moment, and business is difficult to negotiate.

The average values during the week were: Tar, 18s. 3d. to 22s. 3d., *ex* works. Pitch, London, 40s. 6d.; east coast, 39s. 6d. to 40s. 6d.; west coast, 38s. 6d. to 39s. 6d. f.a.s. Mersey ports, 39s. 6d. others. Benzol, 90 per cent., casks included, London, 8d. to 8½d.; North, 8d.; 50-90 per cent., casks included, London and North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4½d. to 4¾d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

Although the market is steady, the amount of new business is not very great. To-day, actual Beckton is quoted at £12; and outside makes, upon Beckton terms, £11 13s. 9d. In Hull, the price is £11 16s. 3d. to £11 17s. 6d.; Liverpool, £11 17s. 6d.; Leith, £11 18s. 9d.; and Middlesbrough, £11 17s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now fully an average production of coal in the Northern trade, and, with some diversion of orders, prices show a little ease. In the steam coal trade, best Northumbrians are from 11s. 3d. to 11s. 4½d. per ton f.o.b., with a moderate demand; second-class steams are from 10s. to 10s. 6d.; and steam smalls, being in fuller supply, are easier at from 6s. to 7s. 3d. In the gas coal trade, demand is only moderate on the long contracts; but the exports are full for this season. Durham gas coals vary according to quality—the usual classes being about 10s. to 10s. 9d. per ton f.o.b., with "Wear specials" at about 11s. 6d. per ton. As to the contracts for the large supplies of gas coal for London, it is now certain that considerable quantities have been arranged for; the price being about 10d. per ton above that of the last year's contracts. About 800,000 tons are spoken of as being arranged for one class of coal, and about 250,000 tons of another; so that it is probable that in another week most of the contracts will have been settled. One or two other contracts are usually given out soon after these; and the are in the market. Coke is now rather quieter, with good gas coke from 13s. 9d. to 14s. per ton f.o.b. in the Tyne or Wear—the output at present being lower.

Scotch Coal Trade.

There is no improvement in the market. Coal for shipment is in poor demand, and so are other sorts. The prices now quoted are: Ell, 9s. 3d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. 3d. to 10s. 6d.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 322,088 tons—an increase of 8052 tons upon the previous week, and of 6667 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,365,234 tons—an increase of 710,222 tons upon the corresponding period.

The Proposed Water Board for the Rhymney Valley.—A further conference of representatives of District Councils in reference to the proposed Water Board for the Rhymney Valley was held at Hengoed last Thursday. In the result, Messrs. Wilcox and Raikes, of Birmingham, were appointed to prepare a report on the sources of supply and various other information.

Tarapaca Water Company, Limited.—In their report for the past year, the Directors state that the net profit amounts to £51,993, which, added to the balance brought forward (£6184), and allowing £1571 for income-tax, makes a total of £56,606 to the credit of profit and loss account. An interim dividend was paid on Oct. 1 last at the rate of 6s. 6d. per share—being equivalent to 7½ per cent. per annum on the paid-up capital for the period—absorbing £13,000, and leaving a sum of £43,606 to be dealt with. The Directors recommend the payment of a final dividend of 4 per cent., making 7½ per cent. for the year, and the placing of £20,000 to the reserve fund. This will leave a balance of £10,806 to be carried forward.

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Gas Profits at Brighouse.

At the meeting of the Brighouse Town Council last Thursday, a report was presented showing that a profit of £2349 had been made by the gas undertaking during the past financial year, compared with £1069 in the preceding twelve months. The Gas Committee recommended the adoption of a system of graduated discounts to large consumers on the following scales: 1d. per 1000 cubic feet on a consumption of from 200,000 to 350,000 cubic feet; 2d. up to 500,000 cubic feet; and 3d. above the latter quantity—this to be in addition to the ordinary discount of 4d. per 1000 cubic feet. The resolution was opposed by Mr. D. Hardaker (a member of the Labour party), who pointed out that whereas prepayment meter consumers were required to pay 3s. 2d. per 1000 cubic feet, ordinary consumers were only charged 2s. 7d.; and now it was proposed to give an extra discount on the top of this. The Mayor (Alderman Thornton) who is Chairman of the Gas Committee, said the slot-meter system cost the Corporation last year £716; whereas only £588 was received from this particular class of customer. Owing to the system of preferential treatment not being adopted, the Corporation had lost two of the largest consumers of gas; and this he attributed in no small measure to Mr. Hardaker's influence. The recommendation of the Committee was adopted.

Charge for Water for Hotels.—After considerable negotiation, the Water Committee of the Torquay Town Council have arranged a new scale of charges for the supply of water for hotels and similar institutions. It is based on a rate of 10d. per 1000 gallons for those which consume less than 500,000 gallons per annum. For those which use above this quantity, discounts will be allowed, on a scale ranging from 5 per cent. for quantities up to a million gallons to 20 per cent. on any quantity over 1½ million gallons. Meter-rent will be charged in addition.

Cape Town and District Gas Company, Limited.—The Directors of this Company, in the report to be presented at the annual general meeting to-morrow, state that the result of the working in the twelve months ended Dec. 31 last is a profit of £15,881. Adding the amount brought forward (£1880), makes a total of £17,761. Out of this there has been provided debenture and debenture stock interest; and the Directors recommend that the sum of £6000 should be written off for depreciation of buildings, plant, and machinery—leaving a balance of £1761 to be carried forward to the next year's account. The quantity of gas made during 1909 was 136,121,000 cubic feet, compared with 151,212,000 cubic feet in 1908. The quantity sold, however, does not show a corresponding decrease. The number of consumers at the end of the year was 5764; being a gain of 366. The average amount of gas supplied to each customer was, however, less than in 1908. The Company have to face the keen competition of the municipal electricity supply; but every endeavour is made to extend the business by the installation of prepayment meters, cooking-stoves, &c., and by cookery demonstrations and lectures.

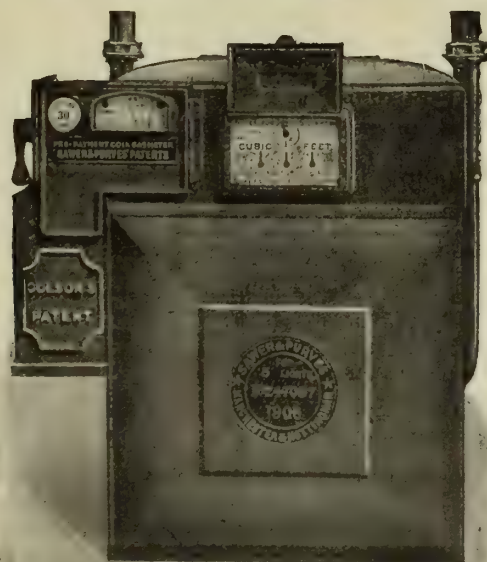
Quality of Holyhead Water.

At the last meeting of the Holyhead Urban District Council, a discussion took place with reference to the water supply, a recent adverse report upon which had caused a sensation in the district. Dr. Clay, the Council's Medical Officer of Health, reported that an analysis of the water had been made, and that the Analyst stated it could hardly be regarded as safe to use for domestic purposes. Dr. Clay expressed the opinion that, though the water was probably contaminated by vegetable matter, and was insufficiently filtered, the report published was exaggerated. As proof that the water was not so bad as had been stated, he pointed out that the death-rate for the district was lower than that for England and Wales. A letter was read from the Holyhead Water Company pointing out that a chemical analysis of the water alone, without any knowledge as to its source and surroundings, was unreliable. The Analyst reported that the filtration had removed all suspended matter, and, though the water contained some organic matter, as it was of vegetable origin it was unobjectionable. The supply was now in very fair condition, and quite suitable for distribution. The Company expressed regret that, though the nature of the work done by the Company during the past few years to improve the supply was within the personal knowledge of many members of the Council, so much alarm and distrust should have been excited in their minds. Had a quiet request been made for an explanation from the Company's Manager, this alarm would have been dissipated. It was decided, in view of the letter, to leave matters in abeyance.

Devonport Gas and Water Profits.—The municipal undertakings at Devonport have had a very successful year. At the meeting of the Town Council last Thursday, Alderman Tozer, the Chairman of the Gas Committee, stated that the accounts which will be presented to the Committee at their next meeting will show that, after paying interest on the capital and providing for the sinking fund, there is a net profit of £3740. Alderman Blackall, the Chairman of the Water Committee, made a similarly gratifying announcement with reference to the water undertaking. He said it had been thought that the Committee would have to come to the Council each year for a grant; but so far they had been able to do without it, and this year there was a net profit of £3265. This would be carried to the reserve or contingent fund. Mr. Perkins asked if anything would be applied in relief of the rates. Alderman Blackall replied in the negative. The Council and the ratepayers must not expect anything from the water undertaking for the present. At the end of another year they would have to commence paying to the sinking fund; and in the meantime they were putting to the reserve fund, or, as he preferred to call it, the contingent fund, any profit they were making. These savings would enable them to carry it on without asking for any contribution from the rates for three years, if at all. The Town Clerk said really the money was utilized for relief of the rates, because if they had not made this profit there would next year be a demand on the rates to pay the sinking fund.

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NOTTINGHAM.

Additional Capital for the Lea Bridge Gas Company.—The estimation in which the Lea Bridge District Gas Company is held by investors was testified last Tuesday by the remarkable rapidity with which the new issue of capital offered by Messrs. A. & W. Richards at the Mart, Tokenhouse Yard, E.C., by order of the Directors, was placed. The first lots offered consisted of £5000 of consolidated ordinary stock, ranking for a standard dividend of 5 per cent., though 1 per cent. more has been paid for some years on similar stock; and the price realized was £123 10s. to £124 10s. per £100. An issue of £4000 of 4 per cent. perpetual debenture stock fetched from £100 10s. to £100 15s. per £100; and £5000 of 5 per cent. preference stock, £114 to £115. The sale lasted only a few minutes.

Visit of Schoolboys to the Wrexham Gas-Works.—By permission of Mr. J. Braithwaite, the Engineer and Manager of the Wrexham Gas Company, the boys in the Seventh Standard at the Victoria Council Schools, under the care of the Headmaster (Mr. Chas. Dodd, F.G.S.), recently paid a visit to the gas-works to view the process of sulphate of ammonia manufacture. They were conducted through the works by the Assistant Manager (Mr. Owen Evans), who explained the method of treating ammoniacal liquor, and the manufacture of sulphate of ammonia, also the action of the Claus sulphur-recovery plant. The inspection of the plant was particularly interesting to the boys, who are studying the composition and uses of various manures. At the conclusion of the visit, Mr. Braithwaite made a few encouraging remarks to the scholars, and promised to present a prize to the boy who wrote the best essay on "The Manufacture of Sulphate of Ammonia and its Uses."

Charge for Water in the City of London.—At the last meeting of the Court of Common Council of the City of London, some reference was made to the charge for water; the subject arising on the election of Alderman Sir George Woodman and Mr. Gunton to represent the City on the Metropolitan Water Board. Mr. A. C. Morton, M.P., said in the days of the Water Companies ratepayers of the City were "robbed" to the extent of from £60,000 to £70,000 a year; but now £50,000 more was being taken out of their pockets.

Compounding for Water-Rates.—The attention of the Public Health Committee of the St. Pancras Borough Council has been drawn to the allowance made in respect of empties at Goldington Buildings, so far as water-rates are concerned. The practice hitherto has been that premises which become empty between any two quarter days of payment are subject to payment of the water-rate in full for the entire quarter. If, for instance, premises are in occupation for only one week at the commencement of a quarter, the full quarter's rate is legally chargeable. With a view of minimizing the apparent hardship which this provision might inflict, especially on owners of property let on weekly or monthly tenancies, the Metropolitan Water Board decided that an allowance of 75 per cent. may be made on the actual periods of non-occupation. The Committee report that, with a view to obtain a uniform allowance for the whole of the buildings, in substitution of the 75 per cent. for the actual periods of non-occupation on empty flats only, the Borough Treasurer has been in communication with the Metropolitan Water Board, who have written in reply to state that they are prepared to compound the water-rates on these dwellings by an allowance of 5 per cent.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS MANAGER, &c. No. 5231.
DRAUGHTSMAN (CANADA). No. 5242.
SHOW-ROOM ATTENDANT. No. 5233.

Plant, &c. (Second Hand), for Sale.

EXHAUSTER, RETORT MOUTHPIECES, &c. Grays and Tilbury Gas Company.
GASHOLDER FRAMING, GIRDERS, &c. Gosport Gas Company.
MOUTHPIECES, ASCENSION PIPES, &c., BOILERS, ENGINES AND EXHAUSTERS, CONDENSERS, TAR EXTRACTOR, SCRUBBERS, PURIFIERS, GASHOLDERS, &c. Merthyr Tydfil Gas Company.

Stocks and Shares.

BARNET GAS COMPANY. May 24.
DORKING GAS COMPANY. May 24.
GAS DEBENTURES. No. 5243.

TENDERS FOR

Coal and Cannel.

BARNOLDSWICK URBAN DISTRICT COUNCIL. Tenders by May 30.
BOGNOR GASLIGHT AND COKE COMPANY. Tenders by May 26.
CARLISLE GAS DEPARTMENT. Tenders by June 1.
CIRENCESTER GAS COMPANY. Tenders by June 2.
CLITHEROE GAS DEPARTMENT. Tenders by May 26.
DENTON GAS DEPARTMENT. Tenders by May 27.
EAST DEREHAM URBAN DISTRICT COUNCIL. Tenders by June 1.

Coal and Cannel (continued).

GAINSBOROUGH GAS DEPARTMENT. Tenders by May 27.
GLOUCESTER GAS COMPANY. Tenders by May 30.
MIDDLETON CORPORATION. Tenders by May 31.
SAFFRON WALDEN GAS AND WATER DEPARTMENT. Tenders by May 30.
SEDDLEY URBAN DISTRICT COUNCIL. Tenders by May 31.
SEVENOAKS GAS COMPANY. Tenders by May 26.
SKIPTON URBAN DISTRICT COUNCIL. Tenders by May 28.
TIVERTON TOWN COUNCIL. Tenders by June 4.

Iron and Steel Work.

MANCHESTER GAS DEPARTMENT. Tenders by June 11.

Tar and Liquor.

GAINSBOROUGH GAS DEPARTMENT. Tenders by May 27.
DENTON GAS DEPARTMENT. Tenders by May 27.
STOURBRIDGE GAS DEPARTMENT. Tenders by June 10.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 422.

| Issue | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|------------|--------|--------------------|--------------------------------|--|--|---------------------|------------------------|-----------|--------|--------------------|-------------------------------|---|--|---------------------|------------------------|
| £ | Stk. | | p.c. | | | | £ s. d. | £ | Stk. | | p.c. | | | | £ s. d. |
| 1,474,000 | Stk. | Apl. 1 | 5 | Alliance & Dublin Ord. | 82-84 | .. | 5 19 1 | 4,940,000 | Stk. | May 12 | 8 | Imperial Continental | 177-179 ⁺ | .. | 4 9 5 |
| 310,000 | Stk. | Jan. 13 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 1,235,000 | Stk. | Feb. 10 | 3 ¹ / ₂ | Do. 3 ¹ / ₂ p.c. Deb. Red. | 94-96 | .. | 3 12 11 |
| 200,000 | 5 | May 12 | 7 | Bombay, Ltd. | 6 ¹ / ₂ -6 ³ / ₄ | .. | 5 9 10 | 561,000 | Stk. | Mar. 16 | 6 | Lea Bridge Ord. 5 p.c. | 122-124 | .. | 4 16 11 |
| 40,000 | 5 | " | 7 | Do. New, £4 paid. | 4 ¹ / ₂ -5 ¹ / ₂ | .. | 5 9 3 | 718,100 | Stk. | Feb. 25 | 10 | Liverpool United A. | 222-224 | .. | 4 9 3 |
| 50,000 | 10 | Feb. 25 | 15 | Bourne- mouth Gas 10 p.c. | 29-30 | .. | 5 0 0 | 306,083 | " | Dec. 29 | 4 | Do. B. | 163 ¹ / ₂ -165 ¹ / ₂ | .. | 4 4 7 |
| 311,810 | 10 | " | 7 | Do. 7 p.c. | 16 ¹ / ₂ -16 ³ / ₄ | .. | 4 3 7 | 75,000 | 5 | Nov. 26 | 5 | Do. Deb. Stk. | 103-105 | .. | 3 16 11 |
| 75,000 | 10 | " | 6 | and Water Pref. 6 p.c. | 15-15 ¹ / ₂ | .. | 3 17 5 | 560,000 | 100 | Apl. 1 | 5 | Malta & Mediterranean. | 4 ¹ / ₂ -5 | .. | 6 0 0 |
| 380,000 | Stk. | " | 12 ¹ / ₂ | Brentford Consolidated | 251-254 | .. | 4 18 5 | 541,920 | 20 | Nov. 11 | 3 ¹ / ₂ | Met. of 15 p.c. Deb. | 100-102 | .. | 4 18 0 |
| 300,000 | " | " | 9 ¹ / ₂ | Do. New | 183-190 | .. | 5 0 0 | 1,775,892 | Stk. | Feb. 25 | 4 ¹ / ₂ | Melbourne 4 ¹ / ₂ p.c. Deb. | 100-102 | .. | 4 8 3 |
| 50,000 | " | Aug. 12 | 5 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 0 | 529,435 | Stk. | Dec. 29 | 3 ¹ / ₂ | Monte Video, Ltd. | 12 ¹ / ₂ -13 ¹ / ₂ | .. | 5 5 8 |
| 206,250 | " | Dec. 29 | 4 | Do. 4 p.c. Deb. | 101-103 | .. | 3 17 8 | 55,940 | 10 | Feb. 25 | 7 | Newcastle & Gt. Tesh'd Con. | 91-93 | .. | 4 2 7 |
| 220,000 | Stk. | Mar. 16 | 11 | Brighton & Hove Orig. | 213-216 | .. | 5 1 0 | 300,000 | Stk. | Apl. 25 | 8 | Do. 3 ¹ / ₂ p.c. Deb. | 91-93 | .. | 3 15 3 |
| 246,320 | " | " | 8 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 60,000 | 5 | Apl. 1 | 8 | North Middlesex 7 p.c. | 13 ¹ / ₂ -14 ¹ / ₂ | .. | 5 1 10 |
| 460,000 | 20 | Apl. 1 | 10 ¹ / ₂ | British | 44-45 | .. | 4 14 8 | 31,800 | 53 | Feb. 25 | 13 | Oriental, Ltd. | 138-140 | .. | 5 14 4 |
| 109,000 | Stk. | Feb. 25 | 6 | Bromley, A 5 p.c. | 118-120 | .. | 5 0 0 | 60,000 | 50 | " | 13 | Ottoman, Ltd. | 6-6 ¹ / ₂ | .. | 6 8 11 |
| 165,700 | " | " | 4 ¹ / ₂ | Do. B 3 ¹ / ₂ p.c. | 88-90 | .. | 5 0 11 | 100,000 | 50 | " | 12 | Portsea Island A. | 134-136 | .. | 5 1 11 |
| 82,278 | " | " | 5 ¹ / ₂ | Do. C 5 p.c. | 105-107 | .. | 5 2 10 | 100,000 | 50 | " | 12 | Do. B. | 126-128 | .. | 5 1 7 |
| 55,000 | " | Dec. 29 | 3 ¹ / ₂ | Do. 3 ¹ / ₂ p.c. Deb. | 87-89 | .. | 3 18 8 | 114,800 | 50 | " | 10 | Do. C. | 119-121 | .. | 4 19 2 |
| 500,000 | 10 | Oct. 14 | 7 | Buenos Ayres (New) Ltd. | — | .. | — | 398,490 | 5 | Apl. 29 | 7 | Do. D and E. | 100-102 | .. | 4 18 0 |
| 250,000 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 98-100 | .. | 4 0 0 | 799,980 | 5 | Jan. 27 | 5 | Primitiva Ord. | 7 ¹ / ₂ -7 ³ / ₄ | .. | 4 10 4 |
| 100,000 | 10 | " | — | Cape Town & Dis., Ltd. | 4-5 | .. | — | 488,903 | 100 | Dec. 1 | 4 | Do. 5 p.c. Pref. | 5 ¹ / ₂ -5 ³ / ₄ | .. | 4 10 11 |
| 100,000 | 10 | " | — | Do. 4 ¹ / ₂ p.c. Pref. | 6-7 | .. | — | 1,000,000 | 10 | Oct. 14 | 8 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 50,000 | 50 | May 3 | 5 | Do. 6 p.c. 1st Mort. | 49-50 | .. | 6 0 0 | 312,650 | Stk. | Dec. 29 | 4 | River Plate Ord. | — | .. | — |
| 100,000 | Stk. | Dec. 29 | 4 ¹ / ₂ | Do. 4 ¹ / ₂ p.c. Deb. Stk. | 96-98 | .. | 5 2 3 | 62,500 | 10 | Apl. 1 | 9 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 11 |
| 157,150 | Stk. | Feb. 25 | 5 | Chester 5 p.c. Ord. | 109-111 | .. | 4 10 1 | 125,000 | 50 | Jan. 3 | 5 | San Paulo, Ltd. | 151-153 | .. | 5 14 8 |
| 1,513,280 | Stk. | Feb. 25 | 5 ¹ / ₂ | Commercial 4 p.c. Stk. | 106-108 | .. | 4 16 4 | 135,000 | Stk. | Mch. 16 | 10 | Do. 6 p.c. Pref. | 111-121 | .. | 4 18 0 |
| 560,000 | " | " | 5 | Do. 3 ¹ / ₂ p.c. do. | 103-105 | .. | 4 15 3 | 209,984 | " | " | 10 | Do. 5 p.c. Deb. | 50 ¹ / ₂ -51 ¹ / ₂ | .. | 4 17 1 |
| 475,000 | " | Dec. 29 | 3 | Do. 3 p.c. Deb. Stk. | 81-83 | .. | 3 12 3 | 523,500 | " | " | 10 | Sheffield A. | 232-234 | .. | 4 5 5 |
| 800,000 | Stk. | Dec. 10 | 5 | Continental Union, Ltd. | 98-100 | .. | 5 0 0 | 70,000 | 10 | Oct. 14 | 10 | Do. B. | 232-234 | .. | 4 5 5 |
| 200,000 | " | " | 7 | Do. 7 p.c. Pref. | 138-140 | .. | 5 0 0 | 6,429,895 | Stk. | Feb. 10 | 5/9/4 | Do. C. | 232-234 | .. | 4 5 5 |
| 492,270 | Stk. | " | 5 ¹ / ₂ | Derby Con. Stk. | 121-123 | .. | 4 9 5 | 1,895,445 | Stk. | Jan. 13 | 3 | South African. | 12-12 ¹ / ₂ | .. | 8 0 0 |
| 55,000 | " | " | 4 | Do. Deb. Stk. | 104-105 | .. | 3 16 2 | 209,823 | Stk. | Mar. 16 | 8 | South Met., 4 p.c. Ord. | 120-122 | .. | 4 9 7 |
| 148,995 | " | Apl. 1 | 5 | East Hull 5 p.c. Ord. | 96-98 | .. | 5 2 0 | 605,000 | Stk. | Feb. 25 | 5 ¹ / ₂ | Do. 3 p.c. Deb. | 81-83 | .. | 5 12 3 |
| 486,090 | 10 | Jan. 27 | 12 | European, Ltd. | 24 ¹ / ₂ -24 ³ / ₄ | .. | 4 17 0 | 60,000 | " | " | 5 | South Shields Con. Stk. | 157-158 | .. | 5 1 3 |
| 354,060 | 10 | " | 12 | Do. £7 10s. paid. | 18 ¹ / ₂ -18 ³ / ₄ | .. | 4 16 0 | 117,058 | Stk. | Jan. 13 | 5 | S'th Suburb'n Ord. 5 p.c. | 121-123 | .. | 4 12 11 |
| 16,198,671 | Stk. | Feb. 10 | 4 ¹ / ₂ | Gas 4 p.c. Ord. | 103 ¹ / ₂ -104 ¹ / ₂ | .. | 4 9 3 | 502,310 | Stk. | May 12 | 5 | Do. 5 p.c. Pref. | 121-123 | .. | 4 1 4 |
| 2,600,000 | " | " | 3 ¹ / ₂ | light 3 ¹ / ₂ p.c. max. | 88-90 | .. | 3 17 9 | 120,000 | Stk. | Feb. 10 | 6 ¹ / ₂ | Do. 5 p.c. Deb. Stk. | 122-124 | .. | 4 0 8 |
| 4,002,235 | " | " | 4 | and 4 p.c. Con. Pref. | 104-106 | .. | 3 15 6 | 453,940 | " | " | 5 ¹ / ₂ | Southampton Ord. | 105-110 ⁺ | .. | 4 10 11 |
| 4,531,796 | " | Dec. 29 | 3 | Coke 3 p.c. Con. Deb. | 81-83 | .. | 3 12 3 | 149,470 | " | Dec. 29 | 4 | Tottenham A 5 p.c. | 133-135 | .. | 5 1 9 |
| 258,740 | Stk. | Mar. 16 | 5 | Hastings & St. L. 3 ¹ / ₂ p.c. | 93-95 | .. | 5 5 3 | 182,380 | 10 | Dec. 29 | 8 | and B 3 ¹ / ₂ p.c. | 113-115 | .. | 4 13 6 |
| 82,500 | " | " | 6 ¹ / ₂ | Do. do. 5 p.c. | 117-119 | .. | 5 9 3 | 149,900 | 10 | Jan. 3 | 5 | Edmonton 4 p.c. Deb. | 59-101 | .. | 3 19 3 |
| 70,000 | 10 | Apl. 29 | 11 | Hongkong & China, Ltd. | 17-17 ¹ / ₂ | .. | 6 5 9 | 236,476 | Stk. | Feb. 25 | 5 | Tuscan, Ltd. | 94-9 ¹ / ₂ | .. | 4 2 2 |
| 131,000 | Stk. | Mar. 16 | 7 | Ilford A and C | 145-147 | .. | 4 15 3 | 255,036 | Stk. | Feb. 25 | 6 ¹ / ₂ | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 19 0 |
| 65,780 | " | " | 5 ¹ / ₂ | Do. B | 108-110 | .. | 5 0 0 | 79,416 | " | Dec. 29 | 3 | Tynemouth, 5 p.c. max. | 113-115 | .. | 4 0 11 |
| 65,500 | " | Dec. 29 | 8 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | | | | | Wands- B 3 ¹ / ₂ p.c. | 139-141 | .. | 4 14 0 |
| | | | | | | | | | | | | worth 7 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |

Prices marked * are "Ex div."

Lowestoft Public Lighting.—At the last meeting of the Lowestoft Town Council, a letter was read from Mr. J. Hawksley, the Manager of the Lowestoft Water and Gas Company, stating that his Board had decided to offer to convert, free of charge, all the public lamps which are at present fitted with flat-flame burners to incandescent burners, and to renew the annual contract for the whole of the street lighting by the incandescent system at the same price per lamp as is at present paid for flat-flame burners—viz., £1 ros. per lamp per annum, and 20s. per lamp per annum for providing the necessary fittings, and cleaning, lighting, and extinguishing. This will be a reduction of ros. per lamp on the present incandescent lighting. The Company are to be asked to submit a tender on these terms.

Proposed Issue of Coalite Debentures.—The following appeared in the "Daily Mail" on Monday last week: "One or two favourable announcements on behalf of the British Coalite Company have been published recently to combat some unfavourable rumours; but we have seen no reference in any of these announcements to an impending issue of debentures. We are able to state, however, that it is contemplated within the next few weeks to offer for subscription at par an issue of £300,000 5 per cent. first mortgage convertible debentures, and that 7½ per cent. commission will be offered for underwriting. Presumably the prospectus, when it appears, will make out an attractive case in the way of estimated profits; but it seems regrettable that the Company should require more money before it can offer more convincing evidence in the way of actual commercial results as to its ultimate success."

The Westminster Public Lighting Contract.—The Works Committee of the Westminster City Council report that when recently accepting the tender of the Gaslight and Coke Company for public lighting the Council decided to ask the Company whether they would be willing, after the expiration of five years, to continue the contract for a further period of five years, on the terms of the tender for ten years, in the event of the Council so deciding, and giving the Company six months' notice before the expiration of five years of the contract period. In a letter received from the Company in reply to the inquiry

they express regret at their inability to agree to the option for which the Council ask. In the Committee's report which was adopted by the Council on the 28th of April, they stated that they were endeavouring to arrange with the Gas Company for a reduction of the tender rates for the installation, in consideration of the Council paying the cost thereof on completion, instead of payment being spread over five years as offered by the Company. In another letter, the Company stated that if payment for the installation were made on the completion of the work, the quoted rates would be subject to a reduction of 7½ per cent. The Committee have accepted the quotation.

At the last meeting of the Milton Regis Urban District Council, the Gas Committee reported that they had accepted the tender of Messrs. Winstanley and Co., amounting to £1065, for carrying out extensions at the gas-works. Their action was approved.

Having passed their jubilee by two years, the Reliance Lubricating Oil Company, of Water Lane, Great Tower Street, E.C., may fairly be regarded as one of the pioneers in the oil trade. Among their specialities is a heavy oil suitable for gas-engines of 60 to 100 H.P.

Messrs. Joseph Taylor and Co. have received orders for solid-plate lead saturators from the Londonderry, Colchester, Waltham Abbey and Cheshunt, and Blyth and Cowpen Gas Companies; and also for saturators, including all the leadwork in connection with the sulphate plants, for the Sevenoaks, Padham, and Skegness Gas-Works.

We have received from Messrs. Fletcher, Russell, and Co., Limited, their list of gas and steam cooking and heating appliances for hotels, mansions, hospitals, large institutions, &c. It occupies rather more than 100 pages, and is a highly creditable production; the articles shown, of which there is a great variety, being printed in black on art paper, with the descriptive matter in red. The list, which is No. 247, is bound in a stiff cover artistically printed in colours. We have also received a booklet containing their new season's cooking appliances, including the series of "Palatine" cookers noticed last week.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional line, 6d.

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Resists 4500° Fahr. Best for GAS-WORKS.

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See Advertisement on p. 460.

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Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

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Telephone: 2836 HOLBORN.

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See Advertisement, May 10, p. II. of Centre.
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Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
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ACT, and Decisions thereunder," 1s.; "TRADE
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GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Re-
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THE very best Patent Grids for Holding
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See Illustrated Advertisement, April 5, p. 8.

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Consumers in any form are invited to correspond
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turers, OLDBURY, WORCS.

GAS-WORKS requiring Extensions
should Communicate with **FIRTH BLAKELEY,**
SONS, AND CO., LIMITED, Dewsbury, who make a
Speciality of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
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CAST-IRON Pipes. Spigot and Socket
or Flanged. Special Quality—9 feet or 12 feet
Lengths. When buying, Write us.
A. LOWCOCK, Limited, SHREWSBURY.

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Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

GAS PLANT for Sale—We can always
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PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gas-holders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
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10d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;
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Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;
Renown Engine Oil, 11d.; and Astral Disinfectant,
2s. 6d. per gallon. Barrels free, carriage paid. Solidified
Oil, 25s. cwt.
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To you the credit is due, and I think you
see the best Investment I ever made."
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GAS COMPANY, LIMITED.

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THE Directors Thank Applicants for
the above Post, and Beg to Inform them that the
POSITION HAS NOW BEEN FILLED.

WANTED, an Attendant for London
Gas-Stove Show-Room. Young, Energetic, and
Experienced.
Apply, by letter, to No. 5233, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

WANTED, a Gas Manager, for a Small
Works (Stoker kept), competent to do the
Plumbing Work of Brewery. Wages, 37s. 6d. per week,
rising to 40s.
Apply, by letter, with full Particulars and copies of
Testimonials, to No. 5234, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

DRAUGHTSMAN wanted (for Canada)
Experienced in the Design of Modern Gas-
works Plant. Age not to exceed 28 Years. Gas-Works
Experience a Recommendation.
Apply, in first instance, by letter, giving full Par-
ticulars, &c., to No. 5242, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

FOR SALE—A Gas Exhauster by Alfred
Williams and Co., London. Capacity 15,000 Cubic
Feet per Hour. In good Condition. Also 19 RETORT
MOUTHPIECES and LIDS, 21 in. by 15 in. Cheap.
For further Particulars, Apply to H. C. BORRADAILE,
Secretary, Grays and Tilbury Gas Company, GRAYS.

GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap for
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GASHOLDER, 20 feet deep; Seven Heavy CAST-
IRON Columns, 3 feet square base, 2 ft. by 1 ft. 10 in.
diameter; and LATTICE GIRDS, 2 feet deep.
Removed from Tank 74 ft. 6 in. diameter.
Apply to the Gosport Gas and Coke Company,
GOSPORT.

THE Merthyr Tydfil Gas Company have
the whole of the COAL-GAS MANUFACTURING
PLANT AND APPARATUS, at their Picton Street
Works, FOR DISPOSAL, comprising RETORT
MOUTHPIECES, ASCENSION and BRIDGE PIPES,
HYDRAULIC, FOUL, and TAR MAINS, BOILERS,
ENGINES and EXHAUSTERS, ANNULAR CON-
DENSERS, PELOUZE and AUDOUIN TAR-EX-
TRACTOR, TOWER SCRUBBERS, PURIFIERS,
GASHOLDERS, VALVES, &c., the whole of which are
in Good Condition.
Permission to Inspect and further Information may
be obtained by Applying to the undersigned.
J. E. KENSHOLE,
General Manager.
Gas Offices, Merthyr Tydfil,
May 12, 1910.

CIRENCESTER GAS COMPANY, LIMITED.
THE Directors are prepared to receive
TENDERS for the Supply of 4000 to 5000 Tons of
GAS COAL to be delivered free to their Siding at the
Watermoor Station of the Midland and South Western
Junction Railway Company during the Twelve Months
commencing July 1, 1910, at such times and in such
Quantities as may be required by their Manager.
Tenders to be sent in by June 2 next, Forms for
which can be obtained from
J. P. BEECHAM,
Secretary.
12, Silver Street, Cirencester,
May 9, 1910.

TENDERS FOR GAS COAL.

THE Sedgley Urban District Council
invite TENDERS for the Supply of 1000 Tons of
GAS COAL (more or less), to be delivered at the Shut
End Siding at such times and in such Quantities as
may be directed.
It is desirable that a statement of an analysis of the
quality of a sample of the Coal to be supplied be sent
with the Tender.
Sealed Tenders, marked "Coal," must reach me not
later than the 31st of May, 1910.
The Council do not bind themselves to accept the
lowest or any Tender.

By order,
THOMAS R. KNIGHT,
Clerk of the Council.
Council House, Sedgley,
May 11, 1910.

GAINSBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas Committee of the above
Council are prepared to receive TENDERS for
the Purchase of the Surplus TAR produced at their Gas-
Works for a period of Twelve Months from July 1,
1910.
Probable Quantity, 450 Tons.
Further Particulars may be obtained on Application
to the undersigned.
Sealed Tenders, endorsed "Tender for Tar," ad-
dressed to the Chairman of the Gas Committee, must
be delivered at the Gas-Works, Gainsborough, not later
than the 27th inst.
The Committee do not bind themselves to accept the
highest or any Tender.

JOHN BALDWIN,
Manager.
Gas-Works, Gainsborough,
May 11, 1910.

GAINSBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee of the above
Council invite TENDERS for the Supply of 8000
Tons of Best GAS COAL (Screened, Unscreened, and
Nuts), to be delivered at the Great Central Railway
Station, Gainsborough, between the 1st of July, 1910,
and the 30th of June, 1911, in such Quantities, Monthly,
as may be required.
Sealed Tenders, endorsed "Tender for Gas Coal,"
giving full Particulars of the Coal offered, to be ad-
dressed to the Chairman of the Gas Committee, must
be delivered at the Gas-Works, Gainsborough, not
later than the 27th inst.
No Special Form of Tender issued.
The Committee do not bind themselves to accept the
lowest or any Tender.

JOHN BALDWIN,
Manager.
Gas-Works, Gainsborough,
May 11, 1910.

MANCHESTER CORPORATION.
(GAS DEPARTMENT.)

TO IRON AND STEEL WORK CONTRACTORS.
THE Gas Committee are prepared to re-
ceive TENDERS for the IRON and STEEL
WORK required for an Installation of Horizontal
Retorts at their Rochdale Road Station.
General Conditions of Contract and Specification
can be obtained on Application to Mr. F. A. Price,
Superintendent, Gas Department, Town Hall, on pay-
ment of Three Guineas, which will be returned on re-
ceipt of a bonâ-fide Tender.
Drawings may be seen and any other Information
obtained on Application to the Engineer, Mr. J. G.
Newbigging, M.Inst.C.E., at his Office, Rochdale Road
Station.
Sealed Tenders, addressed to the Chairman of the
Gas Committee and endorsed "Tender for Iron and
Steel Work, &c., Horizontal Retort Installation, Roch-
dale Road Station," must be delivered at the Gas
Office, Town Hall, Manchester, not later than Twelve
noon on Saturday, the 11th day of June, 1910.
The Committee do not bind themselves to accept the
lowest or any Tender.

By order,
THOMAS HUDSON,
Town Clerk.
Town Hall, Manchester,
May 13, 1910.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company
invite TENDERS for the Supply of about 34,000
Tons of GAS COAL for One Year from the 1st day of
July next, in such Monthly Quantities as may be re-
quired by the Company.
Tenders to state the Price delivered at the Midland
Railway Sidings, Hempstead, near Gloucester, or the
Great Western Railway Wharf, Llanthony, Gloucester;
or, if sent (as preferred) by Water, the price f.o.b., and
also the price delivered at the Gas Company's Wharf
on the Gloucester and Berkeley Canal.
Further Particulars and Forms of Tender may be
obtained from the undersigned.
Sealed Tenders, endorsed "Tender for Coal," spec-
ifying the Description and Quality of the Coal, to be ad-
dressed to the Chairman, Gas Offices, Eastgate Street,
Gloucester, and delivered not later than Monday, the
30th day of May inst.
The Directors reserve to themselves the right to ac-
cept the whole or any portion of any quantity offered,
and do not bind themselves to accept the lowest or any
Tender.

By order,
WILLIAM E. VINSON,
Secretary.
Gas Offices, Gloucester,
May 2, 1910.

THE East Dereham Urban District Council
Council are prepared to receive TENDERS for the Supply of about 1700 Tons of Screened GAS COAL for the ensuing Year.

Particulars and Form of Tender to be had of the undersigned.

Tenders, marked "Coals," to be sent in by Ten a.m. on Wednesday, the 1st of June, 1910, to

B. H. VORES,
Clerk to East Dereham
Urban District Council.

May 11, 1910.

DENTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

COAL.

THE Gas Committee invite Tenders for the Supply of COAL; the same to be sent in on or before the 27th of May inst.

Specification and Form of Tender to be obtained from the Gas Engineer, Mr. J. Chadwick Smith, Gas-Works, Denton, Lancs.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM RICHARDS,
Clerk to the Council.

May 13, 1910.

DENTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TAR.

THE Gas Committee invite Tenders for TAR; the same to be sent in on or before the 27th of May, inst.

Particulars may be obtained from the Gas Engineer, Mr. J. Chadwick Smith, Gas-Works, Denton, Lancs.

The Committee do not bind themselves to accept the highest or any Tender.

By order,
WILLIAM RICHARDS,
Clerk to the Council.

May 13, 1910.

BOROUGH OF CLITHEROE.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for Screened GAS NUTS, to be delivered on the Gas-Works Siding, during the Year ending June 30, 1911.

Particulars and Forms of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Thursday, the 26th of May, 1910.

ROBERT BARRETT,
Engineer and Manager.

Gas-Works, Clitheroe,
May 12, 1910.

BOGNOR GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for the Supply of GAS COAL for One or Two Years, at the rate of from 4000 to 5000 Tons per Year, to be delivered free at Bognor Station, or the Gas-Works Siding (if instructed), in such Quantities and at such times as required from June 15 next.

The Directors reserve the right to accept the whole or any portion of the Quantity offered, and do not bind themselves to accept the lowest or any Tender.

Tenders are to be sent to the undersigned not later than Thursday, May 26, 1910.

By order,
FRANK G. WATSON,
Secretary.

Gas Offices, Bognor,
May 12, 1910.

SKIPTON URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Council invite Tenders for the Supply of about 8000 Tons of Best GAS NUTS, to be delivered free into the Council's Boats at the Pit Wharf, or at the Railway Station, Skipton, or at the Council's Wharf adjoining the Gas-Works in Skipton, on the Leeds and Liverpool Canal, between June 30, 1910, and July 1, 1911, in Monthly Quantities.

Full Particulars as to Periods and Quantities of Deliveries, &c., and Form of Tender, may be obtained from the Manager, Mr. J. H. Woodward, Gas-Works, Skipton, and Tenders, endorsed "Gas Coal," are to be sent to him on or before May 28, 1910.

The lowest or any Tender not necessarily accepted.

RICHARD WILSON,
Clerk to the Council.

BOROUGH OF TIVERTON.

TENDERS FOR COAL.

THE Town Council are prepared to receive TENDERS for the whole or part of 4000 Tons of Freshly Wrought GAS COAL, Screened or Un-screened, including NUTS (giving full Particulars of Coal, with Analysis), to be delivered at the Railway Siding adjoining their Gas-Works at Tiverton during the period of One Year, and in such Quantities as may be directed by the Gas Manager.

Further Particulars and Form of Tender (which must be used) may be obtained on Application to Mr. Clark Jeffery, Gas Manager, Tiverton.

Sealed Tenders, endorsed "Tender for Gas Coal," and addressed to the undersigned, must be received on or before Saturday, the 4th day of June, 1910.

The Committee do not bind themselves to accept the lowest or any Tender.

By order
C. M. HOLF,
Town Clerk.

Tiverton, May 2, 1910.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Purchase of their Surplus TAR during the Twelve Months ending June 30, 1911.

Tenders (on our own Tender Form), endorsed "TAR," and addressed to the Chairman of the Gas Committee, to be sent to me on or before Friday, June 10, 1910.

By order of the Committee,
CHARLES H. WEBB, M.Sc., Assoc. M.Inst.C.E.,
Engineer and Manager.

Gas-Works, Stourbridge,
May 13, 1910.

THE Corporation of Middleton are prepared to receive TENDERS for the COAL required at the Gas-Works for the next Twelve Months.

Further Particulars and Form of Tender, which will contain a Fair Wages Clause, may be obtained from Mr. C. F. Broadhead, Gas Engineer, Gas-Works, Middleton.

Tenders, addressed to the Chairman of the Gas Committee, endorsed "Coal," must be delivered at my Office not later than Tuesday, May 31, 1910.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
May 13, 1910.

CITY OF CARLISLE.

THE Gas Committee of the City of

Carlisle are prepared to receive TENDERS for COAL and CANNEL required at their Works during One Year Commencing the 1st of July next.

Tenders, endorsed "Coal," and addressed to the Chairman of the Gas Committee, must be delivered before Five p.m. on Wednesday, June 1, at the Gas-Works Office, Victoria Viaduct, Carlisle.

The lowest or any Tender not necessarily accepted.

Forms of Tender and other Particulars may be obtained on Application to the undersigned.

HAROLD E. BLOOR, B.Sc., B.Eng.,
Engineer and Manager.

URBAN DISTRICT COUNCIL OF BARNOLDSWICK.

THE above Council invite Tenders for the Supply of 5500 Tons of Best Screened GAS COAL or NUTS, delivered free on rail Barnoldswick (Midland Railway), between June 1, 1910, and May 31, 1911, in such Quantities Monthly as stated on Form of Tender.

The Council do not bind themselves to accept the lowest or any Tender.

Form of Tender supplied on Application to the undersigned.

Tenders must be on the prescribed Forms, and addressed to the Chairman, Gas Committee, Town Hall, Barnoldswick, via Colne, and delivered not later than Monday, May 30, 1910.

J. W. THOMPSON,
Engineer and Manager.

Town Hall, Barnoldswick.

SEVENOAKS GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Sevenoaks Gas

Company invite TENDERS for 8000 Tons of GAS COAL (Durham or Yorkshire preferred), to be delivered at the Company's Siding (South-Eastern and Chatham Railway), Bat and Ball Station, Sevenoaks, for Twelve Months from June, 1910, to June, 1911.

Tenders must be sent in by not later than Thursday, the 26th day of May, 1910, addressed to the Chairman, W. Henry Cronk, Esq., 88, High Street, Sevenoaks, Kent.

Further Particulars may be obtained of the undersigned.

HENRY HOW,
Secretary.

Gas Offices, Sevenoaks,
Kent, May 12, 1910.

BOROUGH OF SAFFRON WALDEN.

TENDERS FOR COAL.

THE Gas and Water Undertaking Com-

mittees of the Town Council are prepared to receive TENDERS for the Supply of about 2000 Tons of Best Screened GAS COAL, and about 200 Tons of Best Hand-Picked Hard STEAM COAL respectively, for the Twelve Months ending the 30th of June, 1911.

Full Particulars can be obtained on Application to Mr. A. H. Forbes, Borough Surveyor.

Sealed Tenders, endorsed "Tender for Gas Coal," or "Tender for Steam Coal," as the case may be, to be addressed and sent to me, the undersigned, not later than Five o'clock in the Afternoon on Monday, the 30th day of May inst.

The lowest or any Tender will not necessarily be accepted.

W. ADAMS,
Town Clerk.

Saffron Walden,
May 13, 1910.

GAS DEBENTURES FOR SALE.

FIVE Per Cent. First Mortgage Debentures, well secured, in Provincial Gas Company.

Address No. 5243, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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By order of the Directors of the

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MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £2200 "D" CAPITAL GAS STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 24, at Two o'clock, in Lots.

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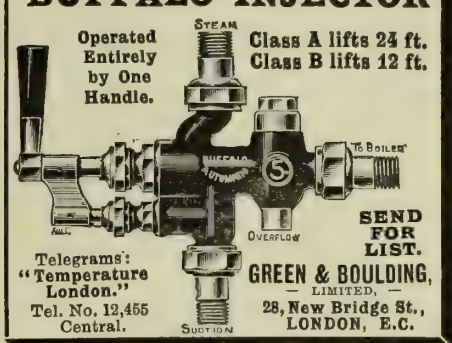
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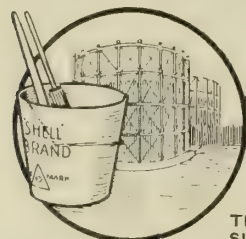
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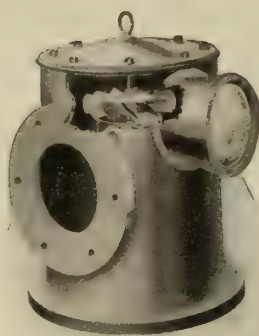
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Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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Telephone: No. 200.

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DISTRICT OFFICE: **6, STRAND, LONDON—C. PARKER & SON, Sole Agents.**

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GRAETZIN LIGHT

Important Improvements.



BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

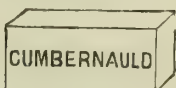
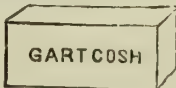
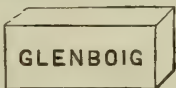
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

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The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.



Works: GLENBOIG, LANARKSHIRE.
Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas of Honour.

Highest Award wherever exhibited.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET, LONDON, E.C., September 21st, 1909.

DEAR SIR,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

| | Raw. | Fired. |
|--------------------------------|--------|--------|
| Silica, free | 3.03 | 3.49 |
| Silica, combined | 43.20 | 49.77 |
| Alumina | 36.55 | 42.10 |
| Ferric oxide | 1.80 | 2.08 |
| Titanic oxide | 1.90 | 1.50 |
| Lime | trace | trace |
| Magnesia | trace | trace |
| Alkaline oxides | trace | trace |
| Sulphates as trioxides | 0.92 | 1.06 |
| Loss on Ignition | 13.20 | — |
| | 100.00 | 100.00 |

PHYSICAL RESULTS.

| | |
|-------------------------------------|-----------------------------|
| Density | 2.65 |
| Volume weight | 1.90 |
| Porosity | 15.4 % |
| Linear shrinkage at 100° C. | 3.70 % |
| " " " 1050° C. | 4.76 % |
| " " " Total | 8.46 % |
| Volume shrinkage at 100° C. | 10.7 % |
| " " " 1050° C. | 12.6 % |
| " " " Total | 23.3 % |
| Plasticity | 20.0 % |
| Fire Stability | 1850° C. equiv. to 3362° F. |

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,
JOHN T. NORMAN.

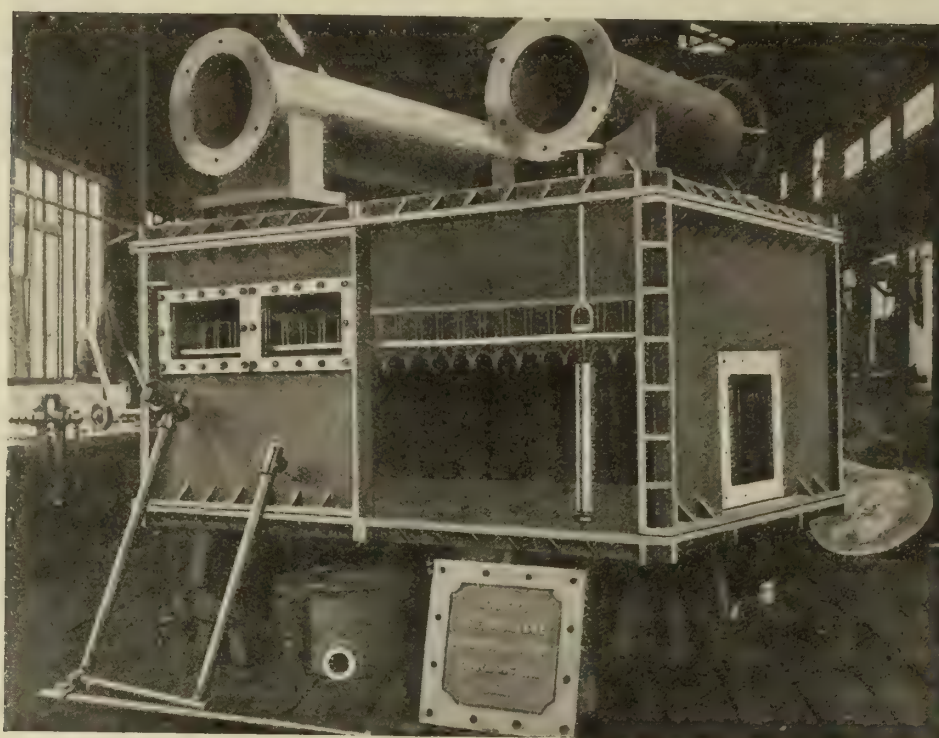
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Gasholders.

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Washer-
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Tanks.

Livesey Washer, in course of construction in our Works.

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And at 39, Victoria St., Westminster, S.W.

GASHOLDERS & STEEL TANKS

Carburetted Water Gas Plant.

DESSAU VERTICAL RETORTS.

Messrs. S. CUTLER & SONS are Contractors to the Vertical Gas Retort Syndicate, Ltd., for all Constructional Steel Work, Operating Gears, Fittings, &c., &c.

The DESSAU System has been adopted at over 60 Gas-Works and up to the present date 5238 Retorts have been ordered.

WATER TUBE CONDENSERS.

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OIL TANKS.

ROOFS.

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Every Requirement for Gas-Works Supplied.

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RETORT BUILDERS ON THE
INCLINED, HORIZONTAL, OR VERTICAL
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See Certified Results of the first Installation on this System
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COMPLETE WITH
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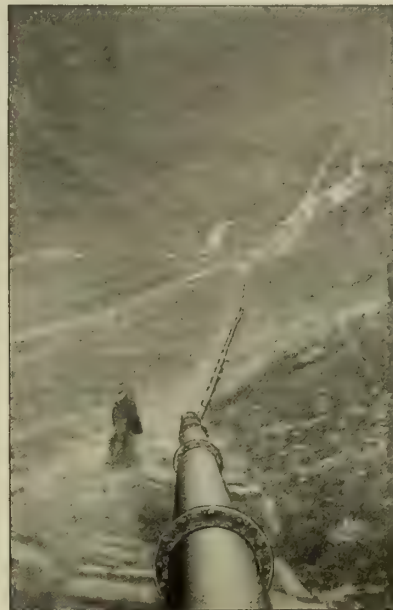
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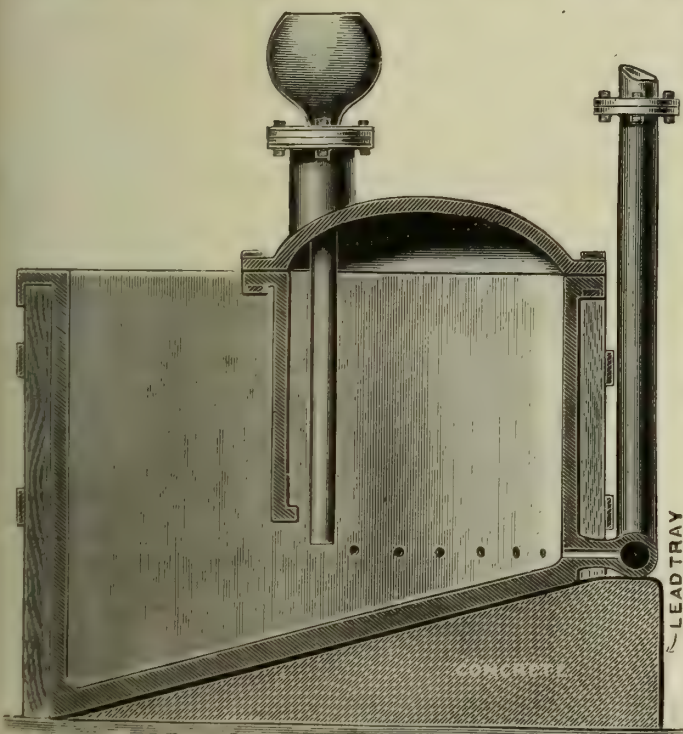


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CARBURETTED WATER-GAS PLANTS.

Aggregate Capacity of Plants supplied
231,600,000 cubic feet Daily.

SULPHATE OF AMMONIA PLANT



Section showing Williams and Fenner's Patent Outside Cracker Pipe
as fitted to our Solid Lead Plate Saturator.

Williams' and Fenner's Patent Saturator with Outside
Cracker Pipe, having the following

ADVANTAGES:—

1. Equal distribution of Steam and Ammonia.
2. Perfect agitation and boiling of the Acid Liquor.
3. No possibility of local Alkalinity.
4. Consequently no formation of Blue Salt.
5. Sulphate is easily forced to point of discharge.
6. No incrustation.
7. No renewals of Cracker Pipe.
8. Capacity of output greatly increased.

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

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Farm Steadings,
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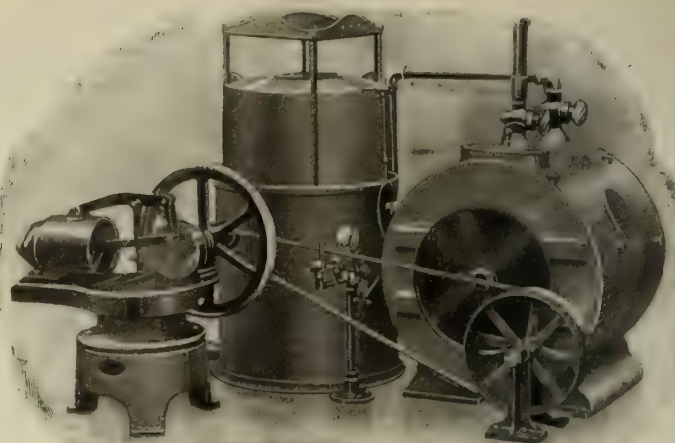
Plants from 100 cub. ft. per hour up to
50,000 cub. ft. per hour for Gas Works.

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NON-EXPLOSIVE and ECONOMICAL.

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SOLE MAKERS AND LICENSEES OF THE

"Simplex" AUTOMATIC GAS LIGHTER AND EXTINGUISHER.

Some of its Special Advantages are:

1. It is instantaneous in Lighting and Extinguishing without shock to Mantle, and can be set to its pre-determined times in a few seconds.
2. The Mechanism will act correctly, even though the Lamp-post and Controller be out of the perpendicular.
3. **THE VALVE.**—As this never leaves its seat, and the gasways being away from the seating, no impurities can collect between the valve and the seating, and by simply removing

a small cap, the gasways can be freed of Naphthalene or any other matter.

4. The leakage of gas into the Clock Mechanism and its resultant troubles are entirely done away with.
5. Vibration of any description will not cause the Mechanism to operate prematurely.
6. The "Simplex" Clock also has the advantage of a Lever Escapement.

PRICES AND PARTICULARS ON APPLICATION.

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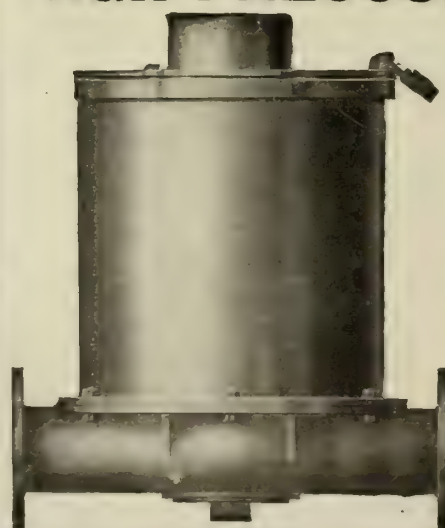
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HIGH PRESSURE MERCURIAL GOVERNOR



THIS Governor has been specially designed to work on high pressure mains, where these have been adopted, to effect the necessary reduction from the high pressure in the main to the low pressure required for normal working.

It can be supplied to suit any desired range of pressures; for example, the standard size reduces from 5 lbs. inlet pressure to ordinary low pressure. At the same time the Governor is correctly compensated and so accurately adjusted that, in the event of the main being temporarily used for low pressure distribution, it will work as an ordinary low pressure governor.

SIZES AND PRICES ON APPLICATION.

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EDINBURGH. LONDON. GLASGOW. LEEDS.

Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

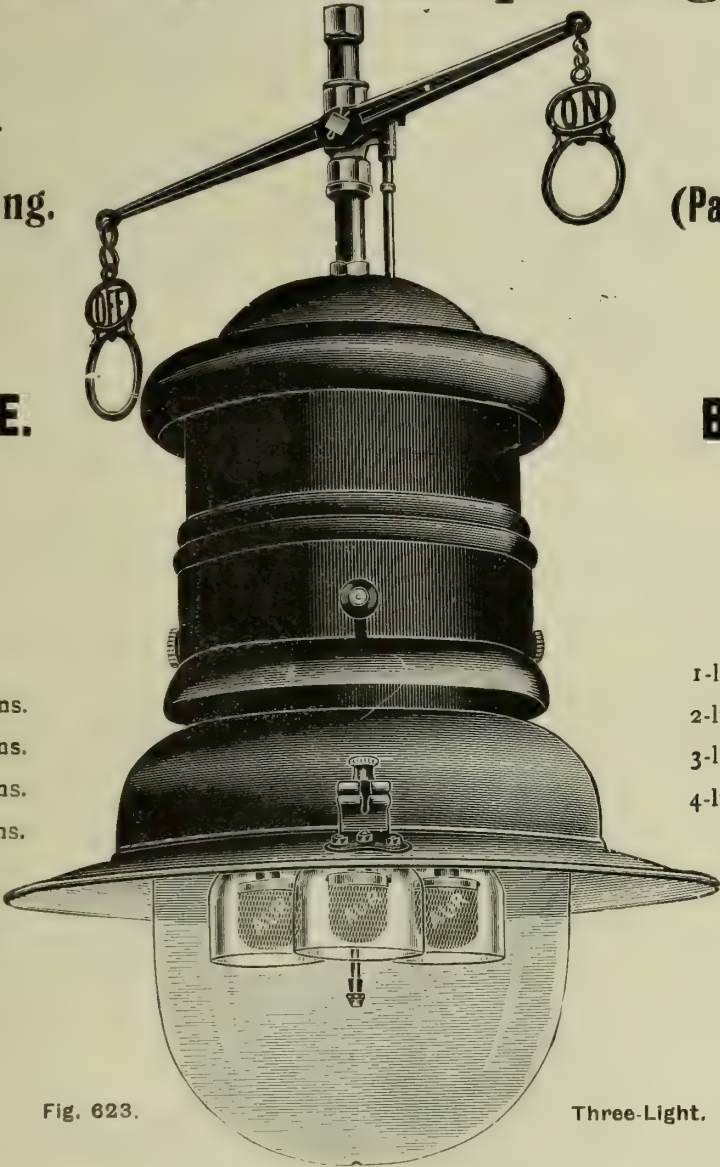


Fig. 623.

Three-Light.

Height over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 8 ins. |
| 2-light | . . . | 2 ft. 4 ins. |
| 3-light | . . . | 2 ft. 4 ins. |
| 4-light | . . . | 2 ft. 7 ins. |

Width over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in. |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

| | Gas per hour. | C.P. | Steel. | Copper Case. | | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
| 2-light | 8 feet | 260 | 47/6 | 6/- extra. | 4-light | 16 feet | 550 | 72/6 | 9/- extra. |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

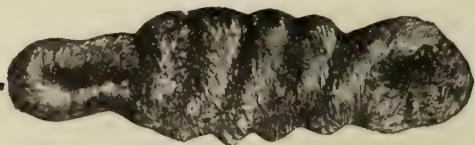
RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

| | 1-Light. | 2-Light. | 3-Light. | 4-Light. | | 1-Light. | 2-Light. | 3-Light. | 4-Light. |
|---------------------------------|----------|----------|----------|----------|----------------------------|----------|-------------------|----------|--------------|
| Clear Glass Globes, each | 2/3 | 5/9 | 5/9 | 9/- | Wired Globes, extra | each | 2/- | 2/- | 2/9 3/6 |
| " " " " In Case lots per dozen. | 19/6 | 57/9 | 57/9 | 93/- | Parabolic Reflector, extra | " | 3/6 | 6/- | 7/6 Not made |
| Case contains | 80 | 18 | 18 | 12 | Welsbach Mantles, each | 6d. | subject as usual. | | |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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Is sent out in Skeins all ready for use.
Every Skein of equal weight and length.
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Lead Wool requires no melting and can be used in water without risk.

Lead Wool Joints are Twice as Strong as Cast Lead Joints and cost 33½ per cent. less.

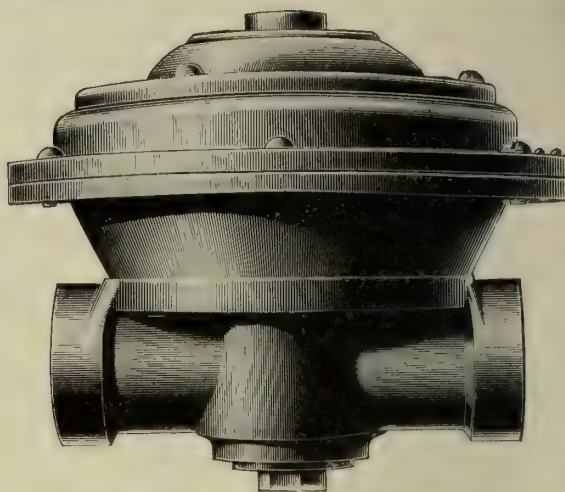
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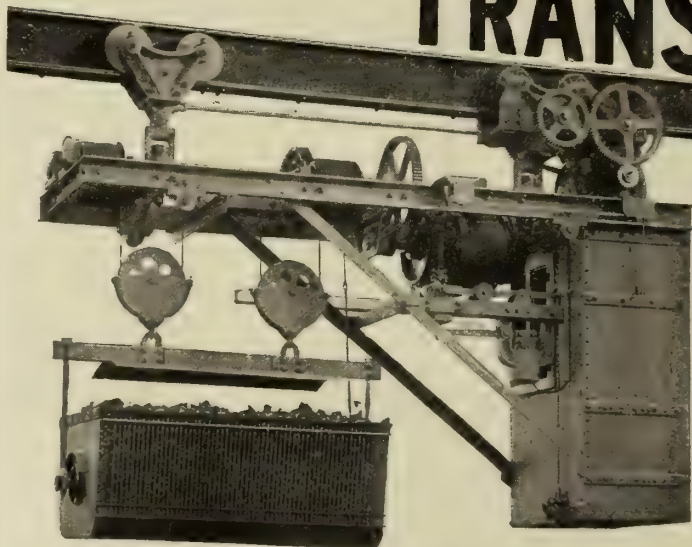
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Hundreds of Gas and Water Authorities have already adopted them; why hesitate? If you have any doubts on any point connected with their use, write us, as we feel sure we can clear them up. A trial will be even more convincing.

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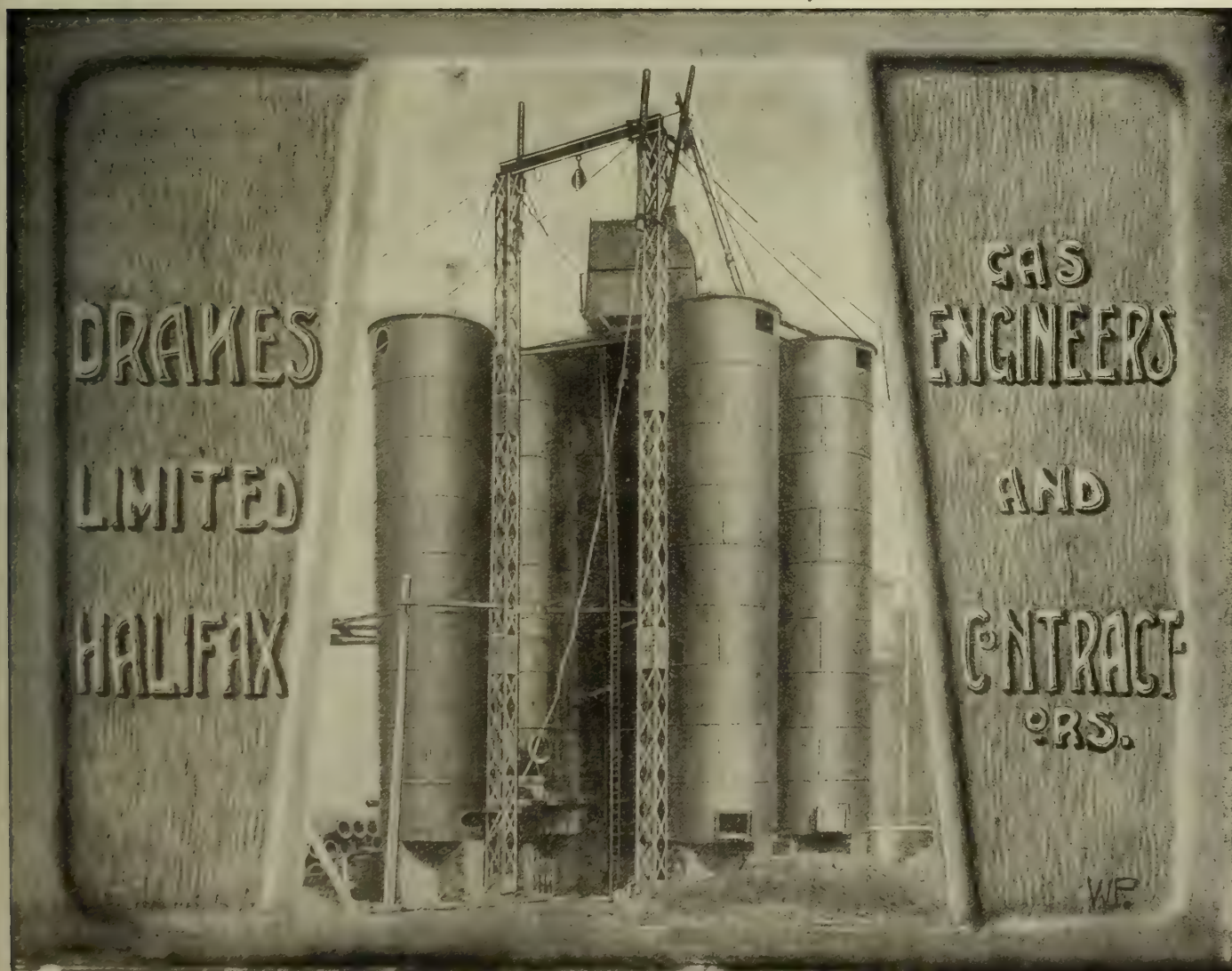
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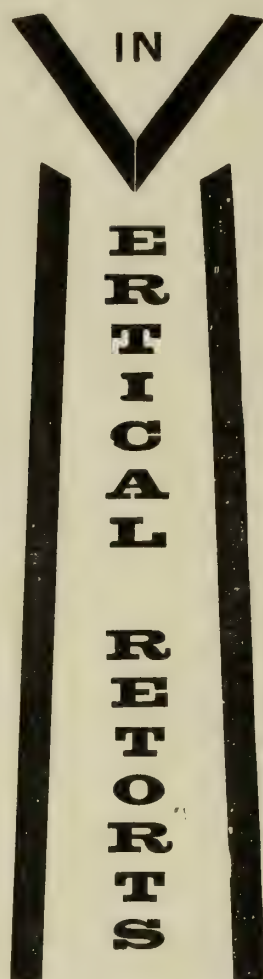
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PATENTS.**



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2 $\frac{3}{4}$ d. PER TON OF COAL CARBONIZED.

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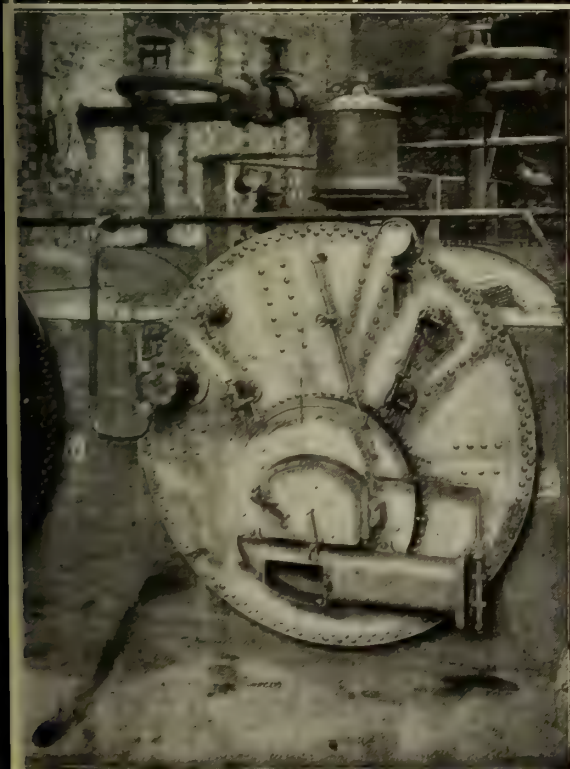
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GAS STOVE RENEWAL PLANT.
SAVE YOUR COOKERS.

Make them into **NEW ONES** with the
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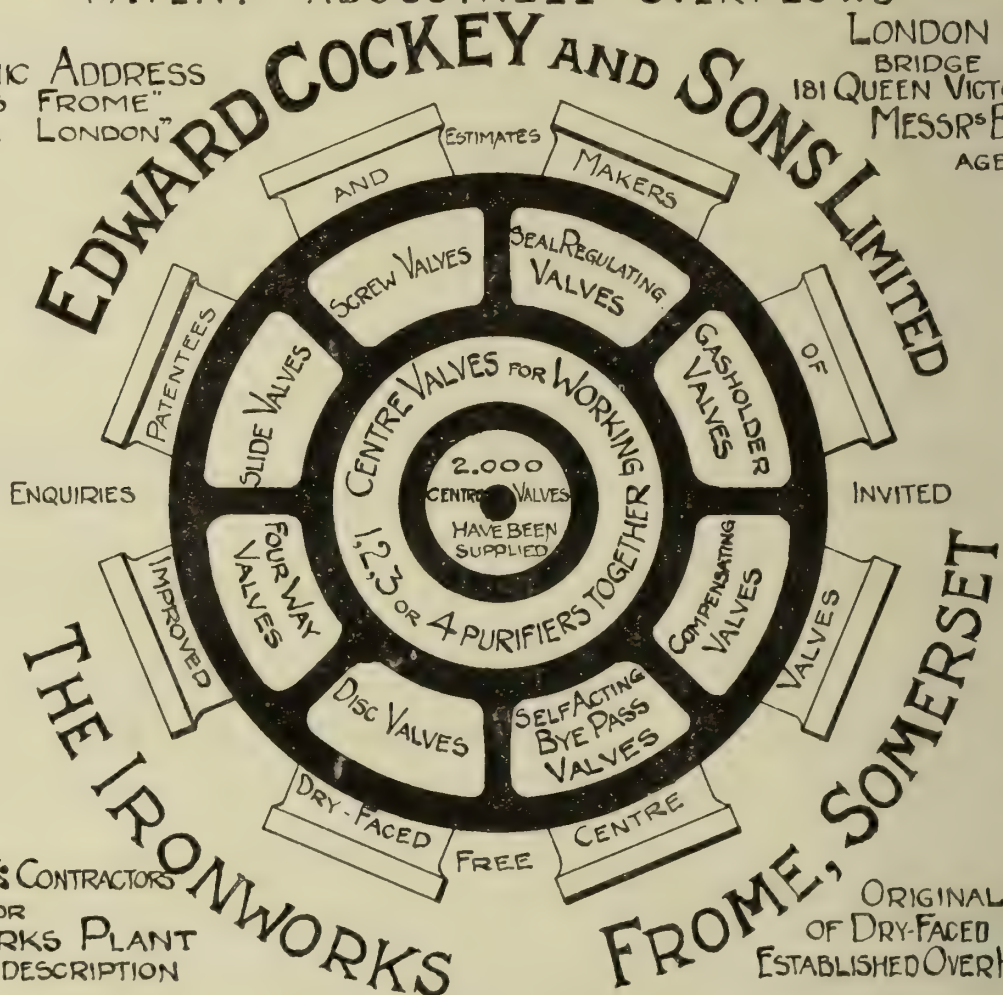
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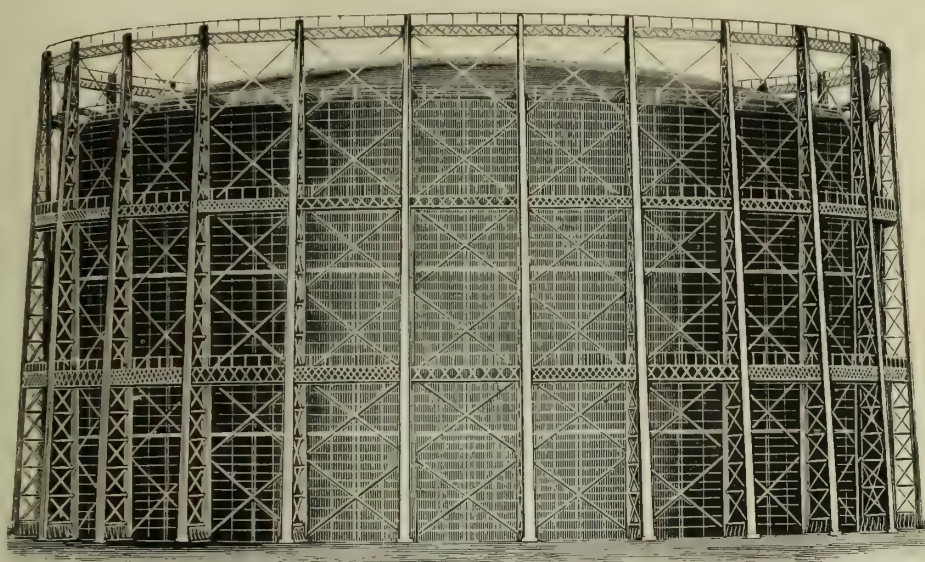
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PARK STREET, OLDHAM.

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Particulars on Application.

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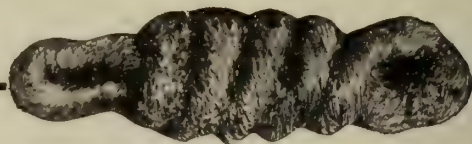
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Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way through.
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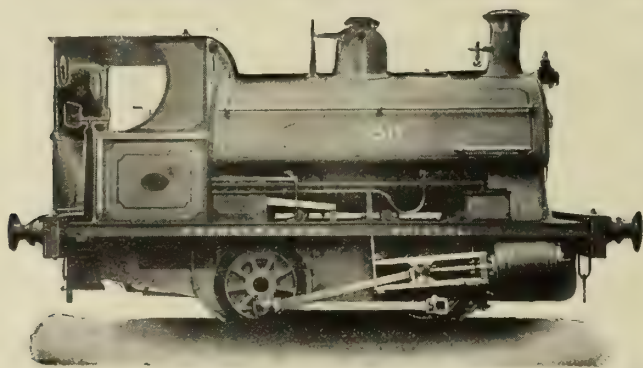
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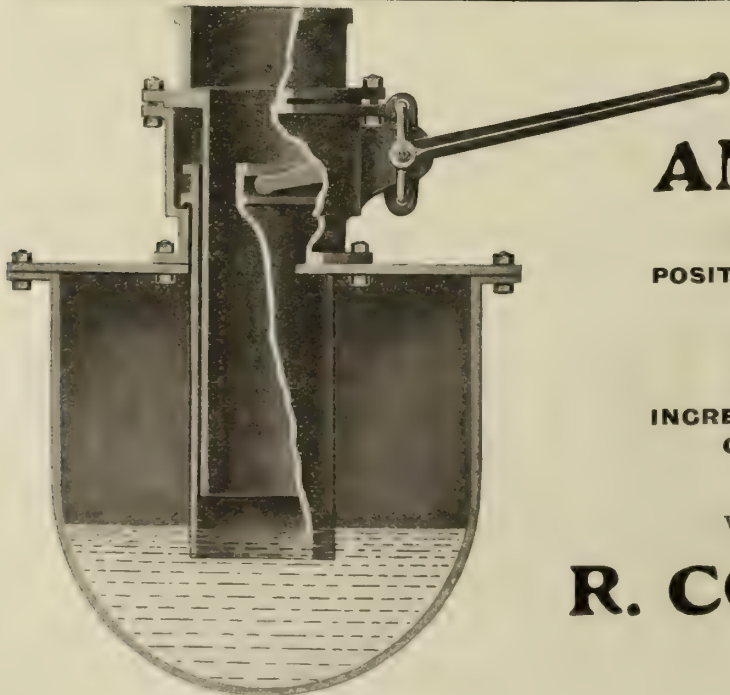
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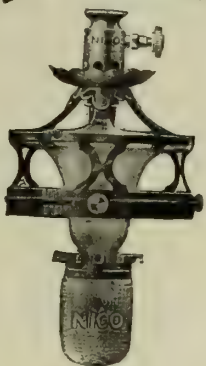
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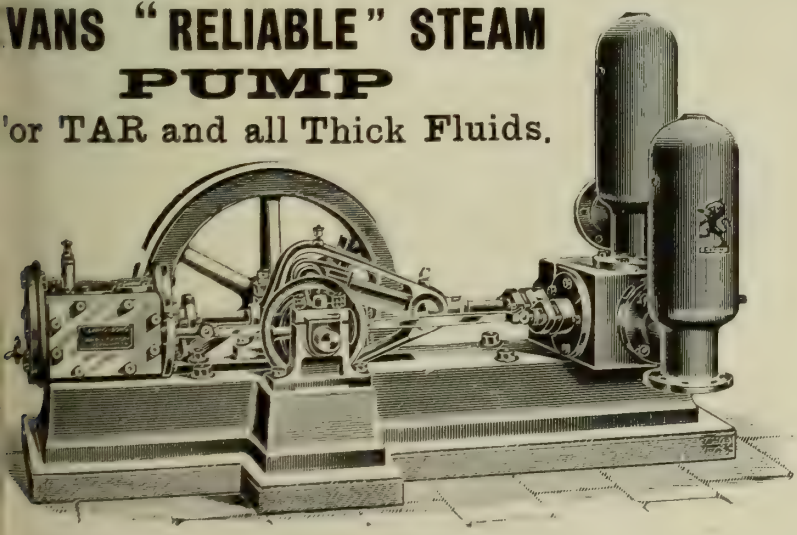
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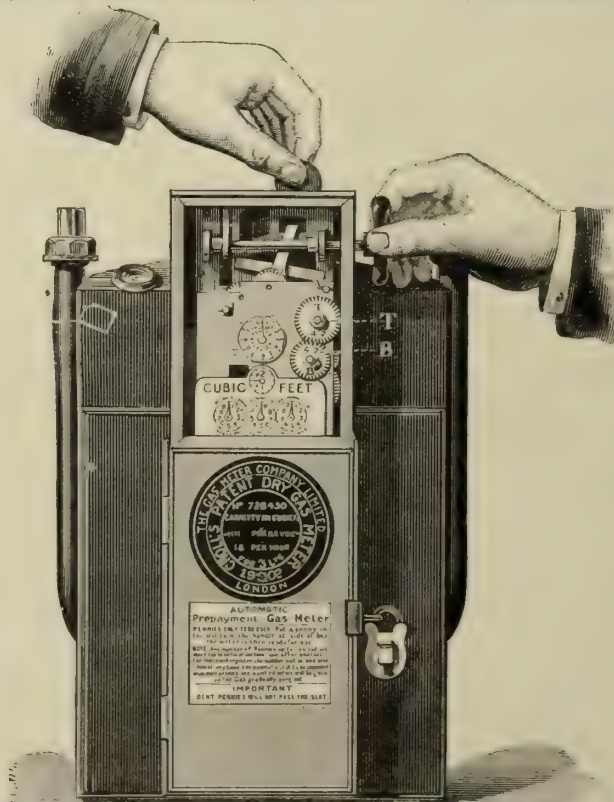
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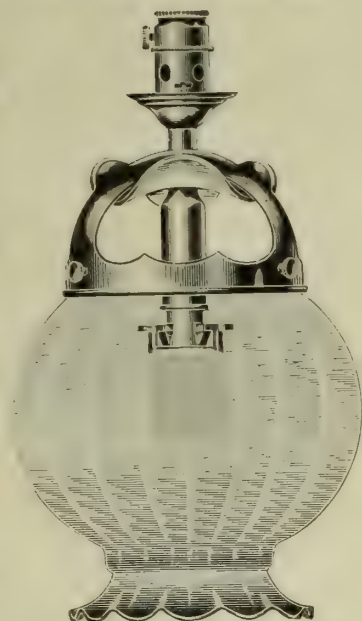
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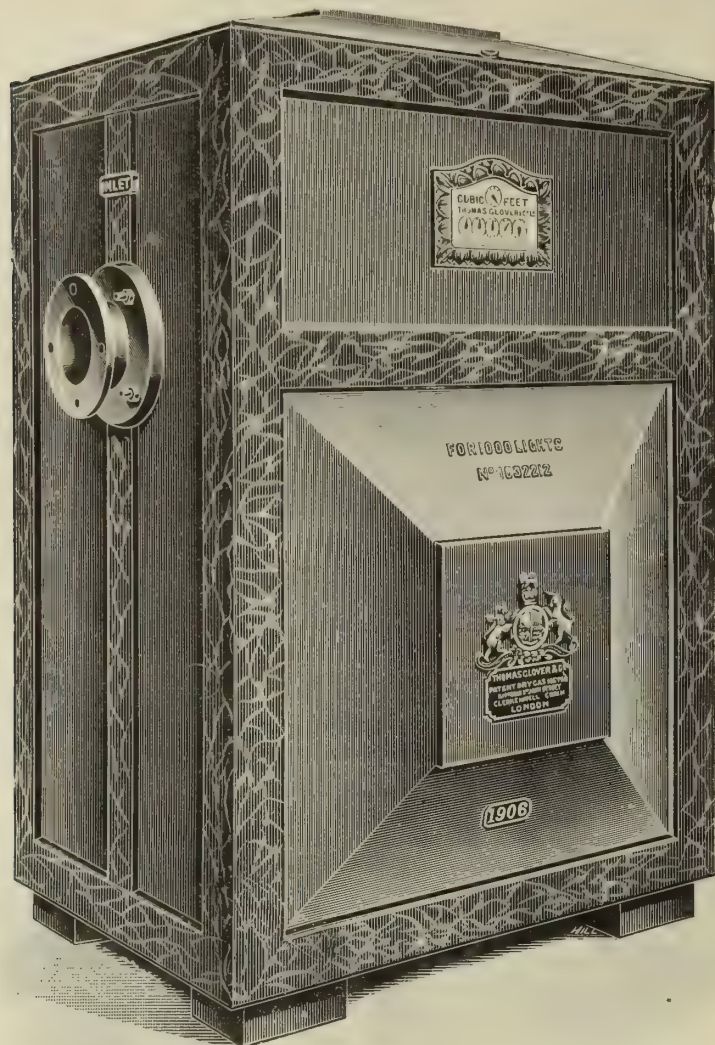
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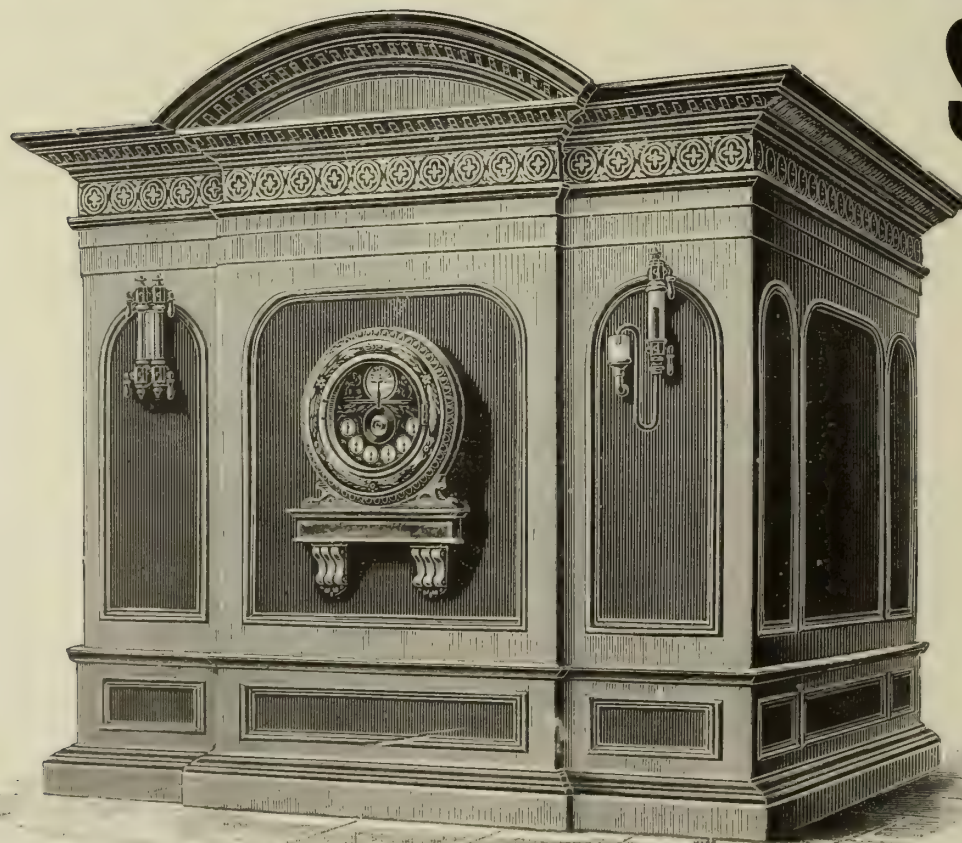
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VOL. CX., No. 2454.—TUESDAY, MAY 24, 1910.

EDITORIAL NOTES—GAS, &c.

The Livesey Fund and Professorship.

THERE need be no regret whatever that the Livesey Memorial Fund Committee have taken time to complete, with meticulous observance of detail, the work connected with the foundation and endowment of the Professorship of Gas Engineering and Fuel at the Leeds University. At the blush, the possession of the necessary money seems to make up all that was requisite for promptly giving effect to the intentions of the subscribers. But one has only to read the report made to the meeting of subscribers last Wednesday by the President of the Institution of Gas Engineers (Mr. James W. Helps), to see that there was much critical thought and difficulty that required discussing and composing; and one has only to read the draft deed in which the results of the conference, negotiation, and agreements were brought into essential and legal form by Mr. H. F. A. Hood (who is now acting as Hon. Solicitor in this matter) to see how carefully the present and future of the fund and its objects have been safeguarded, together with the interests of the subscribers on the one hand and of the University of Leeds on the other. The draft deed has yet only been provisionally approved by Professor Smithells on behalf of the University; and until it is formally ratified (as Professor Smithells has no doubt it will be) we cannot publish it.

There is not, however, the slightest reason why, bearing in mind that the document is subject to the confirmation of the Leeds University, some indication of its contents should be made; so that those subscribers who were not able to be present at the meeting on Wednesday may see that they have in it a very clear definition of respective rights and obligations and the means of protection in regard thereto. The definition and protection which the Leeds University Authorities were as anxious should be provided as were the subscribers to whom had been deputed the duty of giving expression to the wishes of the subscribers, and upon whom rested responsibility to the latter. In the first place, the money forming the fund is to be transferred into the hands of the University of Leeds; and it is to be invested in securities that meet with the approval of the Advisory Committee. This Committee is to consist of not more than 25 members, of whom one is to be the Pro-Chancellor, and another the Vice-Chancellor, of the University; and of the remainder not less than ten are to be nominated by the Institution of Gas Engineers and four by the Society of British Gas Industries. We have some little objection has been felt to the fund being completely transferred into the hands of the University Authorities; and that it has been considered that an *ad hoc* committee might have been formed, in order to retain greater control. But the money is not being placed in the hands of the University Authorities without being hedged in explicitly to use, and without power to put an end to the professorship if it is not calculated to promote efficiently the objects of the founders of the memorial. There are other considerations that influenced the Memorial Committee. All the endowments the Leeds University enjoy have been dealt with somewhat after the manner provided for in this particular instrument; and it must not be for a moment forgotten that here, in the authorities of the University, we have men of distinction and men concerning whose professions one would not waste the slightest breath in questioning. An important point, too, that must not be overlooked is that the income from the fund is only of an amount that is to be devoted to the stipend of the holder of the Professorship. The building in which, and the equipment with which, the work of the department will be carried on, have been provided from other sources; and there is, in addition, a considerable annual expense, amounting to many hundreds of pounds, incurred in prosecuting the work of the

department generally. But, as we have said, the deed will provide for putting an end to the Professorship if, in the Advisory Committee's opinion (as stated in a special resolution passed by not less than two-thirds of the members of the Committee present and voting at the meeting at which it is considered, and of which notice has been given), its continuance is not, to use the words of the deed, "calculated to promote efficiently the objects of the founders of the memorial—viz., the promotion of the sciences of gas engineering and fuel." Then, in such an untoward event, the fund would be transferred to such persons or corporation as the Councils of the Institution of Gas Engineers and the Society of British Gas Industries determine.

Some question was raised at the meeting on Wednesday as to whether the portion of the Advisory Committee representing the subscribers and the gas industry would be able, if necessary at any time, to obtain the requisite two-thirds majority. We do not regard the point as a serious one. It is not a two-thirds majority of the whole Committee that is required, but of those present at the particular meeting at which the special resolution is considered. As the President of the Institution says, putting an end to the Professorship is such a remote contingency that it is hardly necessary to contemplate it; and if—this is also a remote contingency—there is any violation of the objects of the endowment, it cannot be imagined that the University Authorities would not, with open and continued dissatisfaction assailing, be glad enough to lend their aid to end a condition of things that would be as objectionable to them as to those whose duty lay on the side of the subscribers to the fund and of the gas industry generally. But there is no need to anticipate any such difficulty; for prior to it arising, the Advisory Committee have such plenary powers in connection with the work to be done, that we cannot conceive, without dereliction of duty on their own part, any incomplete prosecution of the objects of the fund.

Over the work fulfilling the purposes of the fund, the Leeds University Authorities have (considering how comparatively small is the income from the fund to the total expenses of the department) given the Advisory Committee a very large measure of control. The appointment to the office of the Livesey Professor of Coal Gas and Fuel Industries will be made by the Council of the University, but on the nomination of the Advisory Committee. The duties of the Professor—Professor W. A. Bone enjoys the distinction of being the first occupant of the chair—are to lecture, teach, and examine on topics comprised in the general subjects of gas engineering and fuel. He is also to devote a reasonable amount of time to the research, investigation, and study of the subjects of gas engineering and fuel, and is not to hold any other professorship or any office which, in the opinion of the Council of the University, on the representation of the Advisory Committee, is at all inconsistent with the due performance of his duties as Livesey Professor. Further, a report is to be made to the Advisory Committee each year on the work done by the department, including the researches and investigations carried out. Having regard to this full measure of control, we feel that all concerned will agree that the Memorial Committee have done well, that the University Authorities have shown a large desire to meet the views of those to whom the subscribers to the fund entrusted its safe-keeping and proper utilization, and that Mr. Hood has taken comprehensive measures to ensure the strict fulfilment of objects and the guarding of interests.

In but a few weeks, the foundation and endowment will be complete; and the link will have been forged that will join the Gas Industry and the Leeds University. There will be mutual advantage in the research and training that will go forward there. But let there be no mistake. This advantage will not or cannot be of mushroom growth; it must be the fruit of long and laborious work and of the exercise of many talents. But come the advantage will, by reciprocal consideration, help, and confidence.

The Gas Demonstration at Shepherd's Bush.

IN a popular exhibition, such as the Japan-British, now being held at Shepherd's Bush, it would be a pity if gas were entirely unrepresented in some special way among the exhibits—not necessarily extensively, but in a manner to draw public attention. There are reasons for this, one of which is that where it is desired to outline buildings of the kind of those constituting the White City, electricity does come in very conveniently; and, in the eyes of the public showman, one has in that the *raison d'être* for giving in other directions preference to the illuminant that most readily serves the particular and chief purpose. At Shepherd's Bush, though electricity has a considerable application, for the general purpose of lighting the grounds high-pressure gas has a large innings, and on this occasion larger than ever before. This is satisfactory; but we doubt very much, with all the other attractions about the place, whether the ordinary visitor (unless he be specially interested) gives very much thought to the outside lighting other than that which expressly appeals to the eye through artistic display and unusual profusion. But gas has so many practical and useful applications other than that of mere spectacular effect, such as the outlining of buildings, that where such great numbers of people are gathered together from all quarters of the country, it would, as already said, be a pity if gas were entirely unrepresented in respect of these applications. In the gas industry we are learning more and more of the power of advertisement as an instrument in commercial competition; and that power has to be put to use more and more to bring to public knowledge the latest forms of gas application and utilization, and to delete the false impressions that are so sedulously fostered in the propaganda of our electrical rivals. Such work—some of it not honest—as our competitors have entered upon, cannot be dealt with in any passive way; and there must be activity of the most pronounced order to counteract it.

These are sufficient reasons—others could be readily presented in support if necessary—for being glad that a number of gas companies, chiefly London and Suburban, with a few farther afield (additional financial assistance would be greatly valued), have been enterprising enough to put into the Decorative Arts Section of the exhibition a building in which, amid picturesque surroundings, some of the advances in the methods of applying and utilizing gas are to be seen. Within the compass of their financial ability, the Committee in charge have done exceedingly well; and they here show how, in the interior applications of gas, much decorative and practical efficiency can be produced. The gas industry really suffers from an economical feature of its appliances. They are—save those that are cheap, nasty, and inefficient—from their very nature, durable; and they, after but little repair, continue in service through a long succession of years; the while almost imperceptible advances are being made that, in the aggregate, mean much from the points of view of efficiency and convenience. A demonstration such as that at Shepherd's Bush brings before the householder the considerable difference there is between his own gas appliances and those that are now offered for acceptance; and it also discloses to him how he can increase the comfort of his establishment by adopting some of the newer applications of gas—such as are seen in the kitchen and bath-room of the exhibit. We congratulate the Gas Companies' Committee upon the result of their labours; and we think they, at their inspection yesterday, will have thanked those of their number who have been taking an honorary executive part in the organizing work. More need not be said here, as a special article describing what is to be seen at Shepherd's Bush appears in this issue.

Parliamentary Position of Gas Bills.

OUR legislators are due to meet once again for work next Thursday. They have had a broken holiday under the most melancholy of circumstances. Reassembling chastened in spirit, there is little question that for a time the din of political strife will be much deadened by mutual consent. That is the feeling in the political air at the moment; and one and all must hope that, despite extremist dissatisfaction with any signs of a truce, our national affairs may be so ordered that there may, at this particular juncture, be a period of political concord. We can do with it.

When the Houses meet on Thursday, according to the arrangements made prior to the recess, the formal business

associated with Private Bills will at once be proceeded with—in fact, the day is the one fixed for the second reading in the Commons of the Standard Gas-Burner Bills, which are of capital importance among the gas measures regarding the ultimate fate of which there is still any doubt. All the Gas Bills that have survived have passed through the critical stages in the House in which they originated; and to the extent that one is able to judge, there will be very few that will be opposed in the second House. At the moment, we should point to the Standard Burner Bills and the Brighton and Hove Gas Bill as the only ones of first importance that are likely to encounter any serious or vehement attack. But we look hopefully to their successful issue, in view of what took place in connection with them in the first House. A very careful consideration of the relation of the present position of gas supply to the adoption of the "Metropolitan" No. 2 test-burner resulted in the Lords Committee passing intact the Standard Burner Bills; and a Lords Committee are not likely, in connection with the Brighton Gas Bill, to give the Brighton and Hove Corporation any concession upon that considered adequate by the Commons Committee. For the rest, there are some half-dozen Gas Bills regarding which it is still a little indefinite as to whether they will incur hostility in the second House. But we rather think from what has already transpired in connection with them, that they will go free. Parliamentary Committees have not this year been in the humour to have their time wasted over minor affairs, and they have discouraged vain repetition as much as possible. Those practising in the Committee rooms—Parliamentary Agents among others—have observed this trait; and their clients' interests it is recognized are best served by due respect for the obvious intention to make progress without allowing time-wasting, frivolous points to act as a drag. Our legislators will, after the experiences of 1909, want this year as much leisure as possible; and they mean to get through their public duties as rapidly as may be, dealing only with those matters that the Government, in the changed circumstances, may consider desirable. There is a goodly group of Gas Bills that are entirely unopposed, and the further progress of which will only be marked by the ordinary formalities. Of the gas measures that started on their course there have dropped out, through various circumstances, the Chipping Norton Gas and Electricity Bill, the Ammanford Gas Bill, the Mallow Company's Bill (the District Council Purchase Bill goes forward), the Maltby Bill, the Tipperary Bill, and the Whitland Bill.

The session so far has not been without its features of interest, as a very brief summary will remind. There has been the first contest over the Standard Burner Bills, with joint operations by promoters and opponents. This form of joint promotion does not meet with unbroken approval at Westminster. But the parliamentary authorities seem to have no objection to it; and it is certainly very convenient when to obtain what is commonly considered to be a useful piece of legislation, one of the Government Departments cannot be moved to introduce a General Bill to deal with it. In connection with the adoption of the new standard burner, the Brighton and Hove Company had, under their special circumstances, to relinquish 1d. of their standard price. The fight over their Bill brought up the question of water-rate restriction; and there was a peculiarly satisfactory incident associated with it. Dr. Haldane, who was a member of the Home Office Committee who reported on the question of limitation in 1899, was brought to Westminster by the Speaker's Order; and he gave it as his deliberate opinion that there was not so much reason now as there was a decade and more ago for any restriction, in view of the use of incandescent gas-burners and the voluntary restriction on the part of gas suppliers. Concerning the standard illuminating power, the Middlesbrough Corporation had (like the Bury Corporation last year) so far carried out its request for a 12-candle power standard. Calorific power is not being pressed by opponents. They see the futility of asking for a new standard of quality while one already exists. A Lords Committee refused to impose such a standard in the case of the Farnham Bill; the opponents' Corporations dropped their request in the Brighton case while very little was heard of it in connection with the Standard Burner Bills. But when Parliament or the authorities in their wisdom see fit to relinquish illuminating power as the standard of quality, then of a certainty calorific power will take its place. Capital redemption funds, under the peculiar circumstances of works abandonment, are

en allowed in the instances of the Brighton and Bishop's ortford Bills. Stand-by clauses are, following the precedents of 1909, again being obtained this session. We are a democratic age, when some people think there should nearer approach to equality. Parliament has conferred mplete equality upon the consumers in the area of the asgow Corporation gas supply, by disallowing any right the part of the Corporation to alienate any part of the s profits for the rates, and by stipulating that gas charges oughout the district of supply shall be uniform for like rposes. The coke-oven gas scheme of the Little Hulton strict Council is another among the interesting features the session.

The Gas Supertax.

re Glasgow Corporation have, we think, done wisely in iding to go forward with their Gas Bill, with the limita- ns and excision of powers imposed by the House of Com- ns, in respect of profit appropriation, charges, and rates for blic lighting. In some respects (as before stated), we con- sider the decision of the Commons Committee, in its relative ts, rather harsh. But in regard to the single question of fit appropriation, the position for Glasgow is not altered any serious degree; for the Corporation will not feel in y acute way the loss of a power that has been lying prac- ally dormant ever since they came into possession of it. hat we are hoping is that the repeated decisions showing iamentary disfavour to profit appropriation from muni- al adventure, will have a very salutary effect upon local iorities who dip deeply and without restraint into the ckets of those who—this applies more to gas undertakings n to any other form of municipal enterprise—patronize ir concerns. Look at the statement published last week m Birmingham as to the sums extracted from the gas sumers there—amounting last year, in the total, to 2,024. There is no justification for this sort of thing. t on the general question this we must say, that where right to profit appropriation is removed, it ought, in ice, to be replaced by a power to retrieve from the pro- of a concern—no matter its character if it is a trading —any contribution made by the local rates to liquidate its. Experience shows that such a provision would not the least irksome to municipal gas undertakings, though ight be to electric supply undertakings.

Last session there was some feeling, or perhaps we ought ay hope, in municipal circles that the action of Parlia- ntary Committees in restraining profit-taking was due not any preconceived policy, but to the fact that the Bills cted were unfortunate enough to come before Committees h a majority hostile to the practice of rate-relief from ey derived from a section only of the community who port by their custom a municipal service. And further t it was purely a coincidence that more than one measure uld have had limitation in profit appropriation inflicted a single session. Glasgow this session has commenced disabuse the municipal mind of any such notions. In s case, it is not only limitation, but an absolute wiping of all power to appropriate gas profits. This and the ord and Oldham instances of parliamentary restriction e direct from Westminster. But if further proof were uired that this is not a mere piece of transient caprice the part of Parliamentary Committees, it is to be found he recent decision of the Commission under the Private gislation Procedure (Scotland) Act, in the matter of the kalcady Corporation Order. In this it was proposed to e power to apply, if thought fit, the surplus profits of gas undertaking to the burgh general assessment. But Commissioners declined to allow the power.

For a certainty, past licentiousness in many towns in s matter has had something to do with this change of islative front in regard to the surplus profits of muni- trading; and so also, without doubt, have the inequalities ough profit appropriation) introduced by gas-supply ex- sion into the administrative areas of adjoining small iorities. Municipal authorities, among their speculations l surmises, have been putting the burden of responsibility the change in parliamentary attitude upon the active ity of the outer authorities in the cases of Salford, ham, and Glasgow. But Kirkcaldy makes that alto- her insufficient. In this instance, the gas supply district ot terminal with the burgh boundaries; so that there is question arising with authorities in out-districts. We k to Lord Kintore, the President of the Commission, for explanation as to the reason for profit disallowance;

and he says: "You have electric light coming on more and "more; and the people who consume gas are generally poor "people, and any surplus should go to gas purposes." We do not agree that Lord Kintore selected the most apposite expression in the word "generally;" but what he says is enough to satisfy us that Parliament has taken a very broad view of this matter. And the broader their view, the more will they see the wrong of gas profit appropriation in aid of the rates.

In this Kirkcaldy case, there was another question raised, and an argument advanced, that has rather a striking bearing on this point as to the transference of gas profits to the relief of the rates. Counsel for the promoters asked for some concession in the matter of the period of loan repay- ment; and he pleaded for this in the name of the gas con- sumers, who, he said, had to bear the heavy end of the burden. He recounted the financial obligations of the gas consumers in regard to interest and sinking fund, and (he might have added) upkeep of works and local rates. Now why this appeal on behalf of the consumers if they are in a position to afford (as the Corporation apparently considered they were) to contribute something, beyond their own rates and those paid by the gas undertaking, in aid of the local exchequer? To put another question suggested by Coun- sel's argument. Why should the gas consumers discharge all the financial obligation, and then pay tribute to the rate- payers, who, *quā* ratepayers, have done nothing towards bearing the burden, and many of whom have not contributed a penny piece to the profits?

William Young Memorial Lectureship.

In the "JOURNAL" for March 22, we made an appeal for the necessary funds to enable the North British Association of Gas Managers to establish a Memorial Lectureship to perpetuate the memory of that ardent worker and contributor to our know- ledge in the chemical and physical branches of carbonization. The sum of £600, it was considered, would suffice for the purpose; and, although the Committee who have the matter in hand, and the Hon. Secretary and Treasurer (Mr. Alex. Bell, of Peebles) are well satisfied with the response so far, there is yet a balance to make up—a balance which would represent a considerable amount to an individual subscriber, but by a number of small subscriptions could be readily furnished. We do earnestly ask that this balance be contributed freely and promptly, by remitting the necessary subscriptions to Mr. Bell. Readers will gather the position from the first list of subscribers published in another column. From this it will be observed that £357 has been sub- scribed. It is probable that from the North British Association funds 100 guineas will be forthcoming; so that, roughly speaking, about £140 more is needed to carry out the scheme. To learn that this £140 had been subscribed freely and promptly, on this intimation of their want for completing the fund becoming known, would give our friends northward the utmost gratification.

The Belfast Gas Managership.

It will be seen from the advertisement columns of this issue that the Belfast Corporation are asking for applications for the position of Engineer and Manager of their gas-works, which has become vacant through the sudden and deeply regretted death of Mr. Robert Sharpe, who had held the post since the retirement of Mr. James Stelfox a few years ago. Of course, the erection of new works which is, judging from the amount of discussion that has been taking place in the city, seriously contemplated, lends additional interest to the selection of a fresh head of the work- ing department at the present juncture; and, in this connec- tion, attention may be drawn to a debate in the Council last week, the main portions of which we to-day reproduce. The Gas Com- mittee stated that "in view of the pending extension of the under- taking, and the duties and responsibilities which will consequently devolve upon the holder of the position, the Committee are of opinion that a highly qualified and experienced gentleman should be appointed as Gas Manager and Engineer, and the remunera- tion of the office fixed at £800 a year, rising with four annual increments of £50 to £1000, with free house and gas." It was in respect to the latter portion of the recommendation that the discussion arose; many members of the Town Council being of opinion that no salary should be mentioned in asking for applica- tions, but that candidates should be invited to state on what

terms they would accept the position. The mover of an amendment to that effect put this view of the matter clearly when he remarked that "they felt that they must get the best possible man to be obtained in Great Britain or Ireland; and, in order to do this, they must not say what salary they would give, otherwise they might keep out applicants who might come for a larger salary than was now being offered." This, in the event, proved to be the opinion of the majority of those present; for the amendment was carried. Considering all the circumstances of the case, the decision is to be commended; and we cannot think that the Corporation will have cause to regret having come to it. This expression of opinion, however, must not be taken to apply to all cases of advertisements for applications for the position of gas manager. Leaving candidates for a post to name their own salaries may, of course, sometimes be taken to mean that the lowest offer will be first considered; and that is certainly not a desirable method of securing the services of a suitable officer. But in the case of Belfast no such consideration applies. It is for the purposes of securing the best man, and not the cheapest, that the question of remuneration is left open; and this is a very different thing. One member seemed to think that even the £800 at first suggested was too much to pay, and expressed the opinion that "gas managers were as big a drug on the market as lawyers." His view was not supported by other members; and, in regard to it, the remark may be made that, however numerous the lawyers may be, that profession offers many prizes, and there is no reason why gas engineering should not have its prizes too. One clause in the advertisement states that "candidates should be competent to design and superintend the erection of gas-works of the most modern type." Should not this justify the Corporation in considering the Belfast appointment a prize, and treating it accordingly?

Gas Profits and the Rates at Nottingham.

Nottingham ratepayers have substantial reason to be thankful for their possession of municipal trading concerns, and particularly of the gas undertaking, which comes again to the relief of the rates at a time when local burdens are already sufficiently onerous, and when also trade is not of a particularly robust character in many of the departments on which the city mainly relies. Heavy as it is, the burden would be greatly aggravated but for the revenue-earning branches of Corporation enterprise as represented by gas, electricity, and tramways. Faced by the demands for a much larger sum to meet the total requirements of the ensuing financial year—a contingency for which increasing expenditure on educational arrangements has been largely responsible—there appeared no possibility of avoiding an addition of 2d. in the pound to the district rate. But recourse has been had to the gas undertaking, the skilful management of which is illustrated by larger profits, despite diminished consumption; and instead of £31,000, as originally proposed, it was decided at yesterday's meeting to allocate £35,000 from the earnings, which renders it possible to do with only 1d. in the pound increase on the rates. Thus the gas-works contribute nearly half the £71,000 which is being taken this year from the three principal trading undertakings. It was not so long ago that there were certain quidnuncs in Nottingham who were busy in their criticism of the management of the gas undertaking. But, in the light of results, the erstwhile opponents of the Engineer and General Manager (Mr. J. H. Brown) have for some time been diplomatically silent. While the ratepayers in general have reason for satisfaction at the help which is thus forthcoming, gas consumers have special reason for gratification at the announcement of the intention of the Gas Committee to reduce the price by 2d. per 1000 cubic feet—from 2s. 6d. to 2s. 4d.—which is alike equitable and warranted by the fact that the profits last year were £54,000, or £3000 more than in the previous year, despite the lessened consumption.

An Enterprising Small Gas Company.

The Bideford Gas and Coke Company have well marked their three-quarters of a century of history by the attainment of a record position in the profession. Though the concern remains among the smaller gas undertakings (for the town is not one which grows rapidly), the Company are prosperous and progressing. As will be seen from a report which appears elsewhere, in their 75th year they have remodelled their works, reduced the

price of gas, and paid a dividend on their original shares of 12½ per cent. As in larger communities, the reduction of the price had its reward in a considerable consumption of gas; and there seems no reason to doubt that a still larger measure of prosperity may yet be enjoyed by the Company. In connection with this event in the Company's history, there has been unearthed an advertisement which was issued to the public of Bideford in 1848, when gas was far less in use there than it is now. It reads somewhat strangely nowadays.

The Directors of the Bideford Gas and Coke Company beg to remind the inhabitants of Bideford of the very low price at which gas is now supplied—viz., 7s. 6d. per 1000 feet. The Directors calculate on a very considerable extension of private lights, having procured from the manufacturers a stock of fittings, consisting of pillars, brackets, burners, ties, for which their charges are very low. Meanwhile, and to ensure security and neatness in their fitting, they have engaged experienced workmen in that department. This arrangement, made to facilitate the introduction of gas into private houses as well as shops, they hope will be fully appreciated.

The Company were evidently enterprising in those days as in these. Gas has since then been reduced from 7s. 6d. to 3s. per 1000 cubic feet; and the Company have thus more scope than ever for appealing to the public, on the ground of low price to use it in their private houses. There is still business to be done in fittings, especially in connection with the use of gas for cooking and heating.

Association of Water Engineers.

The fifteenth annual general meeting of the Association will be held at York from the 2nd to the 4th prox., under the presidency of Mr. W. H. Humphreys, Assoc.M.Inst.C.E., the Engineer and Manager of the York Water-Works Company. We learn from the circular issued by the Secretary (Mr. Percy Griffith) that the business meetings will be held in the Lecture Theatre of the Yorkshire Philosophical Society's Museum, where, on the opening day, the members will be welcomed by the Right Hon. the Lord Mayor of York (Alderman James Birch, J.P.). The programme will include the presentation of premiums awarded by the Council for papers read during the year 1909. They were noticed in the "JOURNAL" for the 19th ult. (p. 173). The following papers have been promised for reading and discussion: (1) "Reservoir Orbits," by George N. Yourdi, M.Inst.C.E.; (2) "Notes on Color of Waters," by Dr. Ad. Kemna, of Antwerp; (3) "The Effect of a Sinking Head on Large Castings," by Thomas Kennedy; (4) "The Wellingborough Water-Works and Softening Plant," by E. Y. Harrison, Assoc.M.Inst.C.E.; and (5) "Observations on the Permanency of Overflow Springs," by Henry Preston, F.G.S. A discussion will also take place on the Water Supplies Protection Bill now in Parliament. On the afternoon of the first day, visit will be paid to the York Water-Works at Acomb Landing, which will be inspected under the personal guidance of Mr. W. H. Humphreys, who has prepared a description of them which will be distributed at the meeting. The following afternoon, the members will inspect the Leighton reservoir and other water-works of the Corporation of Leeds, under the conductorship of the Water Engineer (Mr. C. G. Hensell, M.Inst.C.E.). Some descriptive particulars of these works will be circulated among the members taking part in the visit. The annual dinner will be held on the evening of the first day; and it is announced that the Lord Mayor of York and Alderman Sir Joseph Sykes Rymer, J.P., the Chairman of the Water Company, will be present. Ladies will be cordially welcomed at the meetings and visits.

The death occurred on the 17th inst., at Crownpits House, Godalming, of Major Philip Cardew, late of the Royal Engineers, whose name was at one time frequently mentioned in our columns in connection with electric lighting affairs. In 1888 he was appointed Electrical Adviser to the Board of Trade, and held the post till 1899. The deceased was in his 59th year.

According to the American Consul at Erfurt, experiments have been made with preparations of coal tar for the treatment of road surfaces for the prevention of dust. Though recognized as an improvement, the expense connected with the employment of these preparations has stood as an objection to their general use, and the experiments were continued for the purpose of producing a more ideal and cheaper composition. One of the results is the preparation of a substance named "Apokonin," which has been pronounced by some technical observers as the best and most lasting road covering yet brought out. The process for its production is secret; but it is known that coal-tar oils are the main ingredients. The heavy, penetrating qualities of the oils give great binding power to the composition. This, together with the pressure applied, produces a formation which is stated to be unlike in its consistency—making the surface of the road, it is claimed, so smooth and hard that snow and rain cannot penetrate it. Another important advantage ascribed to the material is that the creosote present in the coal tars and the high temperature of the composition, when applied, combine to destroy all the bacteria in the dirt—thus preventing the spread of disease from particles that may be ground and blown off the surface.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 515.)

In the days of mourning to which all London devoted itself last week, the universal lamentation was paramount to all other considerations; and, equally with other business centres, the Stock Exchange felt the hush of sorrow. But looking beyond the tribulation of the day to a brighter morrow, the markets were full of confidence and hope. When business was resumed on Tuesday after the Whitsuntide interval, things were necessarily quiet. There were still many absentees, and a further broken week was in prospect; but a firm tendency was at once apparent. Home Government issues were in demand; Consols rose $\frac{3}{16}$; Railways were strong and still advancing; and more speculative lines were mostly fair. On Wednesday, business was, if anything, quieter still; but there was no lessened strength. The gilt-edged class were steady; Railways were more than holding their own; and the tone in the Foreign Market was good. Quiet continued on Thursday, and markets maintained their strength. Consols rose $\frac{1}{8}$, and the leading departments were strong, while Americans took a favourable turn. On Friday, all business and all pleasure was suspended, that every man might pay his tribute of grief and affection to a dead King who had loved his people as none other perhaps had ever loved before. On Saturday, the affairs of men again claimed their toll of attention; and all markets were calm and confident. In the Money Market, there was a considerable demand for money all through the week, actuated to a great extent by tax collection, and discount rates were harder. Business in the Gas Market was very light, as might be expected, and there was hardly any change—two advances in minor issues being all the variation in prices. In Gaslight and Coke, the ordinary numbered something less than a dozen transactions; and they were done at figures ranging from 103 $\frac{1}{2}$ to 104 $\frac{1}{4}$ —practically the same as the week before. The secured issues showed dealings in the maximum at 89, in the preference at from 105 to 105 $\frac{3}{4}$, and in the debenture at from 82 to 82 $\frac{1}{2}$. A few bargains in South Metropolitan were marked at 120 $\frac{1}{2}$ and 121 $\frac{1}{2}$; and the debenture realized 81 $\frac{1}{2}$ and 82 $\frac{1}{2}$. One transaction in Commercial 3 $\frac{1}{2}$ per cent. figured at 104 $\frac{3}{4}$. Among the Suburban and Provincial group, Brentford new changed hands at 189 $\frac{1}{2}$, South Suburban at 121, and Southampton at 11 $\frac{3}{4}$ —a rise of 2. In the Continental companies, Imperial was steady at 177 to 178 $\frac{1}{2}$, ditto debenture marked 95 $\frac{1}{4}$ and 95 $\frac{1}{2}$, Union 98 $\frac{1}{2}$ free, ditto preference 138 $\frac{1}{4}$ free, European fully-paid 14 $\frac{1}{2}$, and ditto part-paid 18 $\frac{1}{2}$ and 18 $\frac{3}{8}$. Among the undertakings of the remoter world, Cape Town mortgage realized 49 $\frac{1}{4}$, Primitiva from 7 $\frac{1}{8}$ to 7 $\frac{1}{2}$, ditto preference from 5 $\frac{1}{4}$ to 5 $\frac{7}{16}$, River Plate debenture 99 $\frac{1}{2}$, San Paulo 15 $\frac{1}{4}$, and ditto preference 12 and 12 $\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

Injustice in Tendering and in Local Government—Insane Municipal Competition—Periodical Wiring Reinstallation—Flame Arcs and High-Pressure Gas-Lamps.

CERTAIN of the electrical papers were complaining bitterly the other week of what they, in their charity, chose to regard as the vile tactics of the Gaslight and Coke Company in making use of the most up-to-date and economical lamps, and securing a big street-lighting contract in open competition with electricity. This, as readers are aware was in a district in which Company met Company in business rivalry, and where, whatever was done in the matter of price, was at the respective Companies' own risk, and not at the expense of ratepayers or any municipal electricity undertaking. But where there is municipal ownership of the electricity concern, the chance of gas companies competing for the public lighting service on fair terms is becoming daily more shadowy; and the only advantage accruing from the competition appears to be that the ratepayers are, in one way, defended by the gas tendering pushing the cost of the service by the electric department down to the lowest possible price, or rather to an impossible price so far as profit is concerned—thus causing the service to be really of no financial benefit to the electricity undertaking, especially as it comes upon it at the very peak of the private lighting load. Hampstead illustrates the sort of treatment that gas as a competitor is just now subjected to through municipal ownership of electricity supply. There has been a progressive price competition between the Gaslight and Coke Company and the Lighting Committee of the Borough Council under circumstances that are opposed to all fair and legitimate dealing, that are about as unjust as it is possible to conceive, and that are a blot on local government. We should dearly like to hear how any member of the Council engaged in commercial pursuits would like to be subject to similar conditions in his competition for business. They would be the certain death of all competitive business. The Gas Company submit a tender for the lighting of the borough; and it is promptly referred to the Lighting Committee for consideration. The Committee cogitate over the matter, with the prices of the Gas Company before them; and then prepare and submit a tender themselves for electric lighting, and recommend that it be adopted. Simple, is it not? Then the Gas Company, with right on their side, make an amended offer. The same process is again gone through. The Lighting

Committee proceed to "sit on" the Company's tender in a double sense, with the result that they again hatch a tender that has financial similitude to that of the Gas Company, and even *prima facie* an ultimate superiority, until the figures are closely examined to ascertain their true value. But this is what has been evolved, in the way of price undercutting, through this process of municipal dishonesty. Particularly observe the dates, the length of the contracts for electricity compared with gas, the final prices per lamp, and the total costs of lighting the borough:—

| DEC. 20. | | FEB. 24. | |
|-----------------------|--------------|--|--------------|
| Inverted Gas-Burners. | Contract. | Metallic Filament Lamps. | Contract. |
| £2 19 10 .. | Five years | £2 19 6 .. | Eight years |
| 2 15 8 .. | Subsequently | 2 0 2 .. | Subsequently |
| MARCH 16. | | AFTER MARCH 16. | |
| Minimum 60-c.p. | | Two 35-Watt Lamps. (50-c.p. the Pair.) | |
| £2 5 0 .. | Four years | £2 5 0 .. | Eight years |
| 1 19 6 .. | Subsequently | 1 13 6 .. | Subsequently |
| — | — | Four 35-Watt Lamps. | |
| — | — | £3 5 0 .. | Eight years |
| — | — | 2 13 6 .. | Subsequently |

Total Cost of Lighting the Streets under the Above Proposals.

| DEC. 20 OFFER. | FEB. 24. |
|-----------------------|--------------------------|
| Inverted Gas-Burners. | Metallic Filament Lamps. |
| £6692 to 1915 | £6655 to 1918 |
| 6226 Thereafter | 4493 Thereafter |
| MARCH 16. | LATER. |
| £5033 to 1914 | £5033 to 1918 |
| 4418 Thereafter | 3747 Thereafter |

It will be observed, from the final figures submitted for electricity, that the Lighting Committee quote exactly the same price as the Gas Company, per lamp standard per annum, for an eight years' contract (before dropping to a lower price), and for a 50-candle power light; the differences in favour of the Gas Company being that their contract is for four years, with then a drop to a lower price, and a minimum 60-candle power light per standard. The figures mean that practically a whole twelve years have to elapse before the Borough Council secure any financial advantage (on the submitted figures) from changing over to electric lighting; and who knows, with the changes that are being made in gas supply and lighting, at how much less cost—maybe long before twelve years have expired—the Gas Company will be able to supply a minimum 60-candle light? Under the Gas Company's offer at the end of four years, the Council would at once begin to save £615 a year; while with electricity they will have to go eight years before obtaining the financial advantage from decreased cost. The gain to the borough in the four years from the reduced expenditure for gas would be £2460. Utilizing this with the interest would (as already said) carry the Gas Company through a further four years, or in all from the beginning of the contract twelve years, before electricity would show any financial advantage on the present tendered prices for electricity. And all this time from each lamp standard the Gas Company would be giving a light superior by 10 candles to that of the Lighting Committee's electric lamps. Truly; municipal trading in electricity is driving from the business in public lighting all commercial soundness and security. The only good thing that can be said for the Hampstead Council is that by a majority of 1 (please, Mr. Printer, put the 1 in a black type to emphasize the fact that there is a little morality left in the Council yet), on a vote of 35 members, it has been decided to let the Gaslight and Coke Company put up a trial installation of twenty inverted gas-burners. But of what avail will this be under the circumstances related? We shall be pleasantly surprised if, under such spurious local government conditions, the Gas Company succeed in pulling off this contract. The least the Hampstead Council might have done, if they have any sense of administrative decency and justice left, would have been to have invited tenders from the Gas Company and the Lighting Committee, and referred them to a Committee unidentified in membership with the Lighting Committee. After this, the electrical press will be discreet if they maintain silence about the "tactics" of gas companies.

We turn from London to the Provinces, and take from many that are available an example or two of the lengths to which municipal ownership of electricity supply will induce those who are appointed to administer local affairs with economy and efficiency to go, in order to push gas companies out of the street lighting. Take Harrogate. There the Town Council have decided to convert 500 gas-lamps to electricity. We know nothing about the relative candle power or the hours of lighting; but it is reported that it has been found that, by substituting electricity for gas, there will be a substantial saving. We are not surprised when we go on to read that "the cost per post to be charged to the Lighting Committee for a 50-candle power lamp, including renewals and accessories, is 17s. per annum—the lamps to be extinguished at midnight." Perhaps this is not the whole story; but it is all that is vouchsafed in the electrical press. If it is complete, then the 17s. is not a price that has any identity with a commercial transaction. It is a matter upon which we should like to hear something from our gas friends at Harrogate. We turn to Yarmouth. There the Corporation have in hand, as will be remembered, a big scheme of lamp conversion on the instalment plan, despite the protest of the Local Government Board. When the Eastern Counties Gas Managers' Association were in Yarmouth recently, they saw something of the character of the electric arc lighting in the town; and to say that it was nothing short of disgraceful is not a jot too severe. It is now learned that there

are 186 of these gloomy-looking arc lamps in existence, for which the poor ratepayers have been mulct to the extent of £2375 a year. It is a vicious condition of things that a local authority should be in a position to make such charges for such barefaced inefficiency. But the lamps are to be displaced now by 400-candle power metallic filament lamps and flame arc lamps. A strange thing about this change, however, is that a saving of only £200 a year is put down. There must surely be some mistake about this. As to the conversion of the whole of the gas-lamps to electricity, the Borough Surveyor has divided the town into fourteen districts; and he proposes, and the Council have agreed, that four of them shall be dealt with this year and next. We say, again, that gas companies stand little chance of just treatment in the matter of the public lighting business when they have to stand up against such municipal abandonment of all commercial principles. Small comfort it may be; but still we can claim that the advances, and the consequent increasing economy, of gas lighting have given municipal electricity owners an awful fright. But the extreme and unreasonable steps they are taking in this matter of public lighting, cannot be justified simply by their natural feelings of perturbation.

When gas-pipes are properly installed throughout premises, generations come and go without another penny having to be spent upon them in the way of repair or renewal. With electric wiring there must be periodical examination and repair to maintain the system in a condition that, it is hoped, will be safe; and then the time comes when complete reinstallation is advisable. These are items of expense of which calculation is rarely made. The electric wiring at the famous Brighton Pavilion has fallen into a very unsatisfactory condition; and it is imperative that there should be a complete overhauling. The estimate of Mr. J. Christie, the Electrical Engineer, for doing this is £500; but the incidental expenditure in the past necessary to keep the installation in fairly decent condition—by localizing and making good faults "which were a real source of danger"—must have amounted, on the whole, to a considerable sum. But the time has come when patching will no longer avail. The trouble is said to arise from damp getting into the wood-casing and rotting the insulation on the wires. What applies to the Brighton Pavilion will apply likewise to many other places. Of the total cost, Mr. Christie recommends an immediate expenditure of £150 on the renewal of the most "dangerous" portions, in addition to putting in new switch-boards. It is interesting to find such a frank avowal from an electrical quarter that electric wiring is prone to get into a dangerous condition; and all will hope, whatever their lighting creed, that no time will be lost in putting the system of illumination in the Pavilion into, at any rate, a fairly safe condition, as no one would like to see these picturesque buildings—picturesque in historical association as well as architecturally—reduced to ashes. On the point as to periodical expenditure on the overhauling of wiring installations, the Marylebone Borough Council have decided to overhaul, rewire, and put into proper condition the electrical installation at the public baths.

Mr. A. Denman Jones, the Manager of the Jandus Arc Lamp Electric Company, must allow us to congratulate him on the excellent advertisements he manages to secure for his particular type of lamp. A little while ago he had one in the "Electrician," and now in a letter in the "Electrical Times" he has obtained another. He does not particularly favour the metallic filament lamp; and, of course, the Jandus regenerative arc lamp is matchless for fighting high-pressure gas. The Jandus was seen at its best in Victoria Street, Westminster, recently; and many pedestrians and many in control of vehicles wondered what on earth had come over the authorities to permit the Abbey end of the street to be illuminated in such a manner. Those who wondered did not know that it was the much-advertised paragon among flame-arc lamps that was making such a pathetic exhibition. However, when an interview with Mr. Jones appeared in the "Electrician," there was some remark about these lamps having displaced high-pressure gas; and now we are told again that the regenerative arcs have secured "several victories over the latest forms of gas." Though Mr. Jones was silent when we asked before for a list of these instances, he cannot, as there have been "several victories over the latest forms of gas" (by which we presume he means the form giving an efficiency of 60 candles per cubic foot of gas), longer refuse, but should be pleased to score by making these victories known. In the last paragraph of his "Electrical Times" letter, Mr. Jones states that his Company have "prepared a large amount of tabulated information giving the relative costs of the various gas systems as against arc lighting. The figures are not mere catalogue figures, but have been taken from authoritative sources." He adds the Company will "be pleased to supply this information to any electrical engineers who are in the fray against gas." It is hoped that he will make an exception of the writer of the "Memoranda," and not ignore his request for the information, in order that he may examine it. At any rate, a copy of this paragraph shall be sent to Mr. Jones, to see whether it will move him to gracious and valiant compliance.

The Meeting of the Institution of Gas Engineers.—We learn that, in view of the national mourning (which would, of course, render a dance on the occasion out of the question), it has been decided to abandon the usual President's reception in connection with the annual meeting of the Institution of Gas Engineers next month.

THE WILLIAM YOUNG MEMORIAL LECTURE FUND

THE scheme of the North British Association of Gas Managers for founding a Lectureship to commemorate the great work of Mr. William Young in the gas and kindred industries has received financial support that has given satisfaction to the Committee who have the matter in hand, and to the Hon. Secretary and Treasurer (Mr. Alexander Bell, of Peebles). But as will be seen from a paragraph in an earlier column, a further sum is required to supply the necessary amount—about £600; and it is hoped that, when the second list of subscriptions is published, it will be our pleasure to announce that the requisite sum has been secured.

FIRST SUBSCRIPTION LIST.

| | £ | s. | d. |
|---|-------------|----------|----------|
| Miss M. Cusiter, of Portobello | 1 | 1 | 0 |
| John Alison Young, of London | 100 | 0 | 0 |
| Dr. Beilby, F.R.S., LL.D., of Glasgow | 52 | 10 | 0 |
| James M'Kelvie, of Edinburgh | 20 | 0 | 0 |
| Walter King, of London | 10 | 0 | 0 |
| Lothian Coal Company | 10 | 0 | 0 |
| John Dennis, of Dalkeith | 5 | 5 | 0 |
| J. G. Mason, S.S.C., of Edinburgh | 5 | 5 | 0 |
| Samuel Glover, of St. Helens | 5 | 0 | 0 |
| Thomas Glover, of Norwich | 3 | 3 | 0 |
| Charles Fraser, of Melrose | 1 | 1 | 0 |
| James Maxwell, of West Calder | 1 | 1 | 0 |
| Levi Monk, of Hawick | 1 | 1 | 0 |
| R. G. Shadbolt, of Grantham | 1 | 1 | 0 |
| John Gray, of Rock Ferry | 5 | 5 | 0 |
| Peebles and Co., of Edinburgh | 5 | 5 | 0 |
| Alex. C. Young, of Arbroath | 1 | 1 | 0 |
| David Terrace, of Middlesbrough | 3 | 3 | 0 |
| John Wright and Co., of Birmingham | 3 | 3 | 0 |
| James M'Leod, of Greenock | 3 | 3 | 0 |
| Arch. H. Hamilton and Co., of Glasgow | 1 | 0 | 0 |
| James Milne and Son, of Edinburgh | 3 | 3 | 0 |
| William Peattie, of Dunblane | 1 | 1 | 0 |
| Glenboig Union Fire-Clay Company | 5 | 5 | 0 |
| David Grant and Co., of Edinburgh | 1 | 1 | 0 |
| J. W. Napier, of Alloa | 3 | 3 | 0 |
| William Whyte, of Rothesay | 1 | 1 | 0 |
| Daniel Macfie, of Edinburgh | 2 | 2 | 0 |
| R. & A. Main, of Glasgow | 3 | 3 | 0 |
| William Mitchell, of Dalry | 0 | 2 | 6 |
| W. Doig Gibb, of London | 3 | 3 | 0 |
| P. Blair, of Helensburgh | 1 | 0 | 0 |
| Fletcher, Russell, and Co., of Warrington | 3 | 3 | 0 |
| William Blair, of Helensburgh | 1 | 0 | 0 |
| George Keillor, of Broughty Ferry | 3 | 3 | 0 |
| Allan Reid, of Brechin | 1 | 1 | 0 |
| J. B. Scott, of Cowdenbeath | 1 | 1 | 0 |
| Alex. Waddell, of Dunfermline | 3 | 3 | 0 |
| William Brown, of Cardenden | 0 | 5 | 0 |
| Charles W. Kraushaar, of Manchester | 1 | 1 | 0 |
| James Dougall and Sons, of Bonnybridge | 2 | 2 | 0 |
| Adam MacPherson, of Kirkcaldy | 1 | 1 | 0 |
| James D. Smith, of Stirling | 2 | 2 | 0 |
| James W. Carmichael, of Barrhead | 1 | 1 | 0 |
| Scottish Junior Gas Association, Western District (First instalment) | 1 | 1 | 0 |
| J. B. Macdermott, of Glasgow | 0 | 5 | 0 |
| Alex. Mackay, of Montrose | 1 | 1 | 0 |
| William Houston, of Kirkwall | 0 | 10 | 6 |
| Charles Ferns, of Glasgow | 2 | 2 | 0 |
| Alex. Yuill, of Dundee | 3 | 3 | 0 |
| David Vass, of Airdrie | 3 | 3 | 0 |
| Alex. Bell, of Peebles | 3 | 3 | 0 |
| Ayr Gas Company | 5 | 5 | 0 |
| Cardenden Gas Company | 1 | 1 | 0 |
| Galston Gas Company | 1 | 1 | 0 |
| Cowdenbeath Gas Company | 3 | 3 | 0 |
| Alloa Gas Commissioners | 5 | 5 | 0 |
| Musselburgh Gas Company | 2 | 2 | 0 |
| Barrhead Gas Company | 2 | 2 | 0 |
| Montrose Gas Company | 2 | 2 | 0 |
| Saltcoats Gas Company | 2 | 2 | 0 |
| Dunfermline Gas Commissioners | 5 | 5 | 0 |
| Kirkwall Gas Company | 2 | 2 | 0 |
| Baillieston Gas Company | 2 | 2 | 0 |
| Paisley Gas Commissioners | 5 | 5 | 0 |
| Arbroath Gas Commissioners | 3 | 3 | 0 |
| Dundee Gas Commissioners | 10 | 10 | 0 |
| Helensburgh Gas Commissioners | 2 | 2 | 0 |
| Peebles Gas Commissioners | 5 | 5 | 0 |
| Total | £357 | 1 | 0 |

The Postponement of the Visit of German Engineers.—It will be recalled that when the death of the King was announced, Dr. Bunte at once wrote expressing sympathy, and asking whether under the sad circumstances, the visit of German gas engineers to this country at the time which had been arranged would be convenient. As already stated, postponement was felt to be the best course; and the President of the Institution of Gas Engineers (Mr. James W. Helps) has since received a very kind letter from the German Association—signed by Dr. Bunte and Herr Prenger—quite falling in with this view, and saying that they look forward to paying their visit in the autumn.

GAS AT THE JAPAN-BRITISH EXHIBITION.

The Gas Companies' Joint Display.

THE Japan-British Exhibition at Shepherd's Bush has not opened under the most auspicious circumstances, though on the day of its quiet inauguration as well as on Whit Monday the multitude thronged its spacious buildings and broad walks until a late hour. But subsequent to that public thought, feeling, and interest were turned elsewhere, until the great day of national mourning had passed. After, however, the solemnity of, and the remarkable manifestation of sorrow during, the past few days, we shall be quickly returning to normal conditions; and to Shepherd's Bush—to the White City—the crowds will go. The public has a great eye for novelty; and it was a happy conception that has assembled as the prime attraction there so much of the rich fruits of the arts and crafts of our allies of the Far East. Never before, on the same scale, has the British public been brought into contact with the richness of the productions of Japan; and the public will not lose the opportunity now offered to them.

Excepting in its exhibits and entertainments, the huge place externally looks much the same as it did when first the public made its acquaintance. These, however, are matters in which we have little concern in these pages. In the decorative illumination of the buildings, for more reasons than one, electricity again plays a dominating part. We are not disposed to deny that, for the outlining of such immense buildings, to obtain spectacular effect, electricity holds out conveniences that gas does not possess; and in regard to other lighting, the Exhibition Authorities have good cause for maintaining the most friendly relations with the Borough Council within whose jurisdictional area the exhibition exists, and one way of doing so is to be large patrons of their Electricity Department, on the favourable terms of 1d. per unit. But for lighting the grounds, high-pressure gas has on this occasion extended representation (as will be shown later); and we are not without hopes that there will be a greater use made of incandescent gas lighting by certain of the exhibitors than previously. The central gas feature is, of course, the artistically attractive exhibit that the London and Suburban and other Gas Companies have, by joint subscription, brought together, through the agency of a Committee of which Mr. D. Milne Watson is the Chairman, and Mr. F. W. Goodenough the Hon. Secretary—the exhibit itself being under the superintendence of Mr. Edward Pilbrow, whose energetic work in the same capacity will be remembered in connection with the Gas Exhibit at the Franco-British Exhibition. The exhibit is in the Decorative Arts Building; and in location the Committee, it must be said, have made splendid choice, with a view to capturing the general public, whose eye and interest it is desired to secure. Though the exhibit two years ago claimed and gained a large amount of attention, the public generally are not attracted so much by machinery as by the superlative and the novel in the classes of things with which contact is made in everyday life. The Gas Companies' Joint Exhibit will, on this occasion, be direct upon what will be one of the main beaten tracks through the chief exhibition buildings. In making an inspection of such places, one almost involuntarily turns to the right; and entering the Court of Honour, one turns first to the right, and there at once is brought *vis-à-vis* with a wealth of scenic display in which the latest products of the arts of the costumier and of the sartorial adept are set off to advantage. We wander past these; and then before we are well aware of it, attention is arrested by a building the whole front of which is occupied by a room of exceeding richness in its picturesqueness—the main part of the gas exhibit.

The exhibit is in two buildings, separated by a gangway, but both on the main walk. The buildings were specially designed by Mr. W. J. Tapper, A.R.I.B.A., for the Joint Committee; and they were erected by Messrs. J. Jarvis and Sons, Limited, of Hackney Road. We like the design as well as the method of construction, which has the appearance of being entirely in stonework. Artificiality in building work has approached almost to a fine art; and the deception is complete. The buildings have thick wooden cased walls, covered with uraltite and coatstone, which give them the appearance of stone structure. The larger of the two buildings (which occupies an area of 31 ft. by 31 ft.) is partitioned lengthwise centrally; and the whole of the front comprises the room which first arrested attention. The design of the room is choice. It is of the Georgian period; the walls being oak panelled, with floor also of oak. An exquisitely designed recessed fire-place, in Pavanazzo marble, is a feature on which the eye alights. For inspection purposes the front of the room has three large arched openings; and there is a similar opening at either end. Altogether it is 31 ft. long by 17 ft. wide. All the fittings in design are in keeping with the room. There are six sconce candle brackets, with large metal backs, each fitted with three candles, surmounted by small incandescent mantles; and in the centre of the room is a six-light candelabrum, fitted with gas-candle incandescent lights, with small Empire shades. The gas-candle lights were made by Messrs. Benson and Co., Limited, of New Bond Street. When they are all in use, the room will be illuminated by about 450-candle power. In design and in finish, the metal work will meet the view of the most fastidious; and to Mr. Tapper should be given the credit for the design, and to Messrs. W. Bambridge Reynolds, Limited, art metal workers, of Old Town, Clapham, that for giving such excellent and faithful effect to the design. All the

lights in the room are controlled by the pneumatic switch; and in connection with this method of lighting and extinguishing, the old form of switch and wooden knob has been done away with. By arrangement with the Joint Committee, and to their design, the Pneumatic Gas Lighting Company, Limited, have made countersunk oxidized silver plates and knobs for the walls at the entrances to the room, and locally under each bracket. This will be recognized as a distinct improvement—more particularly in respect of neatness—in the design of the operating device. In the Pavanazzo marble fire-place, is a handsome Georgian dog-grate, fitted with Edgar's "Blenheim" fire, with duplex tap. The fire presents a large heating surface, which has the heating support of a substantial fire-clay back. The effect is particularly good; the fire presenting as glowing and cheerful appearance as any coal fire. It should prove a good business-getter.

Passing from this main room to the rear of the building, this portion is found divided into a kitchen (9 ft. by 11 ft.), a bath-room (9 ft. by 11 ft.), and a bedroom (13 ft. 8 in. by 9 ft.). Taking the rooms in this order, and dealing first with the kitchen. It is fitted up with an amount of cooking and water-heating apparatus such as would not be found in practice in any culinary department of the ordinary household. But the idea of the Committee has been—and very properly—to demonstrate to the public, that their choice is not limited in this regard. The kitchen is of lath and plaster, with two arched openings, and has a 12-inch pantile floor. In a tiled recess is a Davis nickel-plated No. 10 cooker, mounted upon which is a Serne's patent hot-closet, which is heated by the waste heat from the top of the grill of the stove, and by a small jet burner. This is of great service when "dishing-up," as well as for warming plates. The make of cooker shown will be changed from time to time during the run of the Exhibition. There is also found here a Wilson hot-water circulator, fitted with a strong glass tube on both the flow and return, so as to show the water in circulation. One of John Wright and Co.'s "Sun" boilers is also fitted, and in action; and there is further a coke-heated boiler, of Messrs. Davey and Roberts' make. Thus the consumer can see how gas undertakings will meet his preference for either gas or coke heated water-circulators. A useful and interesting novelty shown in action is a gas-heated "Normandy" water-distilling machine, made by the Thames Iron Works, Shipbuilding, and Engineering Company. The advantage and comfort of having pure water ready at hand for household use cannot be overrated; and distillation is the way to obtain it. A ring gas-burner is used with this machine, which is entirely automatic in its operation. All that has to be done is to turn on the water to be treated, and to light the gas to generate the steam therefrom. The apparatus will then go on working for any length of time, without any further attention than that of collecting the water as it flows from the apparatus pure, cold, and ready for immediate use. Gas companies should find a market for these distillers in first-class houses, hotels, clubs, hospitals, &c. It is calculated that at ordinary gas prices, the cost of producing a gallon of pure water does not exceed 1½d. A "Uno" coffee-roaster will also be on view; and as a "moving" exhibit always attracts, in all probability the use of gas-heated irons will be demonstrated. The kitchen is illuminated by a two-light pendant, fitted with Bray "C" switch burners, and operated by pneumatic switches.

Entering the bath-room through the arched entrance, it is found furnished with every convenience that such a room should possess for obtaining the requisite hot water, heat, and comfort. An enamelled iron bath is supplied with hot water by one of Ewart's No. 6 "Lightning" geysers. Hot water for the bath can also be obtained from the Wilson circulator and the Wright "Sun" boiler previously mentioned as being fixed in the kitchen. At one side of the bath-room is a wash-hand basin, fitted with Ewart's "Gem" lavatory geyser and shampoo. This is a nice looking thing, very useful, and the consumption of gas is small. Among the other wall fittings is a Kempton nickel-plated combination bracket for lighting, for heating a kettle, and for warming curling-tongs. This again is a serviceable adjunct. Over the bath is a double-arm bracket (made, as is the other one, by Messrs. Ingram and Kemp, of Birmingham), carrying a "Nico" inverted burner. The inverted burners used in the rooms are recognized as being of the New Inverted Company's well-known types. The equipment also includes a hot-air towel-airer (Ewart's manufacture), heated by means of a small gas-jet; and the room itself is warmed by one of Fletcher, Russell, and Co.'s radiators with majolica finish.

The bedroom, though not large, is attractive. The walls (in which are two arched openings) are panelled, and painted cream colour. On the wall at either side of the bed are special novel designs of brackets—the design being due to Mr. Tapper, and the execution to Messrs. Bambridge Reynolds. These are fitted with the "Nico" medium-sized burner, controlled by the pneumatic switch. Over the dressing-table is a "Surprise" pendant by Messrs. Best and Lloyd, also furnished with two inverted burners of the medium size, and surrounded by a handsome silk shade. The heating of the room is by one of Messrs. John Wright and Co.'s "Druid" armour bright finish fires, with boiling-ring on top. The design of the fire is pretty, and harmonizes well with the antique furniture of the room.

Passing from this suite of rooms to the second building, which

is utilized as a general gas show-room, one stops in the (14-feet) gangway between, to examine a pair of most elaborate old-gold gilt-finished lanterns of ancient appearance, in each of which are enclosed four inverted burners. These lanterns were made by Messrs. Bambridge Reynolds. They are constructed of aluminium, cased with wood and lined with copper. The ornamentation is composed of graceful figures and scroll work; the sides having glass panels, with top, bottom, and side wings. The lamps are 4 ft. long by 2 ft. square; and they have an antiquated and rich exterior.

Entering the show-room by one of the several arched entrances, it is learned that it has a floor space of 31 ft. by 13 ft. The walls are papered light green, with a 9-inch white frieze. In it are exhibited examples of the latest lighting and other gas appliances for interior use. There is a veritable profusion of choice designs in brackets and pendants (finished in oxidized silver, copper, and bronze, and polished brass), burners (mostly inverted), and glassware. Among the burners and fittings already on view are the makes of the New Inverted Company, Messrs. William Sugg and Co., Messrs. James Milne and Sons, Messrs. Evered and Co., Messrs. George Hands and Co., Messrs. Whitehouse and Co., Messrs. Messenger and Sons; and many other manufacturers will have samples of their wares displayed during the course of the exhibition. The show-room will not admit of all types being exhibited at one time. Besides the brackets on the walls, there are three large stands, each capable of displaying numerous brackets. These (which are made by Messrs. Edward Dean and Beal) are very useful contrivances for show-room purposes, as they enable not only a good display, but ready examination being made. The pendants in use are fitted with pneumatic switches, and the side brackets by the Telephos Company's electrical system of lighting and extinguishing, in its latest improved form. Both systems are controlled by a cluster of switches at the door, and also locally. Silk shades are also on view; and these are of Messrs. Ellis and Saunders' make. There are also six of Messrs. Fletcher, Russell, and Co.'s fireplaces in the show-room, four along the wall in the rear part, and two corner ones. In these, gas-fires of all the well-known makers will be exhibited from time to time—changes being effected as the exhibition progresses. A four-tube gas-steam radiator of the Cannon Company's make is seen. Cookers are already on view by Messrs. John Wright and Co. and Messrs. Wilson and Mathiesons. Messrs. Fletcher, Russell, and Co., the Richmond Gas Stove and Meter Company, Messrs. R. & A. Main, the Parkinson Stove Company, Messrs. Arden Hill and Co., and, possibly, other makers will also have samples of their goods on view as time passes.

This gives a fair indication of the character of the exhibit that has been promoted by the joint monetary contribution of the London, Suburban, and a few other companies; and it constitutes a most effective demonstration and advertisement. We believe that it will be the means of winning other lighting installations in the exhibition, beyond the immense good—good that it is impossible to measure—that it will do among the countless thousands who will stop, examine, admire, and inquire. Turning from it to the grounds, the Keith high-pressure system has there obtained extended application, under a scheme entrusted to the Brentford Gas Company. Formerly in the walks in the neighbourhood of the Machinery Hall, there were electric arc lamps; now there are high-pressure gas-lamps, showing (as Westminster will do presently) that it is as easy, if not easier, to convert an electric lamp standard to gas lighting, as a gas column to electric lighting. At the rear of the building, in which is housed the Joint Gas Companies exhibit, is an exhibition of Japanese dwarf trees, whose diminutiveness compared with their age makes one view them as something altogether grotesque. There are likewise trees bearing resemblance to birds, and trees trained to all sorts of fantastic forms. Over these, after dusk, Keith high-pressure lamps will shed an attractive effulgence. Japanese wrestlers will also perform their wonderful feats at night time by the aid of the same type of lamp. Altogether, there are now some 350 of the Keith high-pressure lamps in use; and 35 Sugg "Regent" low-pressure lamps. Gas is also largely employed for cooking and for power in the exhibition. From which it will be seen that gas has excellent representation at the White City, to which visitors will be attracted this summer from near and far, and will find there much to interest, educate, and amuse.

Work of the Brentford Gas Company.

Details received from the Brentford Gas Company show that the Company, who supply the whole of the gas to the Exhibition, have again been very active in pushing the sale of gas and advertising the use of gas appliances generally. A Keith high-pressure plant is once more fixed in the Machinery Hall; but engines and compressors of more than double the size of those previously used have been provided—each compressor being able to deliver 25,000 cubic feet of gas per hour. The gas is used in 350 Keith lamps, each of 1500-candle power, distributed about the grounds and in the Machinery Hall itself. The plant has been erected by the Gas Company, and is entirely under their control. The stand is the same as that used last year, except that an additional effect is given by the use of a "Spherelux" illuminated fascia sign.

A further number of electric arc lamps have this year been taken down from positions adjoining the Machinery Hall, and high-pressure gas lights connected in place of them. As a number of

such substitutions also took place last year, this shows a steady advance in the right direction. The gardens in which the Japanese miniature trees are being shown are lighted by high-pressure gas, compressed by a separate "B" size Keith compressor specially put down by the Brentford Company for the purpose. The building used by the Ju-Jitsu wrestlers is also lighted by high-pressure gas; and, in the opinion of many critical observers, it is the most effectively and brilliantly lighted building in the whole of the grounds. The ordinary pressure gas-lamps in the grounds this year are of Sugg's "Regent" pattern, and number about 35.

Many of the stalls and kiosks in the grounds are lighted by gas this year; and gas for power purposes is very largely used—an 80 H.P. engine is employed to drive the Scenic Railway. The current for all the arc lights used in the Canadian Building is generated by a Westinghouse vertical gas-engine. The river flowing through the Poetic Village is pumped by means of a gas-engine lent by the Brentford Company, who are also supplying the source of power required by the "Wiggle-Woggle," "Spider's Web," "Canadian Toboggan," and many other small side-shows. Gas was used on Whit Monday to cook meals and provide teas for 500,000 people.

To supply Messrs. Lyons alone, the Brentford Company have fixed upwards of 27 gas-meters, most of them of 600 cubic feet per hour capacity. In addition to these, gas-heated hot-water circulators and "Ever-Ready" boilers are in use on several stalls and tea-houses. The cooking for all the Japanese is done by gas, which is used even by the Ainu Tribe in their huts. The Formosans are experiencing for the first time the pleasure of gas-heated radiators, which have been fixed in their huts. Hot water for baths is one of the great necessities to the Japanese, and for this purpose gas is used. The large concrete bath used incessantly by the Japanese wrestlers, and holding 800 gallons, is supplied by gas-heated hot water.

LOGARITHMS AND TABLES FOR CHEMISTS.*

TABLES of logarithms arranged by Mr. Woodward on the same system as those now before us are already familiar to many of those who have occasion to use five-figure logarithms for various calculations; and to our knowledge his method of arrangement is by many users preferred to any other. Hence there is no doubt that the present handy little volume will also find numerous appreciative users, merely on account of the simple arrangement of the tables of logarithms of the numbers 1 to 9999. But it includes also tables of atomic weights, hydrometric scales, electro-chemical equivalents, factors for the correction or conversion of volumes of gases, tension of aqueous vapour, thermometric scales, imperial and metric weights and measures equivalents, factors for use in analysis, gas constants, and certain miscellaneous factors and data, all with corresponding logarithms to five or, in a few cases, to seven figures.

The little volume comprises only about 70 pages, so that it will be understood that the author has aimed at great compression and extreme compactness. He has undoubtedly succeeded well in achieving this aim; but, in our opinion, he has thereby rendered some of the tables more intricate and troublesome in use than is warranted by the gain in compactness. The difficulty will doubtless disappear to the constant user of any particular table; but it will certainly tax the patience of the casual user. We incline to think that the author's remarkable ingenuity in the disposition and compression of tables has been exercised in some of those contained in this volume to an extent which not a few of the persons who may take it up will regard as exasperating.

Notwithstanding this fault, which may, after all, have appeared more serious to us than to the majority of those who are likely to require such aids to calculations as the tables afford, we consider the volume will prove very useful to many gas-works' chemists and engineers. We regret, however, that the author appears to have passed over unnoticed the standard conditions of measurement of volumes of gas in English gas-works and in gas-testing rooms—viz., 60° Fahr., 30 inches, and saturated. If given at all, we have failed to find in the book the factors or tabular numbers for converting a volume of gas measured in other conditions of temperature, pressure, and humidity to the corresponding volume in these standard conditions. A factor can be worked out from data given, but only with considerable expenditure of trouble. The author might bear this omission in mind, with a view to its rectification in any subsequent editions of his handy little volume which may be called for.

* "A.B.C. Five-Figure Logarithms and Tables for Chemists, including Electro-Chemical Equivalents, Analytical Factors, Gas Reduction Tables, and Other Tables useful in Chemical Laboratories." By C. J. Woodward, B.Sc., late Head of the Chemical Department, Municipal Technical School, Birmingham. London: E. & F. N. Spon, Ltd.; 1910.

On the 16th ult., Mr. James C. Watson, the Engineer of the Oriental Gas Company, who is Chairman of the Manicktollah Municipality, was entertained by the Vice-Chairman (the Hon. F. H. C. Ariff) at a garden party and dinner, prior to his departure for England on six months' leave of absence. Mr. Watson's services during his chairmanship were highly eulogized by his host.

THE LIVESY MEMORIAL FUND.

The Professorship of Coal Gas and Fuel Industries at Leeds University.

PURSUANT to notice, a meeting of subscribers to the Livesey Memorial Fund was held last Wednesday, in the Hall of the Institution of Mechanical Engineers, to consider final arrangements for the establishment, in fulfilment of the objects of the Livesey Memorial Fund, of the Gas Engineering Professorship at the Leeds University. Mr. JAMES W. HELPS, the President of the Institution of Gas Engineers, was in the chair; and he was supported by the members of the Livesey Fund Committee—the University of Leeds being represented by Alderman Tetley (the Chairman of the Leeds Corporation Gas Committee) and Professor Arthur Smithells.

The PRESIDENT said he was sorry to see so few subscribers present that day, because the subject to occupy their attention was really a most important one. He presumed the smallness of the attendance was due to the fact that everybody seemed quite satisfied to leave the matter in the hands of the Memorial Committee. But he thought it due to those subscribers who were present that he should give them some idea as to what had been done since they last met in that hall, seeing that it might appear to them and to some others that there had been undue delay in bringing matters connected with the fund to the position they now occupied. But there had been a great many matters to be discussed between the University Authorities and the Memorial Committee, which, while not subject for public discussion or debate, had to be settled before anything like finality could be reached. It would be remembered that it was on Dec. 10, 1908, that they met in the hall to discuss the question of the formation of the Livesey Fund, and at that meeting it was resolved: "That a Livesey Memorial Fund be now opened, and that contributions to it be invited with the object of endowing a Professorship in Gas Engineering and Fuel at the Leeds University." In accordance with that resolution, the Secretary of the Institution sent out some 2671 letters, asking for subscriptions from gas companies, local authorities owning gas undertakings, members of the Institution and of the Society of British Gas Industries, manufacturing firms, and individuals throughout the country. Some weeks afterwards—on April 29—the Committee met again; and inasmuch as the response was not quite so satisfactory as they had wished, it was decided to send out further circulars to those who had not then subscribed. Nearly 600 letters were again despatched. By June, on the occasion of the last annual meeting of the Institution, the then President (Mr. Thomas Glover) was able to report that the fund had reached the sum of £10,154 7s. 10d.; and the full list of the subscriptions was then published in the "JOURNAL OF GAS LIGHTING" and the "Gas World." A further appeal was at the same time made through the medium of the Technical Press, and also by letters to the Daily Press throughout the country—a wish having been expressed that the fund should be raised to the sum of £12,000. From time to time, considerable correspondence took place with the Leeds University authorities, principally through Professor Smithells; and, in the course of it, the suggestion was made by the University authorities that it would be well for a deputation to be named by the subscribers to the fund, through the Institution of Gas Engineers, for the purposes of visiting Leeds to confer with the authorities on the whole matter, and to see the character of the work that was being done there. In accordance with this suggestion, a conference was held on Feb. 7 last; the members of the deputation appointed being: The President, Messrs. Corbet Woodall, Charles Carpenter, Charles Hunt, Alexander Wilson, Charles Wood, Dugald Clerk, Thomas Newbigging, and S. Y. Shoubridge. The whole of these gentlemen attended on the occasion, with the exception of Mr. Carpenter, to whom the date was not convenient. But he paid a special visit to the University two or three days previously, and went over it with Professor Smithells. The Committee were graciously received by the University Authorities, and hospitably entertained, at the invitation of the Chairman of the Mining Committee. He (the President) would like to read a copy of the Memorandum prepared by the Registrar as to what transpired at the conference:

The representatives of the Livesey Memorial Fund, consisting of Mr. Jas. W. Helps (President of the Institution of Gas Engineers), Mr. Alexander Wilson, Mr. Charles Hunt, Mr. Thomas Newbigging, Mr. Charles Wood, Mr. Dugald Clerk, and Mr. Shoubridge visited the University on Monday, Feb. 7, 1910, and were received at the University at ten o'clock by the Pro-Chancellor (Dr. A. G. Lupton, the Vice-Chancellor (Sir Nathan Bodington), and Professor Smithells. Mr. Corbet Woodall arrived later in the day. Mr. Charles Carpenter had visited the University the previous Tuesday.

The visitors were taken round the chief Departments of the University, and entertained at luncheon by Mr. W. E. Garforth, the Chairman of the Mining Committee.

A Conference was subsequently held in the Council Room of the University, when there were present, in addition to the members of the Livesey Memorial Fund Committee, the following representatives of the University: The Pro-Chancellor, the Vice-Chancellor, Mr. Garforth, Professor

Green, Professor Smithells, and Mr. Tetley. The chair was occupied by the Pro-Chancellor.

The Chairman explained that it had been the practice of the University in connection with Departments of Applied Science to appoint Advisory Committees representative of the industry concerned. Such Advisory Committees exercised general management of the Department, subject to the final authority of the University Council.

After discussion, it was resolved that, in the opinion of this Conference, it is expedient to place the management of the Department which is to be endowed by the Livesey Fund in the hands of an Advisory Committee under the general control of the University Council. The number of the members and the Societies by which they should be nominated were left for further discussion.

On the subject of the investment of the fund, no definite resolution was passed; but it was generally agreed that it would be expedient to follow the general practice as to Trust Funds administered by the University, by making the investment in the name of the University.

The title of the Professorship was discussed, and the following alternative suggestions were made:—

- (1) Livesey Professorship of Fuel and Gas Industries.
- (2) Livesey Professorship of Coal Gas and Fuel Industries.

The designation of the Chair in the Calendar would stand "Applied Chemistry: Fuel and Gas Industries—Livesey Professorship" or "Applied Chemistry: Coal Gas and Fuel Industries—Livesey Professorship."

On the conclusion of the Conference, Professor Bone was invited to the room, and was informed by the Chairman that the Committee had agreed upon recommending that he should hold the Livesey Professorship, with one of the titles above-named, under an Advisory Committee to be constituted for the management of the Department.

Professor Bone expressed himself as satisfied with this decision.

At a Meeting of the Council of the University held on Feb. 16, the foregoing report was read and considered.

It was resolved that the recommendation of the conference be approved, and that an Advisory Committee be appointed for the Department to be endowed by the Livesey Memorial Fund. The following were appointed members of the Advisory Committee: The Pro-Chancellor (Mr. A. G. Lupton), the Vice-Chancellor (Sir Nathan Bodington), Alderman Tetley, Mr. John Bray, and Professor Smithells.

It was resolved that the Livesey Memorial Fund Committee be requested to make suggestions and nominations with a view to the completion of the Committee.

On Feb. 18, 1910, the Memorial Committee met to consider the report, and passed the following resolutions:

- (1) That the following be nominated to serve on the Advisory Committee suggested in the report:—
Mr. Charles Carpenter,
" James W. Helps,
" Charles Hunt,
" Alexander Wilson,
" Charles Wood,
" Corbet Woodall,
and two representatives to be nominated by the Society of British Gas Industries.
- (2) That the Livesey Memorial Committee is of opinion that the numbers of members of the Advisory Committee nominated to represent those outside the Leeds University should be a majority of the Advisory Committee.
- (3) That of the titles of the Professorship suggested in the report, that of "The Livesey Professorship of Coal Gas and Fuel Industries" should be selected.
- (4) That the Institution's Solicitors be consulted with reference to the preparation of a suitable Deed of Gift to the Leeds University of the sum of money standing to the credit of the Livesey Memorial Fund.
- (5) That a meeting of the subscribers be convened at which the arrangements proposed for the administration of the fund shall be submitted for approval.

In accordance with the fourth resolution, members of the Committee had an interview with Mr. H. F. A. Hood, of Messrs. Radcliffe, Cator, and Hood; and after explaining the circumstances to him, they asked him to consider the whole question, with the view of advising them, and of preparing a draft form of agreement to submit to this meeting. A further meeting of the Committee was then held, which Mr. Hood attended; and after hearing his views, the Committee asked him to submit a draft agreement for submission to the meeting and to the University Authorities. During the previous few days, he (the President) had had an opportunity of discussing the matter at some length with Professor Smithells (who had purposely come to town from Leeds twice during the past week) and with Mr. Dugald Clerk, on behalf of the Society of British Gas Industries. The deed which had been drawn up by Mr. Hood, and which that gentleman would read, had been provisionally approved by Professor Smithells, on behalf

of the Leeds University. He (the President) wanted particularly to impress upon the subscribers that it had not been formally approved by the University Authorities. It would be submitted to them, he believed, some time during June; and there was no reason to suppose it would not prove acceptable to them. He should now ask Mr. Hood to read the draft deed, and then he proposed to move a resolution approving of it. Afterwards he should ask Alderman Tetley, the Chairman of the Leeds Corporation Gas Committee (who was identified with the work of the University), to kindly make a few remarks; and then he would call upon Professor Smithells to say something more about the work that was being done at the University.

Mr. H. F. A. HOOD then read the draft Deed of Gift, which is subject to the approval of the Leeds University authorities.

The CHAIRMAN remarked that before moving the formal resolution, he would just like to tell those present that Mr. Hood, when they approached him and asked him to draw up this Deed of Gift, directly he knew the objects of the fund, said that he and his firm would be most willing to carry out the whole of the work at their own expense, and not make any charge to the fund, except for out-of-pocket expenses. He (the Chairman) thought, therefore, they owed a deep debt of gratitude to Mr. Hood, not only for the excellent manner in which he had drawn up the agreement, but for the kindness in carrying out the work on the conditions mentioned. He begged now to move:

That this meeting of subscribers to the Livesey Memorial Fund hereby approves the draft Deed of Gift which has been read to the meeting, and authorizes the sealing thereof, subject to such modifications as may be suggested by the Leeds University, and accepted by the Committee of the Memorial Fund.

Mr. DUGALD CLERK, in seconding the resolution, said he had had the pleasure and privilege of discussing the whole matter several times with Mr. Helps and Professor Smithells, and generally considering the position; and he thought that the deed and the resolution carried out the intentions of the donors.

The CHAIRMAN thought that before the motion was put to the meeting probably some of those present would like to ask questions and discuss the subject. He would ask Alderman Tetley to make some remarks; and after he and Professor Smithells had spoken, the matter would be open for discussion.

Alderman C. F. TETLEY remarked that he attended the meeting with somewhat mixed feelings. He was extremely sorry that the City of Leeds had not been able to make any contribution of capital money towards this most excellent scheme. They had consulted their Town Clerk, who went into the matter most thoroughly; and he found out that, beyond making an annual grant, which they were pleased to do, to the department of gas engineering, they were not able to do anything at all. Though unhappily their name was therefore absent from the list of subscribers, the meeting might take it from him that the Gas Committee and the Leeds City Council had the interests of the gas industry thoroughly at heart, and also the interests of the University. The method of treating the administration of the fund by an Advisory Committee might sound strange to some of them; but he could assure them—having been on the Council of the University for nearly thirty years—they had found this plan in all cases to work extremely well. The University, he thought, had always been anxious to take the highest view of their duties, and to see that, whatever else happened in the course of the instruction of the professor, he really kept before himself, and before the minds of his pupils, that the opportunity of learning the principles of the great industry with which they were connected was at the beginning of a man's career, and that when once a person got thoroughly instilled into his mind the principles he was going to work on, he had some chance of making advances, and probably very great advances indeed. Therefore he hoped that the subscribers would at any rate do the University the honour of believing that they had approached the subject from what they regarded as the very highest possible point of view, and that they accepted from the subscribers most thankfully and most proudly the confidence which they were so good as to bestow upon them. The Clothworkers Company and others treated the University much in the same way; and he thought his hearers would find as time went on that their connection with the University had led to a very sincere friendship, and that the interests of their great industry were secure in the hands in which they had placed them. Very much was to be learnt with regard to the many problems that were vexing gas engineers. Those who had sometimes to "make bricks without straw"—in the shape of gas out of inferior fuel—he was sure would receive the greatest sympathy; and if they could obtain any assistance from the professorship at the University, he was sure that it would be most thankfully and most gratefully received. It would, of course, be possible to enlarge upon the problems for consideration confronting them; but it was not necessary for him to do so. He would merely add that the University would do their best to justify the confidence that the subscribers to the fund were placing in them. He was confident that, as the Clothworkers had found, so they themselves would see in the course of a few years, that this confidence had not been misplaced.

Professor ARTHUR SMITHELLS remarked that, as had already been stated, he had had the advantage of considering carefully the Deed of Gift under which they proposed to convey the money to the University of Leeds; and he thought he could say with great confidence that there was nothing in it which would prove

unacceptable to the University. It seemed to him to give ample security, without the imposition of any undue restrictions, that the intentions of the donors to the fund would be fully carried out. The formation of an Advisory Committee such as was proposed, with a full representation upon it of the donors, would, he was sure, be highly satisfactory to both sides. University administration was not a very simple matter, and especially was this the case with the modern Universities. Of course, with regard to the older subjects there was abundance of past experience to draw upon; but as those present were no doubt fully aware, the younger Universities had taken upon themselves seriously and earnestly the task of cultivating Applied Science. This was to a very large extent entering on new ground; and it brought with it new problems. One other point which he would like to emphasize was that a very marked difference between the old Universities and the new was that in the case of the latter the administration and the government were not in the hands of an exclusively academic body. If any of his audience shared the feelings of the late Cecil Rhodes, and looked upon a body of professors as a set of guileless gentlemen who could hardly be trusted in business affairs, they need be under no apprehension in the present instance; for it was the good fortune of the University of Leeds to have watching over them with great care and diligence gentlemen of the type of his friend Alderman Tetley. While, however, their Council included, and always had included, a preponderance of such business men, they had found it necessary in connection with all departments of Applied Science to have the further assistance of Advisory Committees. It would not do to have a professorship of Applied Science in a water-tight compartment of the University. They must be in communication with the industry concerned, and the channels of communication must be kept open. It was on this account that they considered it indispensable to have, in connection with all their departments of Applied Science, a body of men who really represented the practical side of the industry in question, and who would give them the benefit of their mature experience and knowledge of the actualities of it. He hoped his hearers would remember this, because it was an essential point in the administration of such a department as the one they were founding. He was extremely sorry that a Committee of this kind had not been appointed before now. He felt nervous and anxious in having a department of Applied Science without such a Committee; and the only excuse they could offer from the University side for not appointing such a Committee before was that they desired that the majority of the members should be nominated by the donors. This it was now proposed should be done; and he was convinced that when the Committee was appointed, the work would go on with greatly increased chances of adapting itself successfully to the needs of the industry which it was intended to serve. There were, of course, difficulties that arose in connection with a department of Applied Science which did not touch the other departments of University work. It was inevitable that questions affecting commercial interests should be raised, and problems crop up which required very careful thought indeed before they could be solved in the right way. He believed it was impossible to lay down general rules which should guide a University in all these matters; and when such points arose, they were able to rely upon the sound judgment of their Advisory Committees, and find a satisfactory way out of their difficulties. He felt assured that this fund would be administered in a manner which would ultimately be of benefit to the great industry to which it was intended to minister. But he would like to appeal for patience. It was a new enterprise; and it was likely that some mistakes might be made. He hoped, however, that they would be allowed a fair time in which to get their work into proper order, and in which to direct it to the right subjects. If this were granted, he firmly believed they would in the end succeed, provided they had the assistance of such representatives of the gas industry as had been named from the chair at this meeting. He need hardly tell his hearers that the enterprise was one which was very dear to his heart. It had been a long-cherished desire of his to see the University equipped for preparing men for the great industry with which the donors to the fund were connected. It was not a diminishing but an increasing need that the industry should have infused into it a continual supply of men bringing with them the resources of Applied Science. When he approached the late Sir George Livesey, he found that he was in entire accord with their objects. The enterprise was one which had his enthusiastic support. In fact, in the very last letter which he (the speaker) had from him, Sir George Livesey expressed confidence that he would be able to raise the £500 a year which would serve as the salary of the professor. Unfortunately he was taken away before he could accomplish this; but it could be confidently asserted that the object which the subscribers to the fund had chosen to commemorate Sir George's memory was one which in his lifetime would have commended itself most strongly to him. When he thought of Sir George's work and his character, when he recalled his own personal association with him, he felt compelled to do everything he could to make this memorial worthy of the name which was connected with it.

Mr. ARTHUR VALON said he was of opinion that there was a very general feeling among the subscribers to the fund that the Councils of the Institution of Gas Engineers and of the Society of British Gas Industries should keep control of the fund; and he thought, though he was not quite sure, that this wish was expressed at a meeting of subscribers. He presumed

that it was in order to meet this view that the clause had been inserted by which the Advisory Committee might revoke the Deed of Gift, or rather transfer the money to some other body. There was only just one small point in regard to this—that was, the majority by which such a resolution was to be carried was two-thirds, while the members of the Advisory Committee nominated by the respective Councils of the Institution and the Society of British Gas Industries did not amount to two-thirds. Consequently, it would be impossible to revoke the gift without the assent of at all events some of the members nominated by the Leeds University. This was an assent which, he might imagine, was hardly likely to be given; and he should think that if it were possible to arrange that the question of the revocation should be in the hands of the members of the Committee appointed by the Councils of the Institution and the Society of British Gas Industries, it would be better.

Mr. H. J. YATES said that while he quite appreciated the points just raised, he thought that difficulties might crop up if the funds were not invested by the Leeds University. They knew the work turned out from Leeds and the men associated with the University; and they might rely upon them to help the subscribers out of such a difficulty as the previous speaker thought might arise. At any rate, he personally, after carefully listening to the reading of the Deed of Gift, was perfectly satisfied as a subscriber, and felt sure there was no need for any fear with regard to obtaining the necessary majority, if at any time trouble should arise.

Mr. R. W. EDWARDS said the deed stated that the fund should be transferred to some person or bodies. He would suggest that this should be altered to some persons nominated by the Institution of Gas Engineers and the Society of British Gas Industries or bodies. Again, it was intended that the professor appointed should make an annual report. He would suggest, in reference to this, that the report should be made in time for it to be received at the annual meeting of the Institution.

The CHAIRMAN remarked that, with regard to the remarks that had been made, no doubt Mr. Valon was thinking of what Mr. Corbet Woodall said at the meeting held in the hall in December, 1908. The remarks he then made, in answer to a question by Mr. Charles Hawksley, were as follows: "I did intend to have suggested before that some means should be taken to maintain a hold upon the endowment, so that if the work were not carried out in the way that Mr. Hawksley desires, and we desire—essentially in the interests of the gas industry—we might make representations, and, if necessary, withdraw the endowment, and see that it was employed in the direction we have in view." He thought that if Mr. Valon considered the final portion of the Deed of Gift, he would find that the very thing suggested by Mr. Woodall in these remarks was carried out. There was power given, in the event of the Committee believing that the work carried out was not essential to the interests of the gas industry, to make such representations and take such steps as would result in the revocation of the Deed of Gift. In reference to the suggestion that the capital should be retained and invested by the subscribers or the Councils of the Institution and the Society of British Gas Industries, and not handed over to the Leeds University authorities, he would like to point out that there were many cases of endowments in connection with the Leeds University; and they were assured that in no instance had the course suggested by Mr. Valon been adopted. Practically all the moneys now held by the University had been invested in the name of the University, and the proceeds used in connection with the chairs or professorships there. As to the question of the majority of the Advisory Committee, it was true that the members nominated by the Institution of Gas Engineers and the Society of British Gas Industries would not constitute the requisite two-thirds majority; but he wanted them to consider first of all whether it was likely that the necessity for putting this provision into force would ever arise. He hoped it never would, and did not think it would; but should it happen to do so, he felt certain it would be on so very definite an issue that they would have no difficulty whatever in getting over from the members appointed by the University the necessary two to vote with them so as to carry the resolution that might be desired. He wanted them also to bear in mind that the Leeds University, in nominating their own members for the Advisory Committee, selected practical men. In fact, among the names he had read out had been that of Mr. John Bray, who himself was connected with the industry; and he could not tell that there would not be others on the Committee occupying a similar position. He did not think they need fear for one single moment that they would have any difficulty in the direction that had been referred to. One or two other small points had been raised. The last speaker had suggested the substitution of "persons" for "person." He did not think Mr. Hood would see any difficulty in making this alteration. As to the date of the report from the University, no doubt this could be secured in time for inclusion in the proceedings at the annual meeting of the Institution.

Mr. VALON: I did not suggest that the capital money should be retained in the hands of the Councils of the Institution and the Society of British Gas Industries, and the interest merely handed over. What I wish to suggest is that the revocation of the gift should be in the hands of members nominated by the Councils.

The resolution was then put, and carried unanimously.

The proceedings closed with a vote of thanks to the Council of the Institution of Mechanical Engineers for the loan of the hall for the meeting, which was accorded on the proposition of the CHAIRMAN, seconded by Alderman TETLEY.

INCREASED BOILER-DUTY IN GAS-WORKS.

[COMMUNICATED.]

ANY reduction in manufacturing costs that can be compassed in gas-works, in these competitive times, is well worth careful consideration. Interesting as theoretical reductions may sometimes be, they cannot, of course, compare with practical reductions. It is, therefore, with the latter that we are here concerned.

An authority has aptly said that economy should begin in the boiler-house; but it should not end there. The trouble is that so few men realize the possibilities of boiler-house economies. It is without doubt very desirable to keep a clean chimney; but it is not good business to keep a clean chimney at the expense of high-duty from the boiler. In other words, it does not pay to make dear steam though no emission of black smoke can be claimed as a set off. Cheap steam undoubtedly means a clean chimney; but it means far more than that. It means clean, bright fires with low-grade and cheap fuels; higher boiler duty without detriment to the boiler; and an accurate adjustment of air supply to ensure perfect combustion. It also means the minimum cost for feeding the fuel supply to the furnaces, and an expeditious delivery from canal barge or railway truck to the bunkers in the first place and subsequently to the mechanical stokers, with ready removal of ashes from the furnaces to the dumping pits.

By a carefully designed and well-constructed coal and ash handling plant, including a supply of machine stokers, managers of gas-works may render themselves to a great extent independent of labour troubles, and ensure a regular and steady output of cheap steam. A brief examination of one or two achievements in this direction in some of the more enterprising boiler-houses of the United Kingdom would conduce to a more just estimate of the importance of economy in steam production, and the various factors that enter into such production.

By a recent installation of the "Bennis" sprinkling stoker and compressed air furnace in the boiler-house of the electricity station at Ivry (Paris-Orleans Railway), the steam-raising by the consumption of smoke-box breeze is successfully carried out. But, one may ask, "How many gas-works at the present time are able to keep up an adequate supply of steam by the utilization of coke breeze?" Again, by means of the same type of stoker, the consumption of pit-rubbish as fuel is made easily possible; bright and clear fires and smokeless chimneys, combined with high duty from the boilers, being the order of the day. Another economic advantage is the fact that it frequently occurs that where the "Bennis" sprinkling stoker is installed a great saving is effected in the requisite number of boilers; it being easily possible to produce the maximum quantity of steam, with fewer boilers, reserving the others as a stand-by, or, if preferred, working them alternately—thus preserving the life of all the boilers.

It is necessary, as already intimated, in estimating the value of mechanical stoking, to conjoin therewith a complete coal and ash elevating system. It is now pretty generally conceded that conveying and ash-handling plant, carefully designed and well constructed—including storage bunkers, band, chain, or bucket conveyors, measuring chambers, shoots, &c.—cannot be dispensed with if economy is to be a leading feature in the boiler-house. Wherever such elevating and conveying plants have been judiciously installed, conspicuous success has attended the installation. Wherever, on the other hand, conveying systems have been installed at needlessly large outlay and without reference to the special requirements of individual cases, the practical verdict has been—"dead failure." Complexity and costliness are not the *sine qua non* for efficiency and scope of application.

Bye-Product Coke-Ovens for the Woodward Iron Company.

The Woodward Iron Company, Alabama, U.S.A., have contracted with Mr. H. Koppers, of Joliet, Ill., to build them sixty bye-product ovens to include the Koppers' direct ammonia recovery process, and with a capacity to handle the bye-products from the plant enlarged to double the number of ovens in the future. The coke produced from the sixty ovens will be 655 tons per 24 hours. In addition, there will be 4,700,000 cubic feet of gas, 4700 gallons of tar, and 9.4 tons of sulphate of ammonia. This is the same type of oven as is being built extensively by the United States Steel Corporation. The rapid growth enjoyed by the Koppers' coke-oven is evidenced by the fact that the number of Koppers' ovens built and under construction in America from the opening of the American office in 1907 to date is 1376; while the total number of Koppers' ovens built and under construction in America and abroad since this type of oven was introduced in 1903 is no less than 5609.

In consequence of the death of His Majesty King Edward VII. the Council of the Institution of Civil Engineers have decided not to hold the usual *conversazione* this year.

The late Sir Frederick Thorpe Mappin, for some years Chairman of the Sheffield Gas Company, whose death on the 19th of March was recorded in the "JOURNAL" at the time, left estate of the gross value of £931,086. He has left £1000 to the Sheffield University, of which he was a generous supporter during his lifetime.

THE EXTENSION OF THE ZÜRICH GAS-WORKS.

(Concluded from p. 428.)

THE NEW GASHOLDER.

THE new gasholder, making the third on the works, has a capacity of 1½ million cubic feet, and is in two lifts. It is shown, alongside the two original gasholders—each of half its capacity—in fig. 9. The tank is of wrought iron, with flat bottom, and contains 3,743,400 gallons of water. The radial system of guiding the holder was adopted—as in the case of the earlier holders on the works, which had behaved satisfactorily during their ten years' use. This is noteworthy, as the position in the valley of the Limmat is very windy. The tank is heated by steam from Körting's steam-injectors, instead of by hot-water circulation, as in the earlier gasholders. This method of heating is simpler, and has answered well for two winters. The water in the cup of the telescopic lift is also heated by means of steam. Should the development of gas supply in Zürich require any further storage, it is not intended to provide it at the Schlieren works, but to form a gasholder station at the opposite side of the district supplied—viz., either at Wollishofen or Riesbach—to which gas would be delivered from the works through a special high-pressure main. If the consumption of gas continues to extend at the present rate, this gasholder station will have to be taken in hand in two or three years' time, as the existing mains of 40 and 32 inches diameter will soon cease to be large enough for the supply of the district.

EXPERIMENTAL WORKS AND LABORATORY.

Apart from the adoption of modern plant, the profitable operation of gas-works of the size of that of Zürich depends very

greatly on the quality of the raw material used. It is not surprising, therefore, that the experts who were consulted concurred in the view that experimental gas-works should be established. The experimental gas-works of the German Association, established under the control of Professor Bunte, at Karlsruhe, a short time previously, served as a model for the Zürich works. A room between the coal-store and No. II. retort-house was made available for the experimental works. The position had the advantage that crude gas could be taken through a short length of main from the vertical retorts to the laboratory. Fig. 10 gives a sectional elevation and plan of the experimental works. The plant comprises a setting, with producer firing, of two horizontal retorts, and a complete equipment of apparatus of a capacity of 17,658 cubic feet per diem. A portion of the gas produced in the experimental works is taken by a special service to the laboratory, while the excess passes into the ordinary gas-works' main. The coal is supplied even to this small works by mechanical means—being raised by an elevator to a small suspension line running directly in front of the setting.

The laboratory is on two floors; and a third for photometrical observations will shortly be added. The first floor contains the office of the chemist and the principal laboratory; the lower floor, which is partly underground, the gas analysis room, a photometer room, and the room in which the coal-testing apparatus of the Swiss Association of Gas and Water Engineers is accommodated. Balances and the finer instruments are in the office, in order that they may not be exposed to the air of the laboratory. All the ordinary works' tests of materials and bye-



Fig. 9.—The Two Original Gasholders, Each of 875,000 Cubic Feet Capacity, and the New Gasholder of 1,750,000 Cubic Feet Capacity.

products are conducted in the principal laboratory. The gas analysis room contains, in addition to analytical apparatus, an automatic recording Junkers calorimeter, tar stills, a transformer for charging accumulators, and arrangements for drying coal and coke. The laboratory has a north aspect, so that the temperature may be maintained as nearly as possible constant.

THE DRAINAGE SYSTEM AND PUMPING STATION.

The gas-works at Schlieren had during the first eight years of its existence been repeatedly threatened with floods; and in one year the underground passages and cellars were twice flooded in consequence of the rise in the water in the Limmat forcing water back through the drainage system. A pumping station was then established containing a 15 H.P. electromotor, driving directly a Sulzer's dirty-water pump of 9 inches bore and a capacity of 1320 gallons per minute. Further flooding of the gas-works has thus been avoided.

RAILWAY SIDINGS, &c.

The sidings for the coal waggons and the empty waggons for bye-products are worked by means of two capstans driven by electromotors of 10 H.P. They are protected from the weather by means of a corrugated iron shed, which rotates about its vertical axis and is provided with a window. This plant has done excellent service, as the handling of the loaded waggons of 10 to 15 tons capacity without its aid required ten to twelve men on horizontal stretches of line. Now, one or two men do the whole work; and there has been a great decrease in the number of accidents to workmen.

COST OF THE EXTENSION.

A lengthy list of the firms responsible for the constructional work and the supply of the different pieces of new apparatus is given. This is followed by a summary of the cost of the extension carried out during the years 1905-07. The chief items in this summary are as follows:—

| | |
|--|----------|
| I. Buildings—viz., apparatus house, purifier house, and revivifying floor, locomotive shed (extension), stores, coal-store, and coal unloading pit, retort-house, and pumping station | £40,950 |
| II. Underground work—viz., tar and liquor wells, anthracene oil well, drainage, roadways, and pavements | 4,720 |
| III. Railway lines and equipment | 2,200 |
| IV. Manufacturing plant—viz., washing and scrubbing plant, &c., purifiers, tar and liquor pumps, steam pipes and heating apparatus, water supply, electric cables, unloading appliances and coal and coke conveyors, coke preparing plant, retort settings and equipment, chimney, gasholder, and a locomotive | 87,280 |
| V. Works' mains | 2,400 |
| VI. Experimental gas-works | 2,200 |
| VII. General expenses of supervising the constructional work | 4,800 |
| VIII. Interest and sundry expenses | 4,440 |
| | £149,000 |

WORKING EXPERIENCES WITH THE NEW PLANT.

More than a year has passed since the extension has been completed, and it may be useful to make a few observations on the experience gained in the working of the new plant. The coal

received from the Saar and Ruhr districts is stored in a broken state ready for charging the retorts. This procedure has answered well for eleven years, and only once—viz., about ten years ago—has there been a case of spontaneous ignition of the coal, which was traced to improper handling before storage of dusty Ruhr coal. The temperature of the coal is observed in the different sections of the coal-store twice or thrice a week. Since these measurements were started ten years ago the temperature has never exceeded 70° Fahr. The low temperature is believed to be due to the special arrangement of the coal-stores, which have sloping bottoms provided with openings for the automatic withdrawal of coal; so that the coal in the store is constantly cooled by a draught of air.

Views of technical men differ greatly as to the proper manner of storing coal; and it can only be said that up to the present experience at Zürich has shown that, with the mode of storage adopted in the first coal-store, coal has been stored to a height of 28 feet without cases of spontaneous ignition having arisen. This favourable result led to the storage depth being increased in the new coal-store; so that the coal is now stored to a maximum height of 33 feet. It is recognized that coals containing much sulphur, such as the majority of English coals, are more liable to spontaneous ignition; and such descriptions of coal are accordingly stored to a reduced height. With the silo type of store, however, no great anxiety as to possible danger need be entertained, as, with the conveying plant provided, hot coal or coke could be removed from any part of the store and conveyed without

danger to the retorts. As the whole construction is of concrete and iron, there is no risk of breakdown; and in the coal fire in 1900 it was found that there was no difficulty in removing the burning coal by the conveyors.

The new coal-store covers an area of 32,450 square feet. About 24,650 square feet of area are available for the storage of coal, and in the basement about 18,030 square feet are applicable to other stores. The cost of the coal-store, exclusive of conveying plant, amounted to about 9s. 8d. per square foot of area covered. Assuming that 14,000 tons of coal are stored, the expenditure amounts to about £1 2s. 6d. per ton. The space beneath the coal tanks being, however, available for other purposes, has a value depending on the value of land in the locality; and if this space is charged with only one-fifth of the total cost of the store, the cost of the coal storage space becomes reduced to 18s. per ton of coal stored.

The discharging of one ten-ton waggon of large coal with the old plant occupied one man 3 to 3½ hours; the cost for wages, &c., amounting to 2rd. per ton. With the new waggon tip two men discharge at least 60 tons of coal in the hour; and, allowing for interest and depreciation of the plant and the current consumed, the cost of discharging coal works out at 0·6d. per ton. This cost, however, applies only if the plant is used to its full capacity. As the coal-store can be doubled or trebled in size at relatively small cost, and the existing conveying plant would only need to be extended, the latter would then become used to its full capacity, and the cost of 0·6d. per ton would be actually realized. At

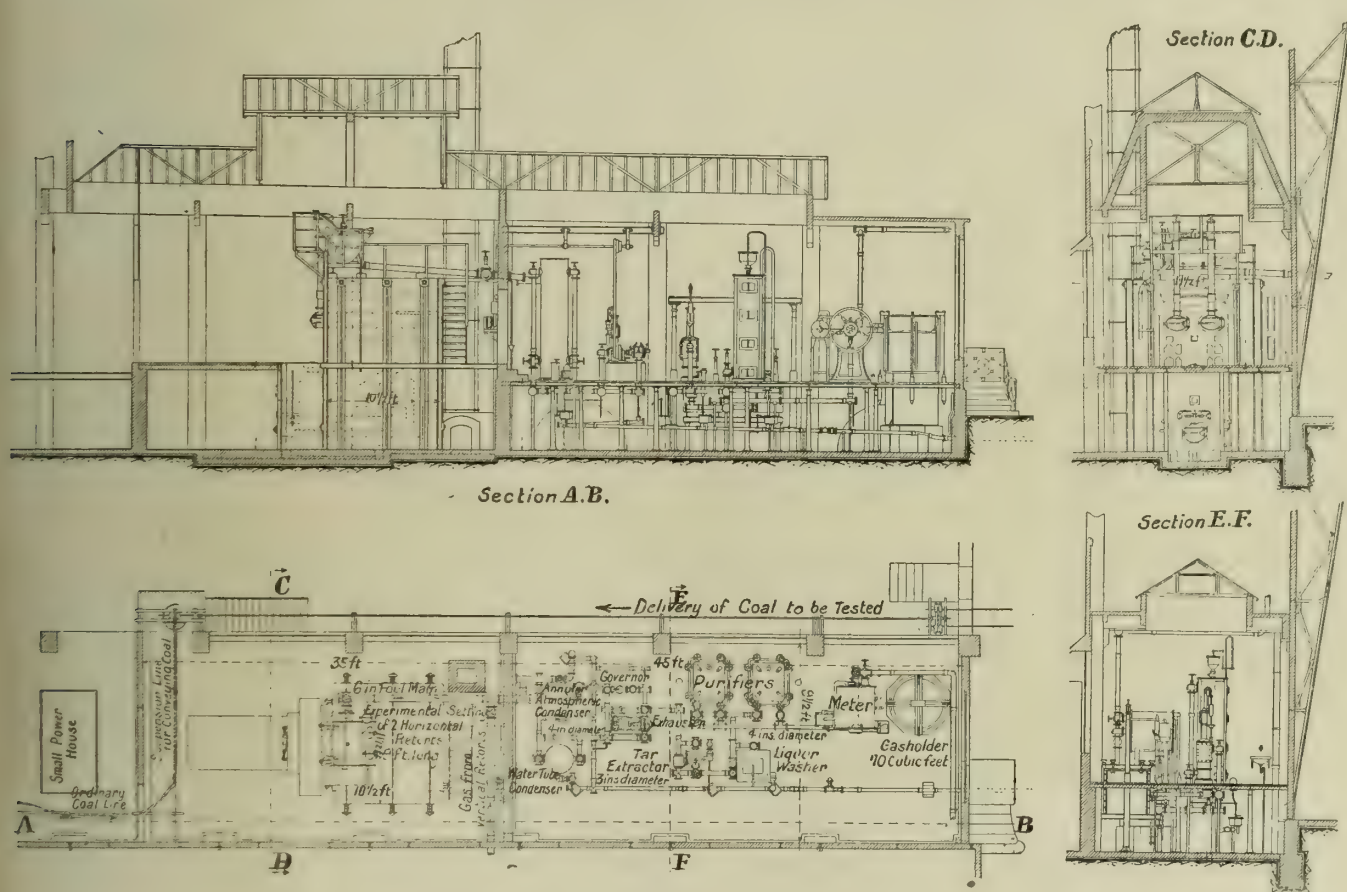


Fig. 10.—The Experimental Gas-Works Plant at Zurich.

present only one-third of the estimated conveying capacity is utilized, and the workmen are not fully employed; so that for the time being the cost of discharging the coal amounts to 1'4d. per ton. If the fifteen-ton or twenty-ton waggons which are now frequently used, are taken as the basis of calculation, instead of ten-ton waggons, the figures for the mechanical discharging of the waggons become still more favourable. The conveying of the coal from the wagon tip to the coal store—inclusive of breaking, removal from the store, and conveying to the coal tanks over the retort-settings—costs, if the conveyors are working to their full capacity, for power and depreciation charges at 10 per cent., 2'44d. per ton, and the wages 0'34d.—making a total of 2'78d. per ton. So long as the quantity of coal conveyed does not use the plant to its full capacity, the cost is correspondingly increased. It has been found that with three men working for ten hours 600 tons of coal can be discharged, broken, and stored in the new coal store, and at the same time 120 tons conveyed from the store to the retort-settings. It is important to note that in this manner the work may be said to be independent of the working staff, which is a factor the importance of which cannot be underrated at the present time.

The vertical retort installation started work in November, 1907, and up to the present has proved entirely satisfactory. The attention required, and the charging and discharging of the

retorts, are of the simplest. The retorts are filled with coal to within some 28 inches of the top. The charge averages 500 kilos (1102 lbs.). The time of carbonization varies, according to the description of coal, from 8 to 10 hours. When no steam is introduced to the retorts, each retort produces 400 cubic metres (14,126 cubic feet) of gas. When steam is introduced during the last hour-and-a-half of the time of carbonization, the make of gas is increased by water gas to the extent of about 10 per cent. The mixed gas thus produced fulfils the requirements in respect of illuminating power and calorific value which are looked for in the gas produced from modern coal gas plant. The quality of the coke is considerably better than that produced from similar coal in inclined retorts, and is especially superior in the case of Ruhr coal. The favourable behaviour of Ruhr coal in vertical retorts has led to its exclusive use in this type of setting at the Schlieren works. The coke produced is very similar in quality to the Ruhr oven-coke, and has nearly the same calorific power as the latter. As it is considerably lower in price, it has been adopted in place of the latter as fuel for use in the central heating stations.

An efficiency trial of the vertical retort plant was made at the instance of the Vertical Retort Company of Berlin by the Instructional and Experimental Works of the German Association of Gas and Water Engineers in May, 1908; and the results have

already been reported in detail in the "JOURNAL" (Vol. CIV., p. 256). The following are the average figures obtained:—

| | Carbonization with Steaming. | Carbonization without Steaming. |
|---|------------------------------------|---------------------------------------|
| Fuel consumed in furnaces—Per cent. by weight of coal carbonized | 15 | 13·9 |
| Make of gas per ton of coal, at 60° Fahr., 30 in. bar., and saturated | 13,814 | 12,164 |
| Yield of coke (dry). Per cent. by weight | 67·2 | 69·3 |
| Fuel consumed per 1000 cubic feet of gas made Pounds | 24·6 | 25·9 |

These favourable results have been substantiated by those obtained in practical working, as is shown by the report of the working of the gas undertaking for the year 1908 ("JOURNAL," Vol. CVIII., pp. 622 and 627). Whereas the inclined retort settings produced on the average only 10,944 cubic feet of gas per ton of coal carbonized, the new vertical retorts produced 12,020 cubic feet, or, inclusive of water gas, 13,280 cubic feet. Further comparative figures of the working were given in the report quoted, the ultimate result being that there was a large economy of coal through the adoption of the vertical retort-settings. Moreover

the conditions with the latter are far less onerous and trying for the stokers than with the old type of settings. The cost of the installation is about the same for the vertical retorts as for inclined retort settings. Some particulars were given in a paper by the author, Herr Weiss, in 1908 (see "JOURNAL," Vol. CII., p. 846). After two years' experience, it may be said that the choice of the Dessau system of vertical retorts has been wholly fortunate. The condition of the settings after 700 working days is extremely good; and it is intended in the ensuing year to convert the old settings of inclined retorts to settings of verticals. The conveying plant for coal and coke has also behaved perfectly satisfactorily throughout the two years it has been in use.

In conclusion, the following comparison of figures taken from the reports of the Zürich gas undertaking for 1896 and 1908 may be of interest.

| | 1896. | 1908. |
|--|--------------------|----------------------|
| Make of gas Cubic feet | 264·9 million | 1017·1 million |
| Wages of a stoker | 3s. 2d. to 3s. 7d. | 4s. 9d. to 5s. |
| Wages of a labourer | 2s. 9d. to 3s. | 3s. 11½d. to 4s. 4d. |
| Expenditure in wages per 1000 cubic feet of gas made | 3½d. | 1·8d. |

Comment on these figures would be superfluous.

HIGH-PRESSURE GAS LIGHTING IN BIRMINGHAM.

Demonstration at the Bingley Hall.

FOR some weeks past, the National Trades and Industrial Exhibition has been held in the Bingley Hall, Birmingham. This building is the largest permanent exhibition hall in the Provinces, and has a floor-space of 65,000 square feet available for exhibits. The Birmingham Gas Department have taken advantage of the opportunity to demonstrate to the manufacturers and factory proprietors of the district the efficiency of modern methods of high-pressure gas lighting. The scheme was arranged by the Fittings Superintendent (Mr. S. R. Barrett, Assoc.M.Inst.C.E.); and four firms prominent in the United Kingdom at the present time are represented in the installation.

The Entertainment Hall and Machinery Section are lighted by Messrs. Thomas Glover and Co., Limited, with the Sale-Onslow vertical system high-pressure burners. The firm exhibit 33 lamps, giving an illuminating power of 48,250 candles with a gas consumption of 1206 cubic feet per hour, costing 27·6d. per hour with gas at 1s. 11d. per 1000 cubic feet. The central bay and bandstand are lighted by 20 Keith-Blackman 1910 pattern inverted lamps, each of 1500-candle power, consuming 25 cubic feet per hour. The Keith and Blackman Company supply altogether 30,000-candle power, at a cost of 11½d. per hour. The third bay is lighted by two types of Messrs. W. Sugg and Co.'s lamps—one portion by eight reflecting lamps fitted with seven bijou inverted burners, each lamp giving 1000-candle power with a consumption of 22·2 cubic feet per hour, and the other by eight lamps with four ordinary size inverted burners, each lamp giving 500-candle power with a consumption of 11·1 cubic feet per hour. The "Ovee" Light Company, of Manchester, light the north bay with eight lamps, each of 1500-candle power, with two inverted burners, and two lamps of 2200-candle power each with three inverted burners. The north balcony is also lighted by this firm with 16 inverted lamps, each giving 100-candle power with a consumption of 2 cubic feet of gas per hour. The outside lighting at the approach to the hall is also effected by two "Ovee" lamps, each giving 2200-candle power, fixed 22 feet from the pavement. It may be mentioned that the "Ovee" type of lamp is that known on the

Continent as the "Millennium" lamp—similar to those adopted by the Berlin Municipality for high-pressure gas lighting in many miles of the best thoroughfares.

The lighting of the whole of the 65,000 square feet of floor space at the Bingley Hall is obtained at a cost of 4s. 5½d. per hour, with gas at 1s. 11d. per 1000 cubic feet. The total illuminating power obtained from the whole installation is 112,650 candles. The experience of this exhibition with high-pressure inverted lighting furnishes confirmatory evidence of the great economy that can be effected in mantle maintenance in the case of a well-fitted installation. Two mantles per burner covers the whole cost of renewals during the period the exhibition has been running—viz., from the 21st of March—including the unavoidable breakages which occurred during the trial lighting in the few days before the official opening. The compressors used are those recommended by each of the firms. Messrs. Thomas Glover and Co., the Keith and Blackman Company, and the "Ovee" Company all use rotary compressors; Messrs. Sugg and Co. employ a reciprocating compressor.

The appended table enables intending users of high-pressure gas to select by their own observation a suitable type of light for their workshops. Though the exhibition is very brilliantly lighted, it has not been unnecessarily illuminated; the chief object having been to exhibit the best types of practical high-pressure workshop and factory lighting systems now on the market in this country. The very small consumption of 2330 cubic feet of gas per hour for the whole exhibition is very notable. The objection to a high temperature by the use of gas for lighting has been quite avoided by the introduction of ventilators fixed in the roof of each bay. There are altogether 15 of them in the building, each delivering foul air from the apex of the roof at the rate of 28,300 cubic feet per hour.

In the centre of the hall, the Birmingham Gas Department have an interesting exhibition of furnaces, stoves, cookers, &c., as well as one novelty in the form of a ratchet cock attached to an ordinary chandelier, by means of which any burner may be turned on or off as desired by one pull. There are likewise interesting exhibits by Messrs. Parkinson and W. & B. Cowan, Limited, and the Cannon Iron Foundries, Limited. In fact, the exhibition, which is held annually in Birmingham, offers an exceptional opportunity each year for the manufacturers of gas lighting and heating appliances to bring their apparatus to the notice of the general public.

| Position. | Name of Maker and System. | Number of Lamps. | Number of Mantles in Each Lamp. | Candle Power of Each Lamp. | Consumption of Gas per Hour Each Lamp. | Total Candle Power. | Total Gas Consumption per Hour. | Cost of Gas per Hour. | Candle Power per Cubic Foot of Gas Used. | Pressure of Gas in Inches of Water. |
|--|-------------------------------|------------------|---------------------------------|----------------------------|--|---------------------|---------------------------------|---|--|-------------------------------------|
| | | | | | | | | Exhibition Price Gas at 1s. 11d. per 1000 Cub. Ft | | |
| Amusements Annexe, south side | Thos. Glover and Co., Limited | 9 | 3 upright | 3000 | 75'00 | 27,000 | 675'0 | 15'5 | 40'0 | 40'0* |
| Machinery Section | Sale-Onslow system | 5 | 3 " | 3000 | 75'00 | 15,000 | 375'0 | 8'6 | 40'0 | 40'0* |
| South Balcony | Do. do. | 13 | 1 " | 250 | 6'25 | 3,250 | 81'0 | 1'8 | 40'0 | 40'0* |
| West Balcony, back of Band-Stand | Do. do. | 6 | 1 " | 500 | 12'50 | 3,000 | 75'0 | 1'7 | 40'0 | 40'0* |
| First Bay | Keith and Blackman Co., Ltd. | 9 | 1 inverted | 1500 | 25'00 | 13,500 | 225'0 | 5'1 | 60'0 | 54'0† |
| Central Bay and Band-Stand | Do. do. | 11 | 1 " | 1500 | 25'00 | 16,500 | 275'0 | 6'3 | 60'0 | 54'0† |
| Third Bay | Wm. Sugg and Co., Limited | 8 | 7 bijou do. | 1000 | 22'20 | 8,000 | 177'6 | 4'07 | 45'0 | 48'0‡ |
| | Do. do. | 8 | 4 inverted | 500 | 11'10 | 4,000 | 88'8 | 2'02 | 45'0 | 48'0‡ |
| Fourth Bay | "Ovee" Light Company | 8 | 2 " | 1500 | 23'50 | 12,000 | 188'0 | 4'3 | 63'8 | 56'8§ |
| | Do. do. | 2 | 3 " | 2200 | 35'00 | 4,400 | 70'0 | 1'6 | 62'8 | 56'8§ |
| Outside lamps | Do. do. | 2 | 3 " | 2200 | 35'00 | 4,400 | 70'0 | 1'6 | 62'8 | 56'8§ |
| North Balcony | Do. do. | 16 | 1 " | 100 | 2'00 | 1,600 | 32'0 | '73 | 50'0 | 56'8§ |
| .. | .. | .. | .. | .. | Totals . | 112,650 | 2332'4 | 53'32 | .. | .. |

* Sale-Onslow compressor, driven by 1 H.P. gas-engine. † Keith's rotary compressor, direct-driven by ½ H.P. gas-engine. ‡ Sugg's direct-action gas-engine compressor, ½ H.P. § "Ovee" compressor, driven by 1½ H.P. gas-engine (½ H.P. only required).

CONCILIATION (TRADE DISPUTES) ACT.

UNLIKE some of its more favoured fellows, the statistical report with regard to proceedings under the Conciliation (Trade Disputes) Act, 1896, usually makes its appearance only once every two years. The seventh report by the Board of Trade, which is now issued (over the signature of Mr. G. R. Askwith, of the Labour Department), covers, in fact, an even longer time, inasmuch as it deals with the period from July 1, 1907, to Dec. 31, 1909, during which the number of cases under the Act, it is gratifying to be able to note, showed a considerable proportionate increase over those in the years referred to in previous reports. In a number of instances, it is stated, the applications for the appointment, under the Act, of arbitrators or conciliators, have been the result of negotiations between the parties conducted by officers of the Board of Trade.

Before briefly noticing some of the main points of the report, it may be as well to indicate the lines of the Act with which it deals. The working provisions are contained in four sections, the first of which provides for the registration of such Conciliation Boards as are constituted for the purpose of settling disputes between employers and workmen, and for the furnishing by them to the Board of Trade of such returns, reports of proceedings, or other documents as may be required. In the next are set forth the powers which may be exercised by the Board of Trade, where a difference exists or is apprehended between an employer, or any class of employers, and workmen, or between different classes of workmen. After inquiring into the causes and circumstances of the difference, the Board may: (1) Take such steps as may seem expedient to them for the purpose of enabling the parties to meet, by themselves or their representatives, under the presidency of a chairman, mutually agreed upon or nominated by the Board of Trade or by some other person or body, with a view to the amicable settlement of the difference; (2) on the application of the employers or workmen interested, and after taking into consideration the existence and adequacy of means available for conciliation in the district or trade and the circumstances of the case appoint a person or persons to act as Conciliator or as a Board of Conciliation; or (3) on the application of both parties to the difference, appoint an Arbitrator. Section 3 stipulates that the Arbitration Act, 1889, shall not apply to the settlement by arbitration of any difference or dispute to which the present Act applies; but any such arbitration proceedings shall be conducted in accordance with such of the provisions of the said Act, or such of the regulations of any Conciliation Board, or under such other rules or regulations, as may be mutually agreed upon between the parties. The last section to which reference need be made provides that if it appears to the Board of Trade that in any district or trade adequate means do not exist of having disputes submitted to a Conciliation Board for the district or trade, they may appoint any person or persons to inquire into the conditions of the district or trade, and to confer with the employers and employed, and (if the Board of Trade think fit) with any local authority or body, as to the expediency of establishing a Conciliation Board for the district or trade.

To return to the report, it may be remarked that the number of cases dealt with during the two-and-a-half years from July, 1907, to December, 1909, was 133; and in 56 of these, stoppage of work occurred. Since 1896, 365 cases in all have been dealt with; and of these 117 occurred during the two years 1908 and 1909. Of the 365 cases, there were joint applications in 234; while in 82 instances the applications were from the workpeople only, and in 24 from the employers only. Whereas in the earlier years of the operation of the Act applications for the intervention of the Board of Trade came mainly from the side of the workpeople, the great majority of the applications in recent years have been of a joint nature—either from the parties themselves or from organizations directly representing them. In the period now under review, 92 of the 133 cases dealt with (or 70 per cent. of the whole) were the result of joint applications. Of course, the report does not pretend to furnish a full statement of what is being accomplished by conciliation, as there are a large number of Conciliation Boards who carry on their work without ever finding it necessary to ask for the intervention of the Board of Trade—or, at any rate, only at infrequent intervals. The provisions of the Act of 1896 are, as a rule, it may be assumed, not brought into action until other means of arriving at a settlement of disputed points have proved ineffectual. Therefore the cases that are dealt with in the report can merely be considered as part of the work done in the name of conciliation. The power to act that is possessed by the Board of Trade when the parties to a dispute are unable of themselves to arrive at an agreement, is an important one; and there have in the period now being dealt with been several memorable instances of the Board's intervention. Among these may be mentioned the disputes which affected the railway servants throughout the United Kingdom, the engineering trade on the North-East coast, the shipbuilding trade in the same district, and the coal miners in Scotland. Of all the 33 cases embraced in the present report, 38 arose in the building trades, 20 in mining and quarrying, 19 in metal, engineering, and shipbuilding trades; 18 in the boot and shoe trade; 10 in the textile trades; 7 in transport trades; and 21 in other trades.

In the railway servants' dispute, a scheme was accepted providing for the establishment of Conciliation Boards to deal with

questions relating to rates of wages and hours of labour which cannot be mutually settled through the usual channels. The intervention in the dispute from which the North-East coast shipbuilding trade suffered, resulted in an agreement establishing machinery for conciliation; provision being made that there shall be no stoppage of work by either party until the matter in dispute shall have been submitted to the Conciliation Committees thus established. The trouble in the Scottish coal trade arose in connection with the question of the minimum wage. The coalowners had given notice of a reduction in wages, to which the men refused to submit. Matters drifted into so grave a position that the Board of Trade approached the representatives of the parties; and conferences were held at which an agreement was arrived at, and the threatened stoppage of work averted. The formation of Conciliation Boards for the employees of the Tramways Department of the London County Council constitutes another important case in which action has been taken by the Board of Trade.

It is recorded that in September, 1908, a memorandum was circulated to Chambers of Commerce and Employers' and Workmen's Associations notifying the intention of the Board of Trade to establish a Court of Arbitration in connection with the Conciliation Act. For the purposes of the Court of Arbitration, three panels were formed—the Chairmen's Panel, the Employer's Panel, and the Labour Panel—and, on the application of the parties to an industrial dispute, a Court of Arbitration, consisting of three or five members, is nominated by the Board of Trade from these panels. Technical Assessors can also be appointed, for the purpose of giving the Court information on technical matters, in cases where their assistance is considered expedient. The first Court of Arbitration was appointed in connection with the Northampton boot and shoe trade. The disputes which had led to a stoppage of work at the Dunkerton Collieries, near Bath, and at the Carron Iron-Works, Falkirk, were referred in each case to the decision of a Court of Arbitration; and there were several other cases in which the parties also applied for the appointment of a Court.

The total number of Conciliation Boards in existence at the end of 1909, so far as known to the Department, was 277, which was an increase of 68 as compared with August, 1907. This number is made up of 260 Boards dealing with particular trades, and 17 District and General Boards, including both those registered under the Conciliation Act and those not so registered. The rules of Conciliation Boards and the "working rules" or other agreements observed by the employers and workpeople in the several trades frequently contain a clause providing that, in the event of the Conciliation Board or other conciliatory agency failing to effect a settlement, application shall be made to the Board of Trade for the appointment of an Arbitrator, Umpire, or Conciliator. So far as the Department are aware, such clauses now exist in 87 agreements.

CAUSES OF DESTRUCTION OF REFRACTORY BLOCKS AND RETORTS.

By ALFRED B. SEARLE, Ph.D.

(Continued from p. 425.)

It has already been shown that, so far as the raw material of which retorts and blocks are made is concerned, its refractoriness depends chiefly on its composition—that is to say, on the presence of a suitable proportion of alumina in the clay, and on the absence of more than trifling proportions of fluxing materials either in the ingredients themselves or in the materials coming into contact with retorts or blocks. In actual use, the term "refractory" is employed to cover a very much wider range, and is commonly understood to mean that articles to which it is applied are resistant to heat under the conditions under which they are actually employed. Hence a clay which may be perfectly satisfactory when heated in the laboratory may prove useless in the works, where the conditions of heating are so different.

SUDDEN CHANGES IN TEMPERATURE.

This is particularly the case in gas manufacture, where a retort full of almost white-hot coke is suddenly emptied—the fall in temperature inside the retort being particularly rapid, while the outside of the retort remains at a practically constant temperature. There are thus set up a number of violent strains within the material of the retort; and unless its texture is suitable for permitting these strains, the damage done may be serious. The amount of strain produced will depend upon the relative freedom of the various particles composing the retort or block; and this freedom to expand or contract may be, in part, influenced by such extraneous conditions as the "setting." The study of the effect of sudden changes in temperature is thus highly complex. Omitting, for the moment, the difficulties due to defective setting, however, the amount of strain produced within the article itself will be, roughly, proportional to the coefficient of expansion of the material, and will be indirectly proportional to the pore-space. Hence, such strains will be far greater with dense articles than with more porous ones.

Almost any degree of porosity (within reasonable limits) may be given to articles made of clay, by the addition of materials

which will burn out during the firing, leaving pore-spaces in their place. But the disadvantage of this method of increasing the "life" of retorts is two-fold. The greater the porosity of the retorts, the more are they liable to cause wastage of gas through the walls; and the more air there is in the pores of the material, the slower will the retort be in heating. Consequently, the retort manufacturer is in a dilemma. If he makes a retort which is sufficiently porous to be very durable under sudden changes of temperature, he will receive complaints that his retorts take too long to heat up; while if he attempts to produce retorts that can be heated rapidly, he runs great risks of manufacturing articles which will only last a short time.

In such a case, compromise is essential. If gas engineers look for rapidity in heating, they must be prepared to forego some amount of durability. Fortunately, in some respects, though disadvantageously in others, a retort soon becomes covered internally with a coating of deposited carbon which stops up many of the pores and so renders what would otherwise be an unusably porous retort quite satisfactory. Hence, the modern manufacturer aims at producing retorts which are really very porous when new, as he is fully aware that the deposited carbon will rapidly prevent them from leaking excessively. In this way, it is possible to obtain all the advantages of resistance to sudden changes of temperature combined with sufficient gas-tightness for all practical purposes. Such retorts are, however, relatively bad conductors of heat, and thus take more time and fuel to raise them to the temperature necessary for the coking of coal, though the difference in this respect is seldom of more than academic interest, and the cost of the extra fuel is far more than counterbalanced by the saving in retorts and in re-setting.

The conditions of heating and cooling vary so greatly in different gas-works that no general figures showing the limits of porosity, density, and heat conductivity are of value—they are in fact misleading. Each engineer must choose for himself a standard, or a series of limits which he has found, by experience, to be the most suitable for a given works; and he must be prepared to revise these whenever he undertakes the charge of a fresh works, using a different bed of coal.

The actual composition of retorts and blocks used in gas manufacture is really outside the province of the gas engineer, though he may often impose certain limits in his specifications. It is, therefore, sufficient to state here that the greater the proportion of the burned material (technically known as "grog" or "burnt stuff" used in the manufacture of refractory articles, the greater will be their porosity and durability. Most British makers of retorts prefer to employ much clay and little burned material, because the latter, being hard and gritty, is unpleasant for the workmen, and soon makes their hands sore unless they adopt various forms of gloves or use tools in place of fingers. Yet the use of a large proportion of unburned fire-clay in the mixture employed for making high-class refractory articles, has been repeatedly shown to be unsatisfactory, as far better results can be obtained when the proportion of raw clay is kept small.

Some clays naturally contain but small proportions of plastic material; and when these are used, the effect is practically the same as when a non-plastic material (such as "grog") is mixed with a little highly plastic clay. For this reason, a number of fire-clays are highly prized by retort manufacturers. They are not only highly refractory, but their low plasticity makes them sufficiently porous when burned to answer practically all the requirements of gas engineers; while the ease with which they can be worked enables the making or shaping of the retorts to be carried out with less discomfort to the men employed.

Unfortunately, the number of these clays is very small, and the amount of them available is rapidly diminishing each year. It is thus becoming increasingly necessary for retort and fire-brick makers in this country to adopt, at any rate in part, the principles found so successful by most German firms in a similar line of business—to regard a burned material of great refractoriness as the basis of their material and to add to this just sufficient plastic clay to produce a mixture with the necessary bonding power and of the required strength. Only in this way can most retort manufacturers expect to keep up to date with the ever-increasing requirements of gas and other engineers. Fortunately, a number of the more prominent manufacturers are already realizing this, and, acting upon the advice of the present writer, have made the necessary modifications in their methods of working.

UNEXPECTED CONTRACTION.

Another frequent cause of destruction of retorts and blocks—particularly when the latter form part of an important setting—is the reduction in size which they undergo after some amount of use. It is well known that a block may be repeatedly heated to the same temperature, and may become less and less after each heating; the shrinkage continuing for a long time without ever ceasing. Many blocks possess this characteristic to a very undesirable extent. It is most marked when the manufacturer has fired his kilns to a temperature below, or at any rate not much greater than, that at which the blocks are used; and this troublesome defect is least noticed in very hard-fired goods.

Most fire-brick and block makers hesitate to fire their goods to a sufficiently high temperature because of the greater cost in fuel and attention which this would involve. Yet to offer for sale goods of this class, which will shrink still further in use, is to create difficulties of many kinds which are exceedingly troublesome to remedy and remove. Brickwork loses its whole strength

and value if the bricks shrink much; for strains are thereby set up which tend to either pull some of the work away from the rest, or put an undue pressure on some other portion ill-calculated to bear it.

This shrinkage difficulty may be, and has for some time past been, overcome by heating the goods to a temperature well above that which they will be required to withstand in actual use. On the Continent, this has been the custom for many years; and foreign fire-brick makers cannot at all understand the British manufacturer's reasons for firing his kilns at so relatively low a temperature. Within the last few years, however, several firms have, under the present writer's recommendations, increased the finishing temperature of the kilns used for "best" fire-bricks and blocks from about 2200° to 2700° Fahr., and in one instance to 2750° Fahr., and have found immediate benefit in the greater satisfaction they have been able to give to their customers. Indeed, the author has long held the opinion (amply confirmed by extensive practice) that for the best work no retorts or blocks should ever be used which have been fired in the kilns at a temperature of less than 2600° Fahr. Notwithstanding the statement to the contrary of many brickmakers, there is no serious difficulty in obtaining this temperature with most of the kilns now in use for fire-brick manufacture; and the increased durability of the product, and great reduction in cost of repairs and renewals amply compensates the users for any slight additional cost which may be incurred in firing to the higher temperature.

In this connection, it may not be inappropriate to mention that many of the smaller firms of retort and block manufacturers have curiously wrong ideas as to the temperature reached in their kilns. This confusion is partly due to pure guesswork, and partly to the use of two scales of temperature in clay-working literature—the Fahrenheit and the Centigrade, the former of which is practically double the latter at high temperatures—and partly to a desire to say what will please the customer. It is, therefore, to the interests of the gas engineer that he should take some means of checking the temperatures reached, and should assure himself by the use of Seger cones, or some other simple test, that the desired temperature has really been reached in the kilns.

Even though the much higher temperature of firing just noted be adopted, shrinkage will still continue; but it will usually be so small as to be inappreciable in ordinary gas engineering.

It is also important, before condemning blocks for excessive shrinkage that the mason's work shall have been properly carried out. It is not unusual to find that condemned samples do not shrink excessively when heated singly, but that the real defect is due to the use of very thick joints in the masonry. If it were possible to build the work dry, and without using any mortar at all, this would form an ideal jointing; but in practice some jointing material is necessary. The most satisfactory, in the author's experience, is fire-clay of good quality mixed with an equal weight of water, and sifted repeatedly through a fine sieve (60 or 80 holes per running inch) until a perfectly smooth "cream" is obtained. The bricks or blocks are then dipped in this, and laid without any further "mortar." In this way the thinnest possible joints are produced. When once they are accustomed to the use of this liquid material, the masons will usually prefer it, as it considerably lessens their labour if the blocks are well-shaped. To the engineer in charge, it has the additional advantage that badly twisted blocks cannot be laid satisfactorily, and must therefore be discarded. In this way, a certain amount of "packing," not frequently used without direct discovery except in the short "life" of the settings, is avoided.

(To be continued.)

English Gas Plant for Canada.—The last number to hand of the "Gas Journal of Canada" contains an illustration of a firm installation of gas plant supplied to the Consumers' Gas Company of Toronto, by Drakes Limited, of Halifax. According to some particulars supplied by Mr. Frank C. Perkins, the plant consists of two 2½ million sections. There are two exhausters in service and two steam engines of high power, together with two air-cooled tubular condensers, each fitted with 185 charcoal iron tubes, 6 inches diameter. There are two Pelouze and Audouin tar-extractors, and two Livesey naphthalene washers work in conjunction with them. The plant is provided, in addition to the above, with two tubular water-cooled condensers each fitted with 669 tubes, 2½ inches diameter, together with two Livesey washers and two rotary washer-scrubbers of an improved English type, with steam-engines for operating them.

Oil and Gas Pumping.—Referring to this subject in "Cassier Magazine" for the current month, Mr. H. D. Emerson says: "In pumping oil through pipes, it is usual to pump it a certain distance and then use a relay pump for the next stage. In handling gas, this is not so efficient a method as to compress the gas at the first station to a maximum density. The amount of gas that can be passed through a line between given points depends on the difference between the squares of the initial and discharge pressures. It is much more economical to pump the gas with one high-stage compression at the initial end than to relay it with several low-stage compressions. The practical result of this experience is that the compressor plants are placed in convenient locations to the wells, and the gas is forced through the transporting lines to the immediate vicinity of consumption, where the pressure in the city distributing lines is regulated by equalizing valves."

DR. BUNTE ON THE GAS INDUSTRY.

The following is an abstract of a lecture delivered by Dr. H. Bunte on the 20th inst., at the Annual Meeting of the Society of German Chemists in Munich. The subject was "Recent Developments in the Production and Application of Gas."

The lecturer dealt first with coal gas, and described its development under the influence of incandescent lighting during the last decade. Statistics, he remarked, showed that in no previous period had the increase in the number of gas-works, as well as in the consumption of gas, been larger than in those ten years. Hundreds of small places were provided with gas from their own works, or by means of a supply from a distance, for lighting, heating, and power; and at the present moment there were in existence thirty plants, commonly called "overland central stations," for distance supply. The consumption of gas in Germany had been doubled during the last decade, and should be to-day about 2000 million cubic metres. Berlin, which was excellently provided with electric current, had a consumption of 183 million cubic metres of gas in 1898; whereas to-day the figure was upwards of 400 million cubic metres. In the same period, the consumption per head of the population had risen from 70 to 120 cubic metres.

The lecturer went on to describe the progress of the gas industry in the chemical and mechanical directions. The tedious work of gas production had, he said, been rendered considerably easier, and the number of hands required had been decreased to one-quarter, by the extensive application of suitable mechanical transport plant, and by the new carbonizing systems which had been introduced, such as the vertical settings of Bueb and Körtling and the chamber settings of Ries, which latter could be seen working at Moosach (Munich).

The more modern idea of gas production regarded the obtaining of a maximum of calorific value from the coal in the form of gas as the most desirable aim of the industry. For the scientific study of gas production and application, the German Association of Gas and Water Engineers had founded an Instructional and Experimental Gas-Works at the Technical High School at Carlsruhe. Dr. Bunte referred to the results of the work done there, and went on to state that upon the dry distillation of coal its calorific value could be found undiminished in the products—about 67 per cent. being found in the coke, 24 per cent. in the gas, and 8 per cent. in the tar. Gas making could therefore be considered to be a refining process—turning smoke-producing raw coal into smokeless coke and gas. For fighting the soot and smoke nuisance in towns, he recommended the motto, "Heat with Coke; Cook with Gas."

Having described, with the aid of diagrams, the construction of modern carbonizing plant and its advantages, Dr. Bunte went on to deal with the application of gas. He gave details of the bunsen burner, which, with the advent of the Welsbach mantle, had come to rule the whole province of lighting and heating. Considerable advances had, he said, been made in connection with upright and inverted incandescent lighting by a suitable design of the bunsen burner with respect to the quantity and quality of air supply and the employment of the waste heat of the products of combustion for preheating. The economy of production of light had thereby been enormously increased. With large high-pressure lamps, only 0.45 litre of gas was consumed per candle-hour, and 0.8 to 1 litre with inverted lamps, as against 1.5 litres with the old Welsbach burner. The cost of equal quantities of light had therefore during the last decade decreased to about one-half at the same price for gas; and gas lighting was unrivalled as regarded cheapness and efficiency. A good deal of work was being done in the direction of perfecting the several systems of distance lighting.

In conclusion, it was mentioned by the lecturer that the gas industry had been connected with aerial navigation from its commencement; and the modern processes for the production of balloon gas by decarburization were described, and experiments and proposals for the manufacture of cheap commercial hydrogen gas from coal gas or water gas were referred to. It was pointed out by Dr. Bunte how important the production of such balloon gases was for the further development of aerial navigation; and he appealed for collaboration in this direction.

PRODUCTION OF FIRE-CLAY GOODS.

In the notice which appeared in the "JOURNAL" for the 10th inst. of the last Blue-book containing the third of a series of tables summarizing the results of returns received under the Census of Production Act, 1906, it was mentioned that there were employed in brick and fire-clay factories (in the year 1907) 63,287 persons, and that the net output was £5,060,000. The Blue-book furnishes the following additional information.

In response to a voluntary question addressed to all manufacturers of fire-clay goods, replies were received showing that such manufacturers raised 340,000 tons of fire-clay from their own quarries and shallow workings. This probably represents the great bulk of the fire-clay so raised; and adding it to the output from mines, it appears that the total quantity of fire-clay raised in

the United Kingdom in 1907 was at least 2,882,000 tons. These figures differ from those shown in the General Report on Mines and Quarries for 1907, Part III., where the output of fire-clay from mines under the Coal Mines Regulation Act alone is said to have been 2,890,000 tons in that year. The difference is probably due, as in the case of coal, to the exclusion of unsaleable clay from the returns made to the Census Office.

In order to obtain more detailed particulars regarding the output of fire-clay goods, a voluntary question on this subject was addressed to all manufacturers. The replies show that manufacturers whose total output of goods made from fire-clay and brick earth was valued at £1,598,000 produced fire-clay goods as under:—

| | Tons. |
|---|---------|
| Fire-bricks (including bricks of 9 in. by 4½ in. by 2½ in. and bricks of 9 in. by 4½ in. by 3 in., smaller bricks, and larger bricks not exceeding 1½ bricks) | 968,000 |
| Large bricks (including quarries, tiles, and bricks larger than 1½ bricks) | 156,000 |
| Retorts | 21,000 |

The above tonnage of retorts refers only to a value of £37,000 out of the total of £57,000. In addition to the output of bricks and retorts set out in the above statement, the firms furnishing particulars had an output of unspecified fire-clay goods valued at £100,000.

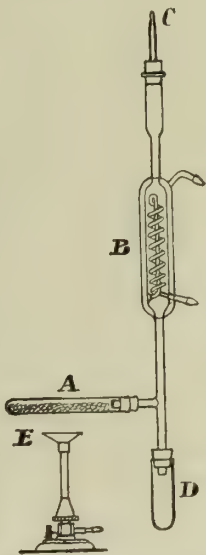
The number of bricks and tiles of brick earth exported (which were grouped together in the export and import lists in 1907) was 101,138,000, valued at £321,000; and the net number imported—i.e., imports less re-exports—was 3,809,000, valued at £22,000.

The net output of the brick and fire-clay factories included in this part of the report was £5,060,000—this sum representing the total amount by which the value of the products of those factories, taken as a whole, exceeded the cost of the materials purchased and used in their manufacture. The actual cost of the materials purchased and used is not known; but it lies between £2,463,000 and £2,643,000. Firms making bricks and fire-clay goods from clay raised from their own mines and workings were instructed not to include the cost of such clay in their "materials" unless they had included it as "output" in the returns which they had already made for their mines or quarries. The cost of materials as furnished to the Census Office includes, therefore, only the cost of such clay as was purchased or transferred from mines owned by the firms making returns; and the rents and royalties for clay workings other than mines had to be defrayed out of the "net output."

APPARATUS FOR SHOWING COAL-GAS MANUFACTURE AS A LECTURE EXPERIMENT.

Lecturers on the manufacture and purification of coal gas will doubtless be interested in a short note contributed to the current issue of the "Chemiker Zeitung," where Herr Nic. Teclu gives a description of an apparatus for the lecture table with which the principles of coal-gas manufacture can be very easily and quickly shown. The arrangement adopted allows of the production of tar and ammoniacal liquor in addition to illuminating gas being shown; and, further, the parts of the apparatus are readily cleaned and put in order again for a repetition of the experiment.

As will be seen from the illustration, small pieces of coal are placed in the tube A, of hard glass, and there heated by a bunsen burner provided with a fan-shaped distributor by which the flame is directed over the length of tube. The products of distillation pass off by the tube on the right; the gas making its escape at C, where, after the air has been expelled from the apparatus, it can be ignited. B is a Landsiehl condenser—that is, one of the spiral pattern which effects thorough cooling, and from which the condensed products return to the tube D—this latter being detached and the tar and ammonia shown to the students. The recommended method of cleaning the tubes after the performance of the experiment is to replace A by a flask in which some methylated spirit can be boiled. The alcohol vapour then cleans out the condenser and other tubes—washing down any deposit into the receiver D.



Mr. Philip Holmes Hunt is due to arrive at Liverpool from Melbourne (via Canada) on Friday next.

The Bolton Corporation Gas Committee have appointed Mr. A. N. Torkington Office Superintendent in succession to Mr. William Walch. Mr. A. Dearden is made Cashier.

The late Sir Robert Giffen, F.R.S., the eminent statistician, whose death was recorded in the "JOURNAL" for the 19th ult. left estate valued at £9645 gross, with net personalty £9566.

PETROL-AIR GAS.

By WILLIAM KEY,

Formerly Manager of the Tradeston Gas-Works, Glasgow.

No form of artificial lighting which has ever been successfully introduced for public and private service has, from its inception, met with such general approval, and given so much satisfaction as an odourless and smokeless illuminant, as has that of petrol-air gas, not only for its wholesomeness and cleanliness as a lighting and cooking medium, but particularly from the fact that its record, throughout the early years of its introduction, has been practically one of entire immunity from fatal, or even serious, accident. Petrol-air gas maintains at the present day that creditable reputation, and occupies a more exalted position in these respects than any other form of illumination. It is not, and never will be, a competitor with cheap coal gas. Everyone extends to that great industry the deepest sympathy in respect of the extraordinary series of unfortunate accidents for which the manufacture of coal gas has been responsible during the past twelve months, whereby many lives and much property have been lost. Three notable cases are those of Geneva, Hamburg, and Coatbridge; and there were also the gas explosions at Bermondsey, Blackfriars Bridge, and in other districts of London. While 45 cases of suicide by inhalation of coal gas were reported during the year, it is noteworthy that no such thing has happened, or can ever occur, by the inhalation of petrol-air gas. In this respect alone, it is well entitled to the name of "Safety Gas."

The process for the generation of petrol-air gas will be more easily understood, and be better illustrated, by one or two references to results given by authors who have devoted study to the evaporation of petrol and similar spirit. In the "Transactions of the Royal Scottish Society of Arts (Edinburgh)," Vol. XVIII., Part III., 1910, Dr. James B. Readman, F.R.S.E., during the reading of his paper on "Fuels for Motor-Car Engines," illustrates the different qualities by evaporation of similar volumes of various petrols as shown in the following table:—

Evaporation of Petrols, &c., in Still Air at Ordinary Temperatures.

| Fuel. | Specific Gravity. | Temperature. | | Time of Evaporation. | | Residue. |
|------------------------------------|-------------------|--------------|---------|----------------------|-------|------------|
| | | Deg. F. | Deg. C. | Hrs. | Mins. | |
| Pratt's petrol | .701 | 43 | = 6.1 | 2 | 31 | None |
| Pratt's distillate below 100° C. | .692 | 62 | = 16.6 | 1 | 14 | " |
| Shell petrol | .719 | 62 | = 16.6 | 2 | 23 | " |
| Oakbank shale spirit | .717 | 62 | = 16.6 | 2 | 8 | " |
| Do. distillate below 100° C. | .703 | 62 | = 16.6 | 1 | 15 | " |
| Pumphreston shale spirit | .717 | 62 | = 16.6 | 1 | 51 | " |
| Benzol | .870 | 43 | = 6.1 | 9 | 5 | Oily drops |
| Do. | .870 | 62 | = 16.6 | 3 | 43 | None |

This table is of particular interest to manufacturers of coal gas, as well as to those whose business it is to generate petrol-air gas at about the prevailing temperatures of the outer air—especially to the former, who have been in the habit of "cracking" a considerable quantity of benzol for the temporary enrichment of coal gas, because at the lower temperature this spirit will again assume the liquid form, not by itself only, but in conjunction with a considerable volume of the lighter hydrocarbon vapours extracted by capillary attractions and varying tensions from the coal gas. The author passed gas ascertained to be of 25-candle power through a tiny model scrubber; the stones being kept moist by dropping on them by a syphon a spirit of .800 sp. gr. obtained from within a gasholder. The temperature was about 43° Fahr. The outlet flow of gas was to the photometer, where 16-candle gas was registered; the quality having dropped 9 candles in passing through a scrubber 12 inches high and 3 inches diameter. To the petrol-air gas manufacturer, this table furnishes a lesson of very great importance, by directing his attention to the time occupied in evaporating petrols in still air. It indicates that inefficiency must attend plant designed so that the air is simply passed over the surface of petrol contained in a vessel; and it clearly shows that a more rapid and more complete evaporation takes place, when the conditions of the atmospheric air and the petrol are in the highest state of agitation or commotion. Such perfection cannot be attained by simply blowing air over the surface of petrol. An action of this nature would simply mean that the more volatile constituents of the petrol would be evaporated first, and the following volumes of air would have the heavier constituents with which to come into contact; and thus an irregular quality of gas to supply the mantles would be the result. For obvious reasons, whether the gas supply be by petrol air gas or by coal gas, the lighting can never be satisfactory, but will become impossible unless the quality at all times be constant. From the author's long experience—especially in connection with gas management of one of the largest gas-works in the country—he was enabled during his first petrol-gas making experience to discover early the necessity for completely fractionizing the air and petrol in small volumes, by violently agitating them in numerous small chambers; and after two years' experimenting, he perfected his multi-chambered turbine arrangement.

Dr. Hugh Marshall, F.R.S., F.R.S.E., read a paper before the Royal Scottish Society of Arts on Nov. 23, 1903, on "Carburetted Air," wherein he made, from his great experience in experimenting with petrol vapour, a very emphatic declaration in regard to

a method for the improved production of petrol-air gas. On this point, he said:

One of the greatest difficulties with regard to installations is due to the variable quality of the carburetted air produced in consequence of the fractionation of the gasoline already alluded to. If one large carburetting vessel is used, then it will give, when newly charged, a much richer gas than when it has become partially exhausted. This causes trouble at the burners, which, of course, can only work satisfactorily with gas of nearly constant composition. In some designs, an attempt is made to get over this difficulty by using two or more carburetors connected "in series." A little consideration will show that this cannot improve matters to any great extent. A sufficiently satisfactory result can be obtained, however, by using a number of carburetors "in parallel," dividing up the air supply so that only a fraction of it passes through each carburetor. By charging the carburetors in rotation (not simultaneously), they are kept at different stages of exhaustion, and at any one time each is producing gas of different richness. When the different fractions of the total gas current reunite to form one stream, a mixture of average quality is obtained.

These statements are very powerful arguments in favour of the "Centenary" turbine rotary generator, though the latter is an immense advance on Dr. Marshall's suggestion. His carburetors gave, when newly filled, a richer gas which gradually became of a poorer quality as air continued to pass through them. Hence his suggestion for a multiplicity of carburetors, each "filled" with petrol at different periods to start with; while the quality of gas depreciated in like manner—the units mixing to form a uniform quality. In the "Turbine" arrangement, however, a different process of manufacture is instituted. Of the numerous gas-generating compartments only one at a time, as the vessel rotates, comes into the position of receiving its full charge of air together with its correct proportion of petrol, and is thereafter immediately submerged in the sealing liquid, whereby violent commotion at once takes place during the consequent displacement of a volume of the sealing liquid equal to that of the contained air volume. This intimate commotion between the air and petrol enables the air instantly to take up the whole of the petrol vapour allocated to it. The turbine still rotating subjects the gas thus formed to additional compression ere it escapes from its generating chamber into a central horizontal mixing chamber, into which all the units are discharged and mixed before they flow off to the gasholder. The generating chamber just vacated, continuing to rotate, is completely filled with the sealing fluid, and is again ready for receiving its next charge of air and petrol on its emerging above the surface of the water. It will thus be seen that, instead of numerous carburetting chambers gradually giving off gas of weaker quality, the "Turbine" chambers practically continue to give gas of one uniform quality, which is made absolutely certain from the whole combined products having to pass into the central chamber before going to the holder.

In strong contrast to the results of Dr. Readman's tests for the time required for the evaporation of petrol in still air, when two hours were required to evaporate a watch-glassful, one of the larger "Centenary" turbine generators can evaporate into a permanent gas a gallon of petrol in fifteen minutes, equivalent to a production of over 4000 cubic feet of gas per hour. During the manufacture of gas, as also when the turbine is at rest, each of the numerous generating chambers is completely sealed in water, and connection with the gasholder is only possible as the apparatus rotates, when each unit volume under pressure "breaks" the seal to obtain a passage towards the holder. This is an advantageous point of safety possessed by no other form of petrol-air gas generator. Variations of temperature have no effect on the gas within the holder, because there is no connection between it and the petrol chamber. At all seasons, during the generation of gas, the only registered difference in temperature with the "Centenary" turbine, as between the entering air and the outgoing gas, never exceeds from 2° to 4° Fahr. This plant is the only one in existence which is equally suitable for large gas-works, as it is proved to be for hospitals, mansions, and the smallest number of lights. It is also as ready to generate gas in an Indian atmosphere as in Canadian climate, where temperatures vary to great extremes throughout the year.

The gas produced by this turbine is a permanent gas, and beyond seeing that it is not allowed to run without a supply of petrol, it requires practically no attention. A coal gas-works which was converted into a petrol-air gas-works, had one of the holders full of petrol-air gas closed up for three months through a 4-inch rack-and-pinion valve getting out of order; and when it was repaired the gas was found to be of the same quality as when it was generated.

The "Centenary" turbine petrol-air gas generator is built to run for 24 hours each day if required. One constructed some four years ago, capable of producing 72,000 cubic feet of gas in 24 hours, has been used to supply a village for three years in the most perfect manner. The turbine required no re-adjustment; no part of it has been touched; the packing-gland at the point where the shaft extends beyond its case has never been tightened; and to-day it is in exactly the same condition as when first put to work. It has filled the gas-works' ordinary holders, from which it has supplied uninterruptedly the consumers through five miles of road mains and services, besides probably other five miles of house-supply pipes, and this without condensation in the street-mains, the gas-meters, or the consumers' pipes and fittings—even in periods of the severest frosty weather experienced during the past thirty years.

Every consumer was satisfied with the quality and wholesome-

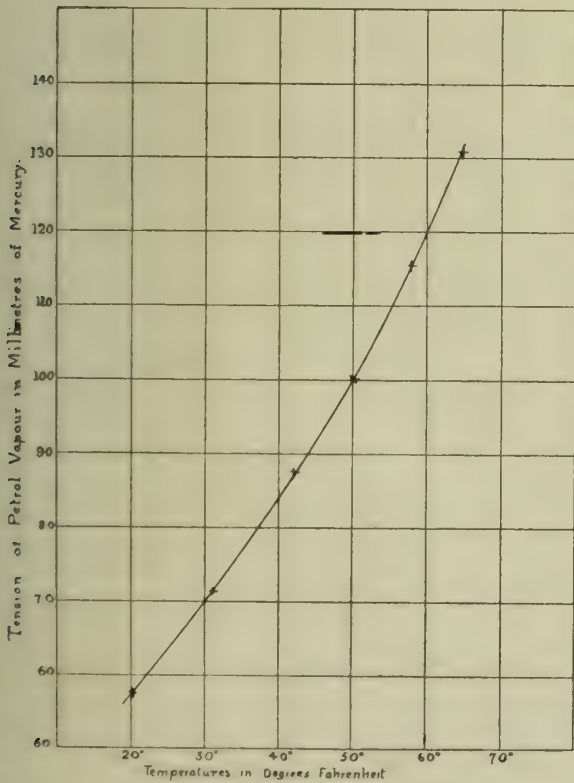
ness of the gas, the permanent quality of which was verified by the fact that during a period of 27° of frost, as at all other times, the consumers farthest from the gas-works continually testified to the brilliance of their lights. Mantles lasted many months, and some showed that their mantles (while consuming gas regularly) had lasted twelve months (not advantageously, of course). Mantles blackened by carbon have never been heard of, because the gas generated by the many-chambered turbine was always one uniform quality. This is possible only by a scientifically and correctly designed and constructed apparatus for dealing with air and petrol by the fractionation of both in small volumes; the units uniting within a central mixing-chamber before passing to the gasholders or to the consumers' lights.

Petrol-air gas to be properly consumed in inverted mantles, so as to obtain the highest light-giving properties of the gas, requires that the recognized principle of "fractionation" in dealing with this gas be continued to the burner; and the patent "M. D." petrol-air gas inverted burner is constructed for this, and effectively gives the highest results per cubic foot consumed. It is also the only illuminating burner by which petrol air-gas can be consumed noiselessly. A recent test of the light of a "Centenary" turbine producing gas through one of these fractionizing burners, gave results higher than has hitherto been recorded by any other form of burner, and was found to be 9-candle power per cubic foot of gas—7 cubic feet of gas per hour being consumed by the burner under ordinary pressures at the time.

The turbine generator produces gas at all times of one uniform quality and at an unvarying pressure, even under conditions when only gas is needed to run the hot-air engine, to supply two or six lights, or up to 200 lights, if the plant be built for that number. There is no difference in the quality of the gas supplied to one light or to fifty or more. Such a 200-light plant has been working throughout last winter, driven by a hot-air engine run on gas generated by it. The engine was usually started at 4 o'clock in the afternoon, and it supplied all the lights required for the mansion house, the stables (about 200 yards away), and cottages. Several lights (probably eight) were alight all night within the mansion, and the engine was only stopped after breakfast—about 8 or 9 A.M. next morning.

Hot-air engines run silently; and the author has found them to be eminently satisfactory. A 25-light Centenary plant produces 250 cubic feet of gas per hour available for illumination, besides the gas required to run the engine, which is one-fourth of a horse-power for this size of plant.

Turbine generators suitable for coal gas-works will assume a very similar appearance to a rotary washer or scrubber, with the steam-engine at one end; also the capacity per hour will be as nearly as possible the same. Thus a size of washer constructed to effectively deal with 500,000 or 1,000,000 cubic feet of coal gas per hour would, in the form of the "Centenary" petrol-air gas generator, produce the same volume of petrol gas, while running at three or four revolutions per minute and at the ordinary temperature of the outer air at the time.



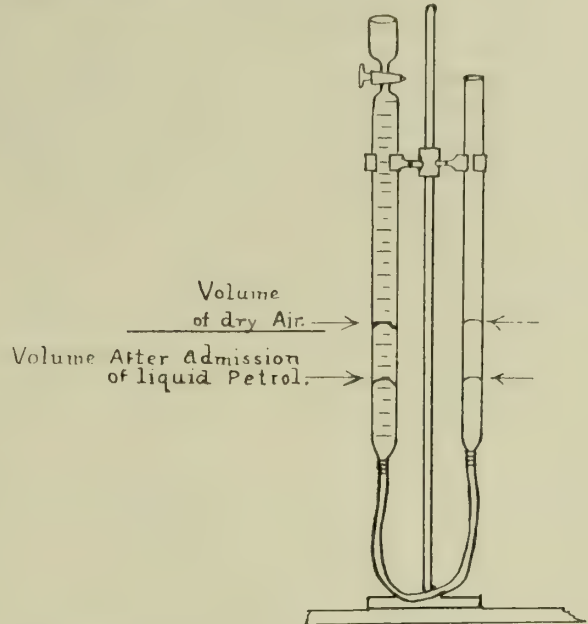
Much uncertainty prevails regarding the percentage of petrol vapour to air to form a safe and profitable quality of gas. One gallon of '715 petrol, on being vaporized at 65° Fahr., without the presence of air, occupies 190 cubic feet. If to this, 810 cubic feet of air be added, a petrol-air gas is obtained having 23 per cent. of petrol vapour. Each cubic foot of the mixture will hold 0.1144 oz. of the petrol. On cooling, a fraction of the vapour

would condense out; but by adding 100 volumes of air to the mixture, an 11.5 per cent. petrol vapour to the air would be obtained. This petrol-air gas is lighter than air, as shown by the above statement, thus—

| | |
|---|---------|
| 1000 cubic feet of atmospheric air = | 77 lbs. |
| 810 c. ft. air (13 c. ft. to 1 lb.) = | 62 lbs. |
| 190 c. ft. petrol vapour (7 lbs. per gallon). | 7 " |
| 1000 c. ft. of mixture = | 69 lbs. |
| Weight of mixture lighter than air by | 8 lbs. |

The ease with which petrol spirits pass into vapour, and the very rapid increase in their vapour pressure for small increments of temperature, are graphically shown in the accompanying curve, obtained by Mr. John Foggie, F.C.S., by actual experiment from a sample of '715 spirit.

Another simple method of showing the increase in bulk when a given volume of air is saturated with petrol is illustrated in the sketch herewith.



An ordinary nitrometer, or glass measuring vessel, with graduated tube, stopcock, and cup, is filled with dry mercury. Then, by lowering the levelling tube, 20 c.c. of air are drawn into the apparatus; the stopcock being shut. The volume can be correctly measured off with the levels of mercury in both tubes coinciding. A little of the petrol is now run into the cup, and the levelling tube is lowered so as to slightly reduce the pressure. By very carefully opening the tap, a few drops of the liquid are allowed to run into the tube; so that a thin film of petrol lies on the top of the mercury. Of course, it is absolutely important that no further quantity of air be admitted. On again adjusting the levels, it will be found that (assuming the temperature of the room and apparatus is 60° Fahr.) an increase of volume of 4.5 c. has taken place, as the original volume of 20 c. is now 24.5 c. This is an increase in volume of 22.5 per cent. by petrol vapour; and the air is said to be saturated with the vapour—i.e., it has taken up as much as it can hold for that temperature. If the temperature be lowered, a little of the vapour would condense to the liquid state.

It is evident now that if this 24.5 c.c. of the mixture be drawn off and mixed with an equal volume of air, the percentage of petrol vapour in this further mixture would be a 11.5 per cent. one; and should again a further equal volume of air be added to the 11.5 per cent. mixture, one of 5.75 per cent. of petrol vapour to air would be obtained. In this way, mixtures of petrol vapour and air can be increased or lowered in percentage of petrol vapour to air at will.

The following table gives the tensions of the vapour of petrol at several temperatures; the volume of vapour being calculated by assuming that the petrol was pure hexane, C₆H₁₄. From these figures the curves here given were drawn.

| Tension in Millimetres of Mercury. | Temperature. Degrees Fahrenheit. | A Gallon Petrol Gives Cubic Feet of Vapour. |
|------------------------------------|----------------------------------|---|
| 131.5 | 65 | 183.90 |
| 115.5 | 57.5 | 209.15 |
| 100.0 | 50 | 235.50 |
| 87.5 | 42 | 264.50 |
| 71.5 | 31 | 319.00 |
| 57.5 | 20 | 388.00 |

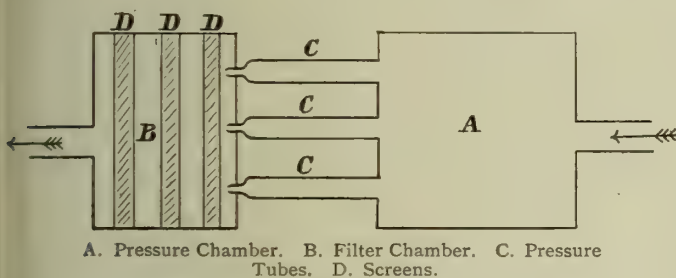
By the design of this generator, it only requires the simple moving of a pointer over a graduated dial to cause the quality of the gas produced to become of 5 per cent. petrol vapour to air; 6, 8, or 10 per cent., or produce illuminating gas of 12 to 14 candle power.

The latter quality would not "carry" in cold weather, and would require burners having fittings for secondary air supply and regu-

day, one is inclined to favour any process for the elimination of naphthalene. The second method referred to above—of keeping the naphthalene in a state of suspension in the gas—is not sufficiently understood to warrant its general adoption; and naphthalene extraction is to the fore. It is almost impossible to remove the whole of the naphthalene from the gas, as even at very low temperatures it exerts an appreciable vapour pressure.

Numerous methods of extraction have been proposed and worked out; and some of these may be described and discussed. The methods depend mainly on the use of some solvent for the naphthalene either in some special plant or in a tar-extractor or washer. One thing must be borne in mind in using any solvent, and that is that the solvent after use, containing the dissolved naphthalene, must be removed as much as possible from the mains. If this is not done, temporary relief only is afforded. The solvent if left in the mains dissolves naphthalene from one part and flows with it to another. The solvent evaporates, and leaves the naphthalene in another place. At one gas undertaking gallons of solvent naphtha are poured into the mains each year, but the naphthalene solution is not run off from the mains. Consequently, all that happens is that the naphthalene moves along the mains and causes stoppages elsewhere, while the naphtha serves to enrich the gas to some extent. This is indeed a wasteful process, and should certainly be discarded. The naphtha used could be far better employed in other ways.

The chief naphthalene solvents in use now are: (1) water-gas tar, (2) light tars from coal gas, (3) benzol, (4) petroleum, (5) naphtha, (6) oil-gas tar, and several special solvents of various compositions. Hot water-gas tar is found to be fairly efficient; but it is not convenient to use this on works which have no water-gas plant. This applies also to oil-gas tar. The other solvents are readily obtainable on a commercial basis, and work quite satisfactorily. The general method of extracting the naphthalene is to wash the gas well with the solvent. The Livesey washer, Everitt's tar fog and naphthalene extractor, the Pelouze and Audouin extractor, Kirkham's naphthalene washer, will do so. The principle of each of these instruments is broadly the same. The solvent is arranged so as to give a 2-inch or 3-inch seal above the liquor, and hence ensures a thorough washing of the gas. The liquid is circulated through the washer, and comes into close contact with the gas and so dissolves out the naphthalene.



A. Pressure Chamber. B. Filter Chamber. C. Pressure Tubes. D. Screens.

The above indicates the arrangement used without naphtha. When this solvent was used, it was injected at C or D, and the apparatus arranged so that the tubes C sloped towards B.

In a previous article on the manufacture of sulphate of ammonia, the author described a form of tar extractor, worked on the pressure system, as one which gave very satisfactory results; and an apparatus has been designed working on similar lines to act as a naphthalene remover also. The accompanying diagram shows the general arrangement of the apparatus. It consists of a pressure chamber, A, into which the gas is partly compressed either by means of a force-pump or a rotary fan. This chamber is provided with several narrow outlet tubes leading into a filter chamber, B, so arranged that the gas issuing from the tubes impinges on a screen. The sudden reduction in pressure, and consequent rapid expansion of the gas, brings about considerable cooling; and this, together with the impact against the screen, frees the gas almost completely from tar and naphthalene. The explanation of this is probably that the tar being first deposited on the screen comes into close contact with the remainder of the gas, and so takes out the naphthalene. In experiments with this apparatus, the crude gas was led through a tube containing naphthalene which was heated gently so as to charge the gas with it for testing purposes. The charged gas was then compressed by means of the force-pump into the pressure chamber, and then allowed to pass through the narrow pressure tubes, and impinge on screens in the filter chamber. The screens were made up of two sheets of coarse canvas, about 2 inches apart; and the intermediate space was loosely packed with lumps of coke. The filter tubes were provided with a side tube, so that the gas could be tested for naphthalene before and after passing the filter chamber. This arrangement was found to answer very well indeed; and though a large amount of naphthalene was injected into the gas, practically the whole of it was taken out in the filter chamber. The Colman-Smith naphthalene test was used—i.e., the gas was passed through solutions of picric acid and the formation of the yellow naphthalene picrate served as indication of the presence of naphthalene.

As practically all methods of naphthalene extraction now involve the use of some solvent other than tar, the apparatus was modified to allow the use of some such liquid as naphtha. The

tubes leading from the pressure chamber to the filter were made to slope downwards towards the latter; and their side tubes were connected to a cylinder containing a supply of naphtha. This was so arranged that the naphtha could either be allowed to flow into the pressure tubes or could be injected by means of steam. As before, gas charged with naphthalene was passed over, and a slow stream of naphtha was run into the pressure tubes; also, as before, the naphthalene was arrested almost completely at the screens. It was found that when steam was injected there was a tendency for the naphthalene to be carried forward, instead of being deposited in the filter chamber after steam had passed for a short time. This was probably due to the fact that naphthalene admits of steam distillation, and so was carried forward through the filter by the uncondensed steam. A further modification was tried; and this also proved to be quite satisfactory. The naphtha, instead of being forced into the pressure tubes, was run direct into the filter, and allowed to stream down the screens. The gas impinging on the naphtha was relieved of its naphthalene, and the excess of the solvent was run off at the bottom of the filter chamber.

Some modifications of gas-works plant may have some effect on the removal of naphthalene. Mr. S. Meunier, of Stockport, claims that his hydraulic main floats have the effect of reducing the amount of naphthalene, and theoretical reasons (as well as practical results) can be found to support this. The floats prevent undue oscillation of the tar and liquor in the hydraulic main, and this necessarily ensures better contact between the gas and the tar, and gives more opportunity for the removal of the naphthalene.

Some time ago Mr. G. H. Niven, of Cleckheaton, in a paper on "Purification," said that the foul main played a very important part in the removal of naphthalene from the gas; and from observations since made by the writer in various works, this has received confirmation. In Mr. Niven's words, "the tar gives off quite a quantity of naphtha vapour which has the power of arresting naphthalene in its formation and depositing its constituents in the tar." By giving the foul main a slight fall, the tar can leave slowly and be long in contact with the gas.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the Bromley Gas-Works.

On Saturday afternoon, there was a large turn-out of members of the Association to take part in the last visit of the present session; and the event proved to be an excellent finish-up to this portion of the programme. It was to Bromley that the big party wended their way; and no one who knows Mr. William Woodward, the Engineer and Manager to the Bromley and Crays Gas Company, and has read the full illustrated descriptions of the works under his charge that have appeared in the pages of the "JOURNAL," will be surprised at the fact that instruction was plentifully combined with the large amount of pleasure that was enjoyed. On arrival, the members were welcomed by Mr. Woodward, who expressed regret that the Chairman of the Company (Mr. Alexander Dickson) was unable to be present to meet them, and then proceeded to lead the way round the works. In the task of explaining the numerous interesting features, and replying to innumerable inquiries, he was ably assisted by the following members of his staff: Messrs. S. B. Chandley, W. Judd, W. Woodward, jun., A. R. Griggs, and H. Eaves.

In view of the afore-mentioned descriptions of the works in our pages, it is needless now to go into details of the plant—especially as a fully illustrated account of the most recent extensions appeared as lately as two months ago (see "JOURNAL" for March 22 and 29, pp. 794 and 869). The works as they were before these improvements were carried out were described in our issue dated Jan. 7, 1908 (p. 22); and copies of a reprint of this article were distributed during the visit among the members. A start was made with the compressor-house, from which the gas is sent at high pressure to the St. Mary Cray works, through 5½ miles of 8-inch Mannesmann steel main. Then the photometer-room was visited, and acquaintance made with a newly fitted "Sarco" recording gas calorimeter. On leaving this, a move was made to the twin-generator carburetted water-gas plant, erected by Messrs. Humphreys and Glasgow, in a disused coal-gas retort-house, which Mr. Woodward had admirably adapted to its new purpose. Considerable time was spent here—much of it in inspecting the convenient arrangements for bringing the coke to the generators. The two carburetted water-gas sets are nominally of 750,000 cubic feet per day each; but they are found to be capable of working up to about 1,000,000 feet.

The members also found much to interest them in connection with the coal-gas retort-house, which has a capacity of some 2,000,000 cubic feet per 24 hours. The stoking machinery and the hydraulic pusher—both eloquent testimony to Mr. Woodward's mechanical skill—received their due meed of praise; and then attention was given to the coke-handling arrangements. As the hot coke is pushed from the retorts, it falls on to a travelling conveyor, and after passing through water is taken to a large underground hopper just outside the house. This hopper is so arranged that buckets, lowered by the crane to the bottom of a well in front of it, can be filled by gravity, and then raised by the crane (which revolves on a circular gantry), so as to be deposited

where desired. With regard to the coke plant, the novel features were much remarked upon—as, indeed, was the case with various other sections of the works. The application of the Venturi tube principle to the measurement of gas—another novelty to be seen in operation at Bromley—was explained at some length by Mr. Woodward; and the members had full opportunity for examining the recording apparatus in connection therewith, which is installed in the water-gas blower-house. Here also Mr. Woodward drew attention to an excellent model of a steam turbo-blower made by one of his own pupils, Mr. A. R. Griggs. Mr. Woodward is proud of the cleverness thus shown by his pupil; and the Association are proud to number Mr. Griggs among their members. The model when put in operation in the machine-tool shop was seen to be as admirable in action as in appearance.

After the inspection, the members were invited into the blower-house again by Mr. Woodward; and here tea was served.

The PRESIDENT (Mr. W. J. Liberty) afterwards said that if he assured Mr. Woodward that the Association were gratified to be at Bromley that afternoon, it would hardly be a strong enough word. They had found things there that some of them barely knew the existence of before. The interesting condition of the works had been brought about by several circumstances. In the first place, when the Bromley and Crays Companies amalgamated, it seemed to be a time, from an engineering point of view, when various new and up-to-date ideas could be put into practice. But though the opportunity was there, advantage might not have been taken of it. The chance had, however, been seized upon; and they saw the result of the great forethought and skill that had been exercised. They had seen the twin-generator carburetted water-gas plant accommodated in an excellent house where there was plenty of room for extension; and yet this building a short time ago was an old retort-house. Mr. Woodward, however, raised the roof 14 feet—making it 34 feet at the eaves—and gave architectural features to it which were non-existent before. From there it was but a step to the circular gantry and travelling crane, which was used for handling the coke; and then there was the Colman "Cyclone" tar-extractor. What, however, had perhaps interested him most of all was the treatment of the coke, both in the retort-house and directly it was got outside. There was the hydraulic pusher, which he understood Mr. Woodward had had in operation some twelve years; and there were all the ingenious arrangements for coke quenching and conveying. The amalgamation had added some 15,000 square acres to the Bromley Company's district; and no doubt in course of time further increase in the productive capacity of the works would be called for. The increase in the output for the last half year was over $7\frac{1}{4}$ million cubic feet, or about $3\frac{1}{2}$ per cent.; so that the undertaking would have to go forward. It seemed to him that Bromley would become the Mecca of gas men—and especially juniors, because they were out to learn how things were done, and when they could take advantage of the kindness of a man like Mr. Woodward to gather "wrinkles," they were not likely to be slow to do so. Personally, he was very delighted to have been afforded the privilege of looking over the works. He understood Mr. Woodward was now in his twenty-first year of service at Bromley; and he hoped he would be there many years more.

Mr. J. G. CLARK proposed a hearty vote of thanks to Mr. Woodward and his assistants. He remarked that over a year ago, he broached the subject of a visit by the members; and Mr. Woodward in his reply suggested that it would be a good thing to wait a little while, when he would have something more to show. Certainly, there was now a great deal for them to see. They had noted in connection with the carburetted water-gas apparatus the use of the pyrometer, which showed how keen a scientific eye was kept on the management of the plant.

Mr. C. TANNER seconded the proposal, and said they were under a deep debt of gratitude to Mr. Woodward and his assistants for giving up their Saturday afternoon to the members as they had done.

The vote of thanks having been carried by acclamation,

Mr. WOODWARD, in acknowledgment, remarked that he had been much gratified by the close consideration that had been given by the visitors to everything about the works. He was thankful to say that he had a most loyal staff. A man in his position could not do much without good assistants. They were proud of their officers; and a good deal of the success that had attended the works was due to them.

In connection with the annual general meeting of the Association next Friday, it may be pointed out that Mr. J. G. Clark will reply to the discussion on his paper (*ante*, p. 236) while the members are taking coffee—that is to say, between 7 and 8 o'clock.

Mr. Reginald A. Helps, who is the son of Mr. J. W. Helps, and is 24 years of age, has been appointed Assistant at the Jersey Gas-Works. He was educated at King's College School, and gained the "Victor Ludorum" medal at the athletic sports two years consecutively. Afterwards he went through the Engineering School at King's College, Strand, under the "sandwich" system, which included practical training at Messrs. Vickers, Sons, and Maxim's Erith works. Mr. Reginald Helps is a Student of the Institution of Civil Engineers, and has served the past five years as an Assistant to Mr. Harold W. Woodall, the Gas and Water Engineer at Bournemouth.

THE ECONOMY OF WATER-GAS PRODUCTION IN VERTICAL RETORTS.

The question of the economy of producing water gas in vertical retorts during the last one or two hours of the period of carbonization of the coal has been discussed on many occasions, and views affirming the economy of the procedure have been expressed by Mr. Körting ("JOURNAL," Vol. CIV., p. 404; and Vol. CV., p. 95) and by Dr. Geipert, of Mariendorf ("JOURNAL," Vol. CVI., p. 296); while equally positive denials of its economy have been made by Herr Kobbert, of Königsberg ("JOURNAL," Vol. CIII., p. 441), Herr Terhaerst and Dr. Trautwein, of Hamburg ("JOURNAL," Vol. CV., p. 903), and Professor Strache, of Vienna ("JOURNAL," Vol. CV., p. 95). In view of this discrepancy of opinion, Herr Debruck, the Superintendent of the Düsseldorf Gas-Works, has re-discussed the whole question in a paper which he read before the meeting of the Association of Gas, Electrical, and Water Engineers of the Rhine District and Westphalia, which was held at Cologne on Jan. 22 last. The paper is reproduced in a recent number of the "Journal für Gasbeleuchtung," from which the following abstract translation of its contents has been prepared.

The question is discussed specially in regard to the conditions which prevail at the Düsseldorf Gas-Works; but an attempt has been made also to eliminate by calculation the effects of purely local circumstances. With a maximum daily make of gas of 5,300,000 cubic feet in the winter months, the manufacture of gas is carried on at Düsseldorf in seven Dessau settings of ten vertical retorts, each 13 feet long, eight settings of nine inclined retorts 18 feet long (as required), 30 to 40 settings of nine horizontal retorts 9 feet in length, and a water-gas plant which is used to produce sufficient blue water gas to bring the gross calorific power of the mixed gas down to a maximum of 5200 calories per cubic metre at 0° C., 760 m.m., and dry (= 543 B.Th.U. per cubic foot at 60° Fahr., 30 inches bar., and saturated). This condition implies that there shall not be more than 14 per cent. of water gas in the mixed gas. Steam is, however, introduced into the vertical retorts during the last two hours of carbonization. The chimney gases from the vertical retort-settings are utilized for heating a boiler by which the steam is provided practically without cost. In the sequel, an attempt has been made to equalize the advantage which this cheap production of steam would give the vertical-retort system; but it must also be admitted that the working of this waste-heat boiler interferes somewhat with the regulation of the heat to the settings, which in any case is a matter of delicate adjustment.

The author next proceeds to compare the figures obtained by Professor Bunte on the vertical retort settings at Mariendorf and Zürich, and by Herr Prenger at Cologne, with the results of the working at Düsseldorf, placing all, as far as possible, on the same basis—though there are necessarily differences in the description of coal carbonized and in the proportion of ash it contains. He finds therefrom that the mean make of gas per ton of coal when the carbonization is ended in ten hours without the admission of steam is 11,739 cubic feet at 60° Fahr., 30 inches bar., and saturated, which make is increased by the admission of steam, for $1\frac{1}{2}$ hours at Zürich and for 2 hours at the remaining works, to an average of 13,639 cubic feet; showing a gain of 1900 cubic feet due to the admission of steam. This 1900 cubic feet is water gas. On the large scale of working, the gain due to the admission of steam will generally be greater.

It is not so easy to get exact figures in regard to the fuel consumption in heating the settings as in regard to the make of gas. But the figures have been collected with care by the author and put, as far as possible, on the same basis. The consumption of coke, excluding the moisture contained in it, per ton of coal carbonized is greater, when steam is admitted, at Zürich, Cologne, and Düsseldorf, but smaller at Mariendorf, than when the retorts are worked without the admission of steam. Averaging the figures, however, it appears that in practice an increased consumption of coke, amounting to 1 per cent. by weight of the coal carbonized, occurs when steam is admitted to the retorts. In regard to the yield of coke, unfortunately no exact determinations have been made at Düsseldorf; and the mean result of the other three works can only therefore be taken. From this, it appears that the yield of dry coke amounts to 72.5 per cent. by weight of the coal carbonized when no steam is admitted, and to 71.5 per cent. when steam is admitted—i.e., there is a falling off in the yield of coke equal to 1 per cent. by weight of the coal carbonized. Assuming, therefore, yields of coke of 72.5 and 71.5 per cent., according as steam is not or is admitted, and that the consumption of coke in the furnace is 16 per cent. or 17 per cent. respectively in the same conditions, the author proceeds to draw up comparative tables of the cost of manufacture of 1000 cubic feet of mixed gas containing 13 per cent. of water gas; the mixed gas being produced on the one hand by ten hours carbonization of coal in vertical retorts without steaming, and the employment of independent water-gas plant, and in the other case by twelve hours carbonization of coal in vertical retorts with steaming during the last two hours. He takes the capital cost of seven beds of vertical retorts, inclusive of the retort-house, chimneys, foundations, coal

bunkers and conveyors, and coke conveyors, &c., at £20,300, or at £2900 per setting.

The Düsseldorf water-gas plant, of a capacity of 1,060,000 cubic feet of simple water gas or 1,270,000 cubic feet of carburetted water gas per diem, with a building sufficiently large to contain plant of more than double that productive capacity, cost £15,550. The large building has been provided for reserve plant and extensions. It would, indeed, be possible to erect water-gas plant of a capacity of 530,000 cubic feet of simple water gas per diem for a capital outlay of £4250; but this would provide no reserve, and would not be adapted for the manufacture of carburetted water gas. Hence the author does not consider it unreasonable to take the capital expenditure on the Düsseldorf plant as the basis for reckoning interest and depreciation charges per 1000 cubic feet of water gas made. The whole of the interest charges on the water gas installation have been charged by him against the water gas made. He assumes that seven beds of vertical retorts without steaming will produce 953,500 cubic feet of coal gas per diem, to which 154,330 cubic feet of simple water gas must be added to produce the equivalent of the quantity of mixed gas which eight-and-a-half settings of vertical retorts with steaming will yield per diem. He has taken the extra capital outlay on the eight-and-a-half settings in the same proportion as the capital outlay on the seven settings, though he points out that the cost of the building, chimneys, foundations, ironwork, and conveyors would not be relatively as great per setting for eight-and-a-half as for seven settings. Also that the wages and cost of conveying coal would be no greater for eight-and-a-half settings with steaming than for seven settings without steaming per 1000 cubic feet of gas made. He charges interest and depreciation at 6 per cent. on the capital expenditure all round, and assumes that the vertical retort plant will be in action on the average 345 days in the year, since experience has shown that, as the vertical retort plant has a life of at least 900 days without repairs, an allowance of 20 days per annum for time necessary for repairing the plant is ample. He next assumes that the water-gas plant would be worked to a productive capacity of 530,000 cubic feet per diem for only 90 days in the year, and for a further 30 days to a productive capacity of at the most 282,500 cubic feet per diem. For the rest of the year, he says the water-gas plant would in any case be kept out of action, because of the much greater convenience of working the vertical retorts with steaming.

In regard to the cost of repairs, the author takes £125 per year per setting as a fair average for the vertical retorts. For a water-gas plant of a productive capacity of 530,000 cubic feet per diem, he takes the cost of repairs at £200 per annum. The wages are taken to include the staff required for conveying coal and coke, for the clinking and charging of the producers, for cleaning the hydraulic main, and lubricating and looking after the machinery. He gives, however, a second computation in which only the wages of the stokers (and the operators and boiler men of the water-gas plant) are taken into account. Coal and bye-products are taken at the prices at which they appear in the accounts of the Düsseldorf gas undertaking of 1908-9. But an increased charge is made for the coke used for the retort furnaces and the water-gas generators, because only screened coke is used in them. The yield of sulphate of ammonia is taken at 0.95 per cent. of the weight of coal carbonized without steaming and at 1 per cent. with steaming. He omits as unimportant the recovery of cyanogen, and likewise the yield of scurf in the retorts. Making the foregoing assumptions, he arrives at the relative net cost of mixed gas made in the two ways, which is shown in the following epitome of his table.

Comparative Cost of 1000 Cubic Feet of Mixed Gas from Vertical Retorts according as Independent Water-Gas Plant is or is not Used.

| | Vertical Retorts, without Steaming, and Water-Gas Plant. | | Vertical Retorts, with Steaming. | |
|---|---|------|-------------------------------------|------|
| | s. | d. | s. | d. |
| Expenditure on coal gas, including interest and depreciation charges, repairs, wages, coal, fuel, and power . . . | 1 | 7.8 | 1 | 5.3 |
| Net receipts for bye-products . . . | 0 | 11.5 | 0 | 9.7 |
| Expenditure on water gas, including interest and depreciation charges, repairs, wages, coke, and power . . | 0 | 9.37 | .. | .. |
| Net cost of 1000 cubic feet of mixed gas | 0 | 8.43 | 0 | 7.61 |

It will be seen from the table that the net cost of 1000 cubic feet of mixed gas when steam is admitted into the vertical retorts is about 0.82d. less than the cost of mixed gas made with vertical retorts without steaming, and the use of independent water-gas plant. So far as Düsseldorf is concerned, the difference means the saving through the working of vertical retorts with steam of nearly £500 in the 120 winter days in which the water-gas plant would be used. Even if 50 per cent. of the cost of the water-gas plant is credited to an emergency account, in virtue of its value in case of strikes, &c., the working of vertical retorts with steaming still remains far cheaper. If the water-gas plant were used throughout the year so as to keep the proportion of water-gas in the mixture constantly at 13.9 per cent., the interest and depreciation charges on the water gas made would be relatively lower; but, nevertheless, the use of vertical retorts with steaming

would still be cheaper by about 0.3d. per 1000 cubic feet of mixed gas. But a water-gas plant of a size sufficient only to make this proportion of water gas would be valueless for the purpose of a reserve plant. Consequently, it will appear that the advantages claimed for water-gas plant are only of minor importance if vertical retort settings are used. The water-gas plant on a gas-works will become less and less economical as the number of vertical retorts used with admission of steam is increased.

The vertical retorts at Düsseldorf as yet only produce 31 per cent. on the average of the annual make of gas; the proportion varying from 16 per cent. on the day when the make is heaviest to 60 per cent. on the day of smallest production. It may be pointed out that at the Cologne Gas-Works the annual make of gas with the vertical retort plant amounts to about 47 million cubic metres (1660 million cubic feet), whereas the water-gas plant there now only produces 44,000 cubic metres (1,554,000 cubic feet). It would appear, therefore, that it has been found in Cologne also that it is more economical to make mixed gas by admitting steam to the vertical retorts. Carburetted water-gas plant, as distinct from plant for the manufacture of simple water gas, has a higher practical value; but the cost of the installation is greater, and the carburetted water gas is costly on account of the high price of oil in Germany. From the standpoint of reserve plant which can rapidly be brought into operation, vertical retorts enable a gas-works to dispense with special water-gas plant, because the productive capacity can be increased or reduced 16 per cent., according as they are worked with or without steaming.

In the discussion which followed the reading of the paper, Herr Froitzheim, of Deutz, near Cologne, stated that he considered the figures given by the author did not show a profit and loss account for the vertical retort settings. The receipts included the profit from bye-products; but the make of gas had not been taken into account. For a few years—1879 to 1883—the prices prevailing for coke were so high that the receipts from bye-products were greater than the expenditure on coal, and it paid to heat the retort settings by means of gas rather than of coke. At the present time, however, other figures applied. Mr. E. Körting, of Berlin, pointed out that the figures given by the author did not refer to absolute quantities of the different products, but to the proportion per 1000 cubic feet of gas. Hence Herr Froitzheim's objection fell to the ground. The author had, however, taken the cost of repairs at a high figure. The oldest vertical retort settings in the speaker's charge had been in use for three years, and it was only the producers which had required any noteworthy repairs. An alteration of the grate had rectified this trouble also. The speaker also questioned the value of water-gas plant as a safeguard in case of strikes, having regard to the fact that two men, with a third for clinking, were all that were required to attend to ten settings of vertical retorts—that is to say, one man produced 11,000 cubic metres (390,000 cubic feet) of gas, which was more than could be done with water-gas plant. Hence vertical-retort plant might be regarded as a better standby than water-gas plant in anticipation of strikes.

In reply to a question by Herr Prenger, the Manager of the Cologne Gas-Works, asking how it was that figures from the Mariendorf Gas-Works showed a lower consumption of fuel in the retort settings when they were worked with steaming than when worked without steaming, Mr. Körting said that the results of single trials must always be taken more or less *cum grano salis*. He would not lay stress on the particular figures, but would prefer to take the broad result that on the large scale the working with steaming proved more advantageous than working without it. Herr Förster, the Manager of the gas-works at Mülheim-on-the-Ruhr, said that the value of water-gas plant as a reserve in case of strikes depended mainly on the fact that gas could be made in it without coal. Herr Kördt, the Manager of the Düsseldorf Gas-Works, concurred in this view. He went on to say that when on opening his letters in the morning he found many complaints of the gas jumping and burning badly, his first question to his superintendent was: Has the water-gas plant been in use? And the answer was always in the affirmative. Nevertheless, they never used more water gas than sufficed to bring the gross calorific power of the mixed gas down to 522 to 543 B.Th.U. per cubic foot (5000 to 5200 calories per cubic metre), and, consequently, the trouble could only be due to the difficulty of mixing coal gas and water gas thoroughly. The complaints did not occur when all the gas was made in the vertical retorts with steaming.

Herr W. von Oechelhaeuser, the General Manager of the German Continental Gas Company, expressed his gratification at Herr Debruck's paper. Dessau, where vertical retorts had first been used and where the whole of the gas supplied was now made in them, had been omitted by the author from the towns whence his data were taken; but this was because the scale of working at Dessau was small compared with Berlin, Cologne, and Düsseldorf. Moreover, Mr. Körting, of Berlin, had succeeded, through the setting of the retorts in three rows instead of two, in greatly improving the results obtained at the Mariendorf works. The author had demonstrated the advantages of admitting steam to the vertical retorts; but there was one small point in its favour that he had omitted to mention—viz., that it extended the life of the retorts, by preventing them becoming overheated towards the end of the time of carbonization.

In reply to a question as to the quality of the gas made with steaming in vertical retorts, Mr. Körting said Professor Bunte

and other German chemists had already decided that gas ought not to have a gross calorific power below 5000 calories per cubic metre at 0°C ., 760 mm., and dry (522 B.Th.U. per cubic foot at 60°Fahr ., 30 inches, and saturated). Actually the vertical retort gas in Berlin had a gross calorific power as a rule of 543 to 554 B.Th.U. per cubic foot. Herr Schnorrenberg, of Barmen, next spoke. He said that the trouble of burners lighting-back and even going out when water gas was used, to which Herr Kordt had referred, could be overcome by having the nipples and air inlets to the burners properly regulated. The economy of water-gas plant depended on the extent to which it was used; and the cost of water gas would naturally be very much greater if the plant were only employed for a few hours a day instead of continuously. Continuous working also facilitated uniform admixture with the coal gas. Water-gas plant, and especially carburated water-gas plant, was invaluable in reducing the large stocks of coke which otherwise frequently assumed appalling dimensions on gas-works.

The meeting passed a hearty vote of thanks to Herr Debruck for his paper.

ILLUMINATING ENGINEERING SOCIETY.

Report of the Council.

At the Annual General Meeting of this Society, which was held at the Royal Society of Arts last night, the Council presented the following report.

The holding of the annual general meeting on the 23rd of May, terminated the first session of the Illuminating Engineering Society. This Society, it will be recalled, was formed last year, in order to bring together engineers, architects, members of the medical profession, and others interested in illumination, in order that an impartial and international platform might be provided for the discussion of problems of this kind. The work of the last session has fully demonstrated the usefulness of the Society. There has been a steady growth in the number of articles in the Technical Press, and in papers read before societies, dealing with various aspects of lighting. Municipal authorities are coming to take a more active interest in street lighting; and gas and electrical supply companies now pay much attention to the conditions of illumination enjoyed by the consumer. In addition, the most recent reports of the Factory Department of the Home Office and of the Medical Officer to the London County Council show that the importance of good lighting in schools and factories is more fully appreciated. Good illumination, it is now felt, is not a luxury but a necessity.

The first year's work of the Illuminating Engineering Society has proved two things—firstly, that the discussions, in which representatives of different systems of lighting took part, were of a perfectly amicable character; and, secondly, that there would not be the least difficulty in the future of finding plenty of matter for discussion. During the session the membership has steadily increased, and is also of a very representative character—including gas and electrical engineers, representatives of systems of lighting using oil, petrol air, and acetylene, professors in technical colleges, medical men, architects and surveyors, manufacturers of lamps, shades, and reflectors, &c. What is equally satisfactory is that the Society has been able to secure the co-operation of so many leading authorities in this country, on the Continent, and in the United States. During the past session, the first three distinguished honorary members of the Society have also been elected. They are Sir William Preece, one of the earliest to study the measurement of illumination; Sir Joseph Swan, one of the inventors of the electric incandescent lamp; and Dr. A. G. Vernon Harcourt, the inventor of the ten-candle power pentane standard of light.

A special feature of the past session has also been the co-operation of eminent corresponding members of the Society, many of whom participated in the discussions. The Society hope that in the future their international attitude will be influential in the promotion of common agreement and standardization of photometrical terms and processes, &c. In this work they will have the benefit of the co-operation of the American Illuminating Engineering Society, who have already passed a resolution expressing their desire for mutual assistance on the part of the two bodies. The Society has also received an official invitation to be represented at the International Medical Congress to be held in Brussels this year, and proposes to send delegates. At this congress the question of the hygienic conditions of factories and schools, and the effect of light on the health of employees, will be studied in connection with the engineering aspects of illumination.

During the past session, five monthly meetings of the Society have been held. The inaugural meeting took place on Nov. 18, 1909, and was followed by four discussions in 1910 on "Glare: Its Causes and Effects" and "The Measurement of Light and Illumination" respectively. At the inaugural meeting, the President, Professor Silvanus P. Thompson, D.Sc., F.R.S., delivered his Inaugural Address, in which he summarized the intentions of the future work of the Society; and Sir Boverton Redwood, Mr. A. P. Trotter, Professor J. S. Haldane, Mr. W. M. Mordey, and Dr. R. M. Walmsley expressed sympathy with the movement.

The subsequent meetings dealt with subjects of wide public interest, and attracted a considerable amount of attention outside

the Society. Now that so many different systems of lighting, many of them of great brilliancy, are available, it is a matter of considerable consequence to understand exactly what is meant by a "glaring" system of illumination, and to know how to avoid such an affect by the judicious placing of lights and the use of shades, &c. This subject received special attention from oculists and members of the medical profession, many of them taking part in the discussion; and afterwards becoming members of the Society.

The next two meetings, devoted to "The Measurement of Light and Illumination," also proved most successful. A feature of the proceedings was the exhibition, by the inventors, of different types of instruments, and the demonstration of their actual use in practice.

The first anniversary dinner of the Society, which took place on Feb. 10, also proved most successful. The occasion served to show how fully the work of the Society receives the support of other older bodies, and how wide is the nature of the subject with which it proposes to deal.

In the next session of the Society, it is again proposed to devote the monthly meetings to subjects of general interest, and arrangements are being made for papers on such subjects as the lighting of streets, shops, libraries, schools, &c., and the recent developments of gas and electric lighting, &c. During the past year, the Society has gained support in many influential quarters; and it is hoped during the next session to extend still further its circle of sympathizers and its scheme of operations.

ILLUMINATION REQUIREMENTS IN THE LIGHTING OF STREETS.

(Concluded from p. 439.)

The second great division of the subject—the study of glare effect—has already been introduced in general terms in the earlier portion of this paper. It now remains to analyze it closely, to determine the laws of operation of the conditions that produce it, and to learn the limitations which it imposes on the problem of illumination.

As will be at once recognized, the consideration of avoidance of glare effect will operate by imposing a definite limit of candle power at each distribution angle; this limit varying only with the mounting height. In proportion as the limit is exceeded, a greater or less glare effect will result. The exact relations of this limitation will be apparent by reference to fig. 7, in which a very

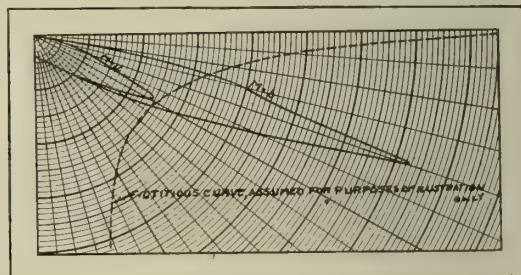


Fig. 7.

erroneous curve of zero glare effect has purposely been assumed. Here are shown two ideal distribution curves, $M = a$ and $M = b$. It is presupposed that the circular co-ordinates have definite candle-power values assigned to them. Now, for any given mounting height, there will be a definite curve of zero glare effect, as illustrated by the indicated fictitious curve. Along any angle, candle powers greater than those indicated by the zero curve will produce a greater or less glare effect. All ideal distribution curves exceeding some definite value for M will be intersected by the curve of zero glare effect. Such curves of ideal distribution, typified by the curve $M = b$, are therefore unsuited for application to actual practice, since they would introduce a more or less serious condition of glare, with resultant decrease in visual efficiency. The net result, therefore, of the limitations imposed by the avoidance of glare effect will be to eliminate for any given mounting height all curves of ideal distribution exceeding some definite value of M .

We now have clearly before us the nature of the limitations imposed by the avoidance of glare effect. There remains to be determined the exact shapes and candle-power values of the zero curves for different mounting heights. Subject to confirmation by research results, glare effect may be assumed to vary with the following factors: (a) Distance of the eye from the light source. (b) Total light-flux in the direction of the eye; this being measured in apparent candle power at the distance of the eye. (c) Intrinsic brilliancy of the light source. (d) Angular position of the light source in the field of vision; the visualized object being assumed to occupy the centre of the field of vision. (e) Distance of the light source from the eye relative to the distance of the visualized object on which the eye is focussed. In the research to be reported upon in the following paragraphs, the factor (a) was separately studied and determined with sufficient exactness to indicate reliably its character and approximate magnitude for distances up to 100 feet. Factors (b) and (c) were studied unseparated, as a

single factor; the light flux varying directly as the intrinsic brilliancy. Factor (*d*) was separately studied and evaluated. Factor (*e*) was not investigated; the distance of the light source from the eye being in all cases taken as equal to the distance of the visualized object. This condition corresponds to the most usual condition of actual street vision.

Heretofore no satisfactory measure of glare effect has been proposed. Since we are dealing with a psychological phenomenon, the basis of measure must obviously be a psychological one. On the other hand, the measure must be expressible in definite numerical units. A basis of measure fulfilling these requirements was conceived for this investigation; and it proved a very satisfactory one. Preliminary to a more detailed description, such a measure may be described as the ratio of two minimum light intensities on the visualized object, of magnitude just sufficient to enable its discernment when the eye was successively exposed to the two conditions under comparison. A careful preliminary investigation established the fact that, under widely varying daylight conditions, visual acuity was wholly independent of distance, within the limits investigated—that is to say, with any given type of visualized object, the minimum size of object which can be just barely distinguished as a separate unity is exactly proportional to the visual distance. Three different test-plates were employed, in which each object or unit gradation was 10 per cent. smaller than the one previous. After establishing the fact just stated, each observer was calibrated; the determination being made of the minimum unit gradation which could be individualized under daylight conditions at various standard test distances.

The basis of measurement being established, tests were first made to determine the relation between the distance of the light source from the eye and the magnitude of the decrease in visual efficiency due to glare. These tests were made at five test-stations; three independent sets of readings, one with each test-plate, being taken at each station. Parallel tests were made with different observers. The complete series was then repeated with each observer, using various other candle-power intensities of the light source. The area of the light source throughout all these tests was kept constant, at about 50 square inches; the intrinsic brilliancy thus varying directly with the candle power, as has already been stated.

[Diagrams derived from the test data are given by the author. One shows the relation between glare effect and distance—the light unit being situated beside the visualized object in the centre of the field of vision; another, the relation of glare effect and candle power, or intrinsic brilliancy; and a third, its relation to the angular position of the light source in the field of vision. According to the first diagram, at $12\frac{1}{2}$ -candle power and an intrinsic brilliancy of 0.25 (British units), the glare effect drops off at a moderate rate with increase in distance; while at higher candle powers and a higher intrinsic brilliancy the glare effect decreases more slowly with increase in distance, until finally, at 400-candle power and an intrinsic brilliancy of 8, there is no measurable decrease with increase in distance within the limits investigated. The second diagram shows that for all ordinary distances the presence of a light source of even a very low candle power in the centre of the field of vision causes a very great drop in visual efficiency; also that at 300-candle power the glare effect has nearly reached its maximum, and that beyond this a large increase produces but a small decrease in visual efficiency. At any given candle power, a considerable increase in distance produces only a small decrease in glare effect. The curves in the third diagram express a fact of the very highest importance in the study of glare—that, at an angle varying (depending on the candle power) between approximately 22° and 26° , the glare effect reaches zero, though the light source is still well within the field of vision. This would seem to indicate that on its physiological side glare effect is a local retinal disturbance which, when sufficiently separated on the retina from the disturbance produced by the visualized object, does not extend to or affect the latter area of disturbance. This apparent fact seems to hold true even when a considerable time factor is introduced. Apparently pupillary contraction acts merely as a function protecting, within its very limited capacity, from a glare effect more or less suffused over the whole retina. The writer previously believed that pupillary contraction was in itself a cause of decreased visual efficiency in that, on account of it, a smaller amount of light would be admitted to the retina from the visualized object. He now believes that it should be regarded as a purely protective function, and not, through its operation, in any sense itself a cause of decreased visual efficiency.]

The practical importance attaching to these facts is of no less vital interest than the scientific. The third diagram means that the light instrumental in causing glare comes entirely from the polar angles above 60° . In the average actual case, it is almost wholly caused by the light between the angles of 65° and 80° with the nadir. The light within these angles must be partially or wholly suppressed, as the further facts of the case shall show to be required, if glare is to be avoided.

We are now in a position to determine the true curves of zero glare effect; and fig. 8 (derived from the first and third of the diagrams referred to) gives the curves for various mounting heights. Comparing these with the curve of ideal distribution when $M = 6$ (fig. 4), we see at once that this curve, together with curves of the larger value of M , will be eliminated on account of the serious glare effect which would result from the application of such distributions to actual practice. Reference to the figure

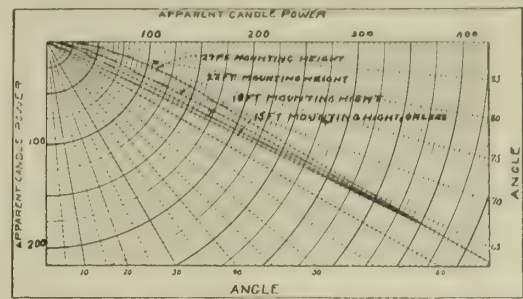


Fig. 8.

shows that, for all practical purposes, 60° is an absolute limit for maximum candle power if serious glare effect is to be avoided. It will also be observed that an increase in mounting height, while it does not change the limiting angle for maximum candle power, does considerably lighten the severity of the limitations at 65° and above. Mounting heights of the larger values, when made possible by actual conditions, are also desirable, as permitting wider separation of units, with resultant decreased installation and maintenance cost. For mounting heights of 15 feet or less, the curve $M = 4$ will produce considerable glare, beyond, indeed, what proper limitations can permit. For such lesser mounting heights, as has already been pointed out, a closer spacing of units, and distribution corresponding to the curve $M = 3$, should be used.

In designing a light unit to give the desired distribution which has largest field of application (viz., the distribution from $M = 4$), it will be far preferable that the candle-power values at 60° and upwards should be less than those made proper by the ideal curve, rather than that these ideal values should be exceeded. With an ideal curve of such candle-power magnitude as would be most useful, the candle-power values at the angles under consideration come perilously near to the glare limit, or may even exceed it. A percentage variation from the ideal curve of four to one is, as has been pointed out, permissible. Even a moderate condition of glare, on the other hand, is very undesirable. Practical considerations, therefore, will lead us, in the design of the actual unit, to intentionally deviate from the $M = 4$ curve at the angles of 60° and upwards; this deviation being in the direction of lesser candle-power values.

It is of the utmost importance to note that if the glare limit is exceeded at all, it will almost of necessity be exceeded excessively. It is also of great importance to note that the curve of ideal distribution for $M = 4$ remains, though not an ideal, yet none the less the best possible curve when applied to actual conditions where M has a larger value than 4. The curve $M = 4$ gives the best spot-lighting effect and the best marker-effect which are possible without engendering a condition of glare. This research has indicated that, for ordinary mounting heights, moderate glare is a mere name; the reality is always excessive glare. It is the opinion of the writer, therefore, that glare must be avoided, even if so important a consideration as proper distribution has to be sacrificed. And, indeed, as has been shown, other conditions than glare make a proper distribution impracticable or even impossible with the larger values of M . The curve $M = 4$ is to be regarded, therefore, not merely as the ideal curve for a certain relatively close spacing of light units which the public are not as yet educated up to, but as the best possible distribution which can be applied to any of our present-day spacings.

This paper is not presented, therefore, as merely expressing an ideal to be approximated to in a comparatively remote future. Rather, it should serve as a guide of immediate usefulness and application to present-day practice. And yet, as the writer is well aware, before such application has gained any great headway, there must be a vast amount of educational work accomplished. The ordinary citizen of to-day uses in his ignorance the very defect itself—the glaring character of a street illuminant—as a measure of its excellence. Such ordinary citizen would consider himself defrauded were he called upon to pay through his taxes for a street illumination characterized by absence of glare—by light on the street itself and not in the eye.

This paper, obviously, is not addressed to the ordinary taxpayer. It is addressed to the scientist, to the manufacturer of street illuminants, to the central station superintendent, to the educated and public-spirited citizen. Let these work shoulder to shoulder in the education of the public, and this must eventually become a reality in a no distant future. And the rewards, whether commercial and material or as pride in a useful service accomplished, will come first and in largest measure to those who join in the work. Let us teach the public—teach them so thoroughly that it becomes a popular catch-word—“Light on the object, not in the eye.” Let us teach them that this “light on the object” can be accomplished only by a closer spacing of light units, which will mean a larger increase in the cost of installation, though but a small increase in operating cost, and that light “not in the eye” means of necessity absence of glare; so that the excellence of a street illumination must be measured by the absence rather than by the presence of glare. Thus, working together, in our own time the day shall come when our streets will be illuminated by night as beautifully, and with as great comfort to the eye, as the open country road lying clear in the bright moonlight.

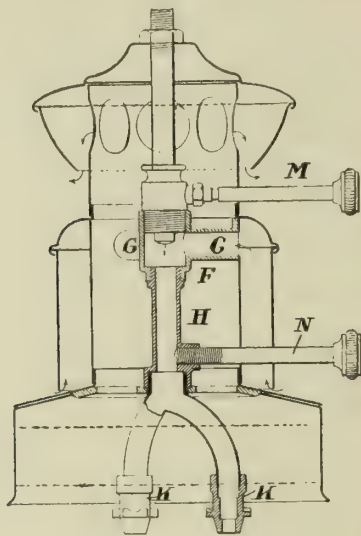
REGISTER OF PATENTS.

Inverted Incandescent Gas-Burners.

WILLIAM SUGG AND CO., LIMITED, and WRIGHT, E. S., of Regency Street, Westminster.

No. 10,177; April 29, 1909.

Burners are already known, the patentees point out, in which the bunsen burner tube is formed (as to its upper part) of a cylindrical barrel opening into a wider part to which is fitted the burner, or cluster of burners, the internal diameter of which have at first a sectional area greater than the enlarged part of the burner-tube, but contracted some distance before the outlet of the burner is reached. The present invention consists in providing a burner in which the contraction is abrupt and placed close to the outlet or immediately in front of the point of ignition. The stream of hot air and gas passing down the bunsen tube thus gathers velocity in the upper part, expands suddenly in the enlarged portion, and is throttled again at the outlet of the burner or burners.



Sugg's Inverted Burner.

The gas-nozzle E is enclosed in a casing F, and G are air-tubes inserted radially in the casing. H is the bunsen tube pendent from the casing and expanding at its lower end into a cylindrical part which receives the cluster of burners terminating at their outlet with internally constricted portions K. M is a screw for controlling the gas supply, and N is a screw in the bunsen tube for regulating the passage of the air and gas mixture to the burner.

The bunsen tube H must have a diameter approximately equal to a third of its length, and must open out into a space the area of which in cross section must be greater than the cross sectional area of the bunsen tube. The combined areas of the burner tubes, if a cluster is used, or the area of a single burner if only one is used, must at first be greater than the space aforesaid; but the burner outlet, which, as illustrated, is constricted by two steps, must be considerably less.

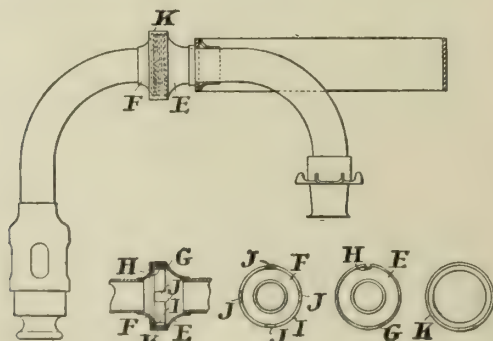
It is said that "in burners thus constructed the combustion takes place within the mantle at a point and in a manner calculated to bring the latter to a state of incandescence which will provide improved light-giving efficiency."

Inverted Incandescent Gas-Burners.

FALK, S., of Farringdon Road, E.C.

No. 12,678; May 28, 1909.

This invention relates to burners for inverted incandescent gas lighting and to burners as described in patent No. 19,395 of 1905, wherein provision is made for varying the position of the mixing-chamber relatively with the mantle support, in order to adapt the fitting for attachment to either a rising or falling pipe, or to a pipe extending more or less horizontally in either direction.



Falk's Inverted Burner Pipe Connections.

The two curved sections adapted to fit one into the other are provided on the adjacent ends with discs designed to be locked together. In practice one of the parts should be externally screw-threaded and recessed; the other or spigot part being fitted into it and held by a screw collar. In the recess in the screw-threaded disc is formed a lug

or projection, and on the other or spigot disc a series of notches is formed, or *vice versa*, with either of which notches the projection engages, according to the position of the parts.

The accompanying illustration shows a side view of the burner fitting, with sections illustrating the construction of the joint for locking the two parts of the fitting together, and details of same.

The two curved sections of the burner fitting are provided with a support for the mantle one end, and on the other with a mixing-chamber for the bunsen burner. Discs on the two parts are designed to be locked together in different positions according to requirements.

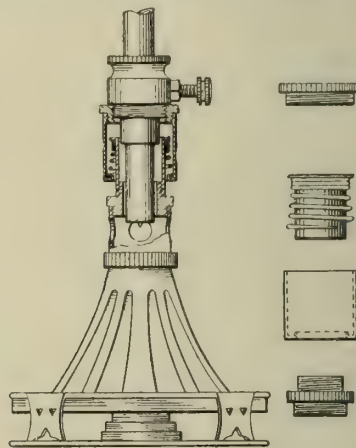
In the form shown, the disc E is formed with a screw-threaded extension G (which constitutes a kind of socket) externally screw-threaded and provided with a recess which forms a protuberance H on the inner surface of the socket. The disc F has formed upon it a flange I, which fits into the socket as a spigot, and which has formed in it a series of notches J, any one of which may be engaged with the protuberance H, according to the positions which the two curved parts are to occupy relatively with one another. The two parts E and F are locked together by a screw collar K having a flange which bears against the back of the disc F; and, as the collar is screwed up on to the part G, it serves to draw the two parts tightly together. By loosening or removing the collar K and turning the discs relatively to one another, the position of the two pipe sections may be adjusted in any desired manner; the tightening of the screw collar serving to fix the two parts in position.

Preventing Vibration in Inverted Incandescent Gas-Lamps.

BARK, B., of Hanwell, and BARK, S. E., of Sunbury-on-Thames.

No. 17,433; July 27, 1909.

This anti-vibration device comprises a pair of spring-controlled telescopic, flanged, tubular members, one of which is attached to the fixed burner fitting, and the other to a part of the lamp.



Bark's Inverted Burner Anti-Vibrator.

As shown, in conjunction with a pair of spring-controlled telescopic and flanged members that are freely connected with each other in a non-gas-tight manner, an extended or elongated gas-nipple is provided that is adapted to be connected to one of the members and to the gas supply pipe or fitting, and that is extended to pass completely through the members to co-operate with an ordinary bunsen tube to which the other member and the burner are attached. It will be seen that, owing to the position of the anti-vibrator above the bunsen tube, its spring will not be so liable to be damaged as in cases where the device is arranged below the bunsen tube.

The illustration shows a sectional elevation of the anti-vibrator applied to an ordinary inverted incandescent gas-lamp fitting; also detail views of some of the separate parts constituting the device.

Gas-Heating Stoves.

HEDGES, K. W., of South Kensington, S.W.

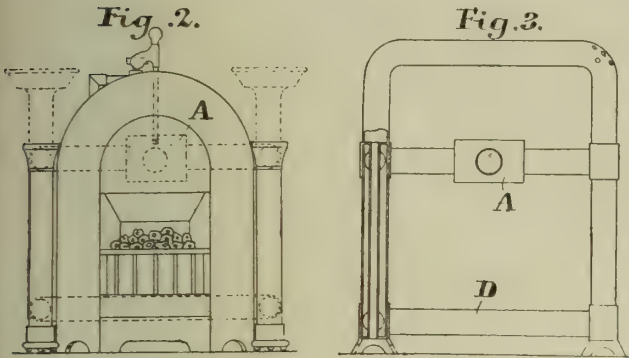
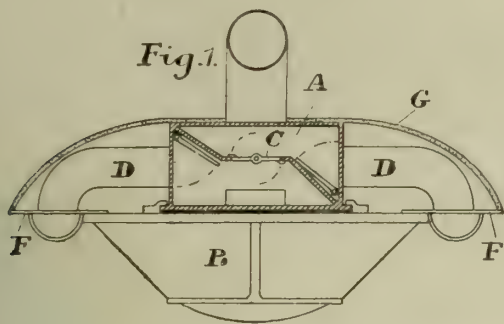
No. 11,143; May 11, 1909.

This invention relates to gas-heating stoves and heating appliances connected therewith, as described in patent No. 410 of 1908.

Fig. 1 (p. 505) is a sectional plan illustrating a gas-stove fitted with some of the improvements. Figs. 2 and 3 show modifications of the circulating pipes.

Referring to fig. 1, the chamber or box A is attached to the back of the stove B; an opening being formed in the box to admit the stove outlet. The joint between the box A and the stove is packed with asbestos. The heating pipes D convey the gases from A round the stove and back to the box on the opposite side of a diagonal diaphragm, whence the gases pass to the flue-pipe. The diaphragm is provided with a diverting valve C of the rotary disc type. The inlet to, and the outlet from, the pipes D are provided with valves connected with the valve C; so that when the main valve is opened direct to the flue the other two valves are closed, and thus prevent the products of combustion descending within, and condensing in, the pipes D.

In some cases, the vertical portions of the heating pipes are located within the side panels of the fire-place; the original panels being removed and perforated panels being substituted to allow the heated air to issue—the back of the pipes being packed with asbestos or other non-conducting material. Or, as shown in fig. 1, the space between the stove and the fire-place may be filled in with a screen or surround F, which is formed with pipes or channels communicating with the pipes D. Preferably, the back of the screen and stove is enclosed by a non-conducting shield G; and openings are formed at the upper and lower parts of the screen to allow air to circulate between the screen F and the shield G, and thereby become heated before it re-enters the



Killingworth Hedges' Gas-Heating Stove.

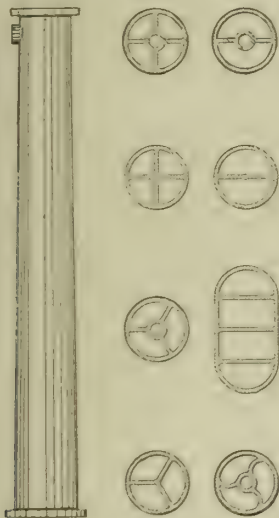
room. Also, the vertical pipes of the circulating system may stand out beyond the front of the stove as ornamental columns, as in fig. 2, and the columns may be formed with vertical air-tubes. The upper ends of the air-tubes may open into ornamental caps (fig. 2 or fig. 3), or into a hot-air chamber (fig. 3); vent holes being provided for the escape of the heated air.

Distillation of Coal.

TOZER, C. W., of Regent Street, S.W.

No. 20,158; Sept. 3, 1909.

This invention relates to a retort for use in gas, coalite, coke, tarless fuel, or other works where any carbonaceous substance is treated in a retort under atmospheric or other pressure, or in a vacuum or partial vacuum—the object being “the rapid and thorough distillation or carbonization of the contents of the retort.”



Tozer's Tapered and Ribbed Vertical Retorts.

The retort is made with internal longitudinal ribs connected to the outer shell portion of it and also to an internal core or cores. The ribs—either plain or perforated, straight or curved, and of any desired thickness—may be cast solid or fastened to the shell and internal core portions of the retort, or they may project inward from the shell without meeting at the centre or core. The core may extend the full length of the retort, or even project beyond it. The internal core or cores may be plain or perforated, hollow or solid, and of any desired size. The core portion may be omitted if desired.

The retorts are fitted with covers or doors and gas outlets, and (heated by a suitable furnace) may be used either singly or in any desired number or benches. In the larger sizes and for special uses the heat applied may be allowed to pass through cored spaces in the internal ribs into and through the central core or cores, or may pass through the core portion as well as to the outside of shell of the retort.

The internal ribs and core “give greatly increased strength against internal or external collapse, thereby allowing the retort to be subjected to a greater heat than when a plain retort is used, especially when retorts are operated under a high vacuum. The ribs and core also conduct the heat to the inner or central portion, giving a more rapid and uniform heat to the charge in the retort.”

The illustration shows an elevation of a retort tapered in form to

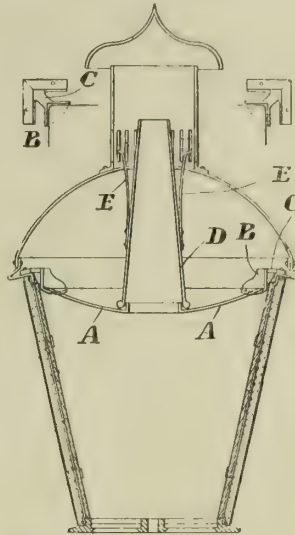
facilitate the removal of the coke or other contents; also cross sections of some suitable types of retorts.

Street-Lamps.

GLOVER, R. B. G., of Queen Victoria Street, E.C.

No. 17,458; July 27, 1909.

For the purpose of this invention, to enable the reflector A to be easily removed from inside the lamp, there is provided at each corner a bracket B constructed from L strip having within the members an arm C carrying a V-shaped ledge positioned at a lower level than the arm. The brackets are riveted or screwed to the lamp frame with the ledge projecting inside the lamp body; and the reflector (of a smaller size than the lamp frame at the part to which it is to be positioned) merely rests on the ledges, so that by lifting the reflector off the ledges and



Glover's Street-Lamp Lantern.

tilting it, it can be easily removed from inside the lamp and through the door for cleaning or polishing purposes. The chimney D is provided with spring strips E, which engage the hole in the top of the lamp and centralize it; the strips being provided with turned-over ends, which prevent the chimney falling out when the reflector is removed, but allow of the chimney being easily removed when desired. The chimney has a good surface contact with the reflector, so as to prevent air as much as possible from passing between it and the reflector.

The lamp is so constructed that the products of combustion pass up the chimney and away through the top of the hood; while the air to support combustion passes in at slots at the bottom of the hood, under the top of the lamp, over the reflector, and into the lamp through the space between the edge of the reflector and the lamp frame, so that the air is heated to a great extent before reaching the burners.

APPLICATIONS FOR LETTERS PATENT.

- 11,399.—HAWORTH, J. R., and SKIPPERS, F., “Gas-irons.” May 9.
- 11,443.—CLOUDESLEY, J. L., SEN., “Gas metering devices.” May 9.
- 11,444.—CLERK, D., BICKERTON, H. N., and BRADLEY, H. W., “Gas-producers.” May 9.
- 11,451.—KITLEY, H., and HARVEY, W., “Incandescent burners.” May 9.
- 11,459.—WILLIAMS, A. H., “Mantles.” May 9.
- 11,479.—BARTLETT, L. G., “Automatically igniting and controlling gas.” May 9.
- 11,491.—BOWING, J., “Retorts for use in the production of water gas.” May 9.
- 11,497.—RICHMOND GAS STOVE AND METER COMPANY, LIMITED, and RANSOME, J. A., “Gas cooking apparatus.” May 9.
- 11,509.—BROWETT, T. N., “Acetylene generators.” May 9.
- 11,521.—WOODROFFE, F. K., “Analyzing gas.” May 10.
- 11,532.—KIPPING, R. H., and CLARKE, A., “Igniting gas-jets.” May 10.
- 11,675.—YATES, H. J., “Gas-fires.” May 11.
- 11,676.—BEST, R. H., and HAMLYN, S. W., “Gas-fittings.” May 11.
- 11,694.—WAKEFIELD, C. C., “Acetylene generators.” May 11.
- 11,709.—HARSANT, H., “Combination gas and air burner for use with petrol spirit or coal gas.” May 11.
- 11,712.—ADAMSON, R. A., “Scraping and cleaning water-mains.” May 11.
- 11,722.—COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES A GAZ, “Lighting and extinguishing gas-burners automatically.” May 11.
- 11,759.—STENBERG, S., “Taps or cocks.” May 12.
- 11,782.—MASCHINENFABRIKEN VORM. GEBR. GUTTMANN UND BRESLAUER METALLGIESSEREI AKT.-GES., “Liquid meter with Woltmann screw.” May 12.
- 11,799.—SCOTT-SNELL, E., “Compressing elastic fluids.” May 12.
- 11,833.—SIMPSON, W. S., “Gas cooking utensils.” May 12.
- 11,917.—STILL, W. M., and SONS, LIMITED, and ADAMSON, A. G., “Mantles.” May 13.
- 12,009.—CROSS, F. L., “Pressure regulators.” May 14.
- 12,010.—CROSS, F. L., “Volume regulator and indicator.” May 14.
- 12,013.—CROSSLEY, K., and RIGBY, T., “Working ammonia recovery producer gas plants in conjunction with fuel briquette plants.” May 14.
- 12,064.—DOBSON, E., “Gas-governors.” May 14.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Calorific Values and High Temperatures.

SIR,—In your issue of May 17, your contributor under the above heading considers the calorific value of coal gas as affected by the proportion of its constituents, and remarks, after giving the values of marsh gas, hydrogen, and carbon monoxide:

"It is thus seen that the marsh gas has by far the highest calorific value; and therefore as high a proportion of this gas as possible should be obtained in the gas. This is best attained by using high heats for carbonization."

One would like to know upon what evidence Mr. Cooper bases this opinion that high heats produce a high proportion of methane in the gas. Practical experience proves that the difficulty is to maintain the proportion of this constituent as the temperature of carbonization increases. At any rate, this is so for temperatures above 950° C., when regular decreases of methane content are conditioned by equally regular increments of temperature. The C_nH_m constituent also decreases; and carbon monoxide and hydrogen increase—the former only slightly. These changes tend to lower the calorific value, not to increase it.

One would be only too glad to hear of any modifications of our carbonizing methods towards the production of a greater proportion of methane. Perhaps Mr. Cooper may yet tell us how it can be done.

Leeds Gas Department Laboratory, May 19, 1910.

A. EDWARDS.

Carbonizing Systems—Dr. Geipert's Criticisms.

SIR,—In your issue of April 19 (p. 169) is given a report of Dr. Geipert's reply to my remarks relating to vertical retorts in my paper, on "Carbonizing Systems," read at the last meeting of the Midland Association.

While thanking Dr. Geipert for his candid criticisms, the nature of his remarks indicate that he has either not read and studied my paper carefully, or else has deliberately ignored the qualifying remarks made by me on the particular points he criticizes.

Dr. Geipert states that my opinion is that the gas in vertical retorts is under a higher pressure than in retorts set otherwise than vertical; and that, consequently, the deposition of scurf is favoured by the former. This is not so generally; my contention with regard to excessive pressure only applying to certain classes of coal carbonized in intermittent vertical retorts, as the following extract from my paper upon this particular point will show: "With coal that swells considerably during carbonization, rendering the coke very dense and compressed tightly against the sides or walls of the retorts, very great resistance to the passage of the gas occurs; and in such cases the rapid formation of carbon must inevitably result, reducing the capacity, and rendering the frequent cleaning of the retorts necessary."

Although Dr. Geipert infers that this is not the case in actual practice (and may be so, so far as the Dessau settings at the Oberspreewerke at Berlin are concerned), his experience evidently has not extended to certain English coals, or he would not have implied that the conditions which may exist at Berlin must apply generally.

In your editorial remarks upon this particular point (see "JOURNAL," March 8, p. 640), you say that devices for grading the charges into large and small on opposite sides of the retorts have cured the trouble in this regard, though it has introduced an additional operation. This would appear to be only partially so, as from the letter of Messrs. Robert Dempster and Sons (see "JOURNAL," March 15, p. 744) referring to objectionable pressure in vertical retorts, while it is stated that, although the grading of the coal by their patent shoot forms a porous column, a certain amount of pressure on the bottom mouthpieces does still exist, varying with various coals from 12-10ths to 5-10ths over a short portion of the carbonizing period.

If this objectionable pressure has not existed, why the necessity for inventing means to obviate it? And such being the case, I have yet to learn that the deposition of carbon is not greater with a plus pressure than with a minus one.

It is, therefore, not a matter of conjecture, but of actual experience in a setting which has carbonized 3000 tons of coal; and, further, my personal experience, extending over a period of nearly two years, is that with the full retort, where pressure exists on the lower mouthpiece, the formation of carbon is much more rapid than in horizontal or inclined retorts only partially filled.

Dr. Geipert's attempt to prove the superiority of the Dessau system to the extent of 4 per cent. over any other system of vertical retorts, is too amusing to be seriously considered. While making use of the table given in my paper, showing the results obtained from the various systems referred to (and which is marked Table III. in the report of his lecture given at the annual meeting of the Association of Gas Engineers of Saxony and Thuringia, recently held at Magdeburg), if correctly reported, he has apparently purposely omitted the column in the table which shows that in each case a separate and distinct class of coal was used. And, further, he also makes no reference to my remarks relating to the same, which were as follows: "The figures given do not enable a fair comparison of the results obtained from the various systems to be made, owing to the different character and gas producing qualities of the coals used." To the members of his audience and readers of the report of his lecture who had not read my paper, the inference to be drawn by them is that the results given in the table were obtained under similar conditions.

This is putting an entirely wrong construction on the actual facts; and I strongly resent the use and publication of only that portion of the table which permits of such misconstruction being wrongfully applied in attempting to prove the alleged superiority of any particular system. The table should either have been published in its entirety or not at all. If the former had been done, the fallacy of the attempt would have been obvious, as to the youngest student in gas manufacture it is quite

apparent that it is ridiculous to attempt to make a reliable comparison of efficiency of the various systems when the testing material differs both in character and quality in each case.

It is satisfactory to learn from Dr. Geipert that the working life of vertical retorts compares favourably with horizontals or inclines. While this may be so in continuous working, I still contend that the vertical retort does not lend itself so easily as horizontals or inclines for repairs after being put out of action. Dr. Geipert's statement with regard to their adaptability to being frequently put out of use without need of repair—"one setting as much as sixty times"—needs further explanation. Does this mean that the setting has been allowed to cool down to atmospheric temperature and restarted sixty times, or has the setting only been thrown out of use so far as suspending carbonizing operations for a short period, and the temperature of the setting partly maintained. There is a vast difference in the condition of the retorts after the former as compared with the latter. And, further, what may be called a satisfactory condition of the retort when making gas of low illuminating power would not apply where straight coal gas of higher illuminating standard had to be maintained.

Market Harborough, May 17, 1910.

ALFRED T. HARRIS.

MISCELLANEOUS NEWS.

BELFAST GAS MANAGERSHIP.

The Question of Salary.

At a Special Meeting of the Belfast Borough Council last Tuesday, Mr. J. A. Doran moved the adoption of the following minute of the Gas Committee: "That the death of Mr. Robert Sharpe, Engineer and Gas Manager, be reported with deep regret to the Council; and that, in view of the pending extension of the undertaking, and the duties and responsibilities which will consequently devolve upon the holder of the position, the Committee are of opinion that a highly qualified and experienced gentleman should be appointed as Gas Manager and Engineer, and the remuneration of the office fixed at £800 a year, rising by four annual increments of £50 to £1000, with free house and gas." He said he regretted very much to have to move the resolution, in consequence of the death of Mr. Sharpe, which came upon them all as a great surprise, seeing that upon the Friday previous to his demise he attended the Committee meeting. Their late Manager was a capable man, well up in everything connected with the manufacture of gas. He was of a retiring disposition, and had done a great deal of work of which few of them knew anything. He might say that the Committee, with one exception, were unanimous in passing the resolution. The exception was the Vice-Chairman, Mr. Squire, who thought it would be better not to mention any salary.

The motion having been seconded, Mr. Squire said he was quite friendly with the Gas Committee in the matter; but he did not think the resolution would be a wise one to adopt. As to the unanimity of the Committee, he might say there were eight members present; and three of them at least were undecided as to the form of the resolution, while two did not allow their names to go forward as objecting. They felt that they must get the best possible man to be obtained in Great Britain or Ireland; and in order to do this, they must not say what salary they would give, otherwise they might keep out applicants who might come for a larger salary than was now being offered. He therefore moved as an amendment: "That, with a view to securing the services of the best available Engineer and Manager for the gas undertaking, the minutes of the Gas Committee referring to the appointment of an Engineer and Manager owing to the death of their late Manager be sent back to the Committee, with instructions to advertise without naming remuneration, and inviting applicants to state on what terms they would accept the position." As he had said, they needed the very best Manager they could get. It was within the bounds of possibility that they might secure a first-class man at £800; but what they wanted was a leading man, who might at the present time be in receipt of that salary, or possibly £1000. Gas managers were receiving from £800 to £1000 a year in towns not more than two-thirds the size of Belfast. They must have a man who was a chemist, because with the new works they would probably be manufacturing their own chemicals, &c.; but if the advertisement stood as proposed, they would only get men who were now receiving £600 or £700 a year in subordinate positions. A few hundred pounds in the appointment of a man to such an important position did not matter in the slightest degree—especially seeing that they were going to do very much greater things in the future than they had done in the past—and they should give the opportunity to men now getting £1000, or even £1200, to say they were willing to come at such-and-such a figure.

Alderman Sir James Henderson, in seconding the amendment, said that, as he was away from home at the time of Mr. Sharpe's death, perhaps he might be allowed to express his deep regret at the termination of his useful career. Certainly, the sad event could not have happened at a worse time for the Corporation. Mr. Sharpe had all the points about the Twin Island site at his finger-ends, for he had worked day and night to ascertain the truth about the whole matter; and it was unfortunate that death had claimed the official who would have been of most use to the Council at this juncture.

Alderman Sir Robert Anderson said his experience was that the best men were the cheapest. A good man would make a concern like the gas-works a success; whereas a middling man would spoil it. It was a great pity, with £40,000 or £50,000 at stake, to hear carping about a few hundred pounds. The duties which the new Manager would have to discharge would be very serious; and he would have everybody to please. He supported the amendment, believing that they should get the very best man, no matter where he came from, who applied for the position.

Alderman Finnigan said, with the possibilities of making thousands of pounds, it would be most unwise to tie their hands for the sake of £200 in the appointment of a Manager. They wanted a man who would

be not only able to manage their works successfully, but who, in addition, would be a good chemist and know everything about his work. Some men in charge of gas-works in England had between £1000 and £1500 a year; and in Cologne, where he had visited the gas-works, the Deputy-Manager received about £800 a year.

Mr. Riddell did not think it was possible to get the best men by advertising in the manner proposed in the Committee's resolution. He said that at the Committee meeting he was quite willing that the advertisement should be so worded that applications should be invited from engineers of thorough experience in gas management, assuring them that their applications would be treated confidentially, and that the best man would be liberally dealt with.

Alderman Tougher agreed that they should have the best man; but he asked whether the Corporation were willing to pay more than £1000. If they gave £1000, it would be £1200 with house and gas. Mr. Stelfox had £1200; but he had a great experience of 33 years. The fact that a man asked a large figure did not make him a good man. In a great many cases, young men across the water in circumscribed places, even with good salaries, would take a less salary on account of the possibilities opened to them in a city like Belfast.

Mr. M'Keown said he believed gas managers were as big a drug on the market as lawyers. It was his firm conviction that they could get as many competent managers at £600 a year as could supply all the gas-works in Ireland.

Mr. Doran complained that the members of the Committee who had supported the amendment did not speak out their minds at the Committee meeting. Why, he asked, should it go out now and be published in the gas papers that they were prepared to pay £1500 a year? Some of them seemed very generous now; but two years ago there were not so many of them anxious to support him in trying to get an additional £200 for Mr. Sharpe. The only reason they required a man now was because they were going to erect new gas-works; and it was a question whether the works would ever be constructed. They had an Assistant at present, a thoroughly qualified man, who had been 25 years in the concern; and by giving him another £100, they would not require a Manager at all. He could tell them that the best qualified man in the United Kingdom would be willing to come for £1000. Mr. Stelfox started at £500. They had also in their employment one of the best chemists, who could carry on the place to-morrow if only given a chance.

After several other members had contributed to the discussion, the amendment was put and carried. The advertisement referred to appears in another part of the "JOURNAL" to-day.

PUBLIC LIGHTING QUESTION AT HARROGATE.

Extension of Electricity.

Our readers are aware that during the past few months the question of the public lighting of Harrogate has been engaging the attention of the Lighting Committee of the Corporation; and in connection therewith some correspondence has passed between the Secretary and General Manager of the Gas Company (Mr. Harry Wilkinson) and the Town Clerk (Mr. J. Turner Taylor). As the result of an interview between the Chairman of the Committee (Mr. Rowntree) and the Gas Company early last month, Mr. Wilkinson submitted five alternative schemes for lighting the whole of the public lamps by gas for 2082½ hours, with additions for 29 lamps to be left alight all night. The schemes were marked respectively A to E. Under the first scheme, the present gas-lamps and the upright incandescent gas lighting were to be retained, and the electric lights were to be altered into inverted incandescent gas-lamps. Under all the other schemes, there would be a considerable increase over the illuminating power provided by either of the existing methods in the whole of the borough; while in schemes C, D, and E, new and modern lamps, of more elegant appearance than the existing ones, would be introduced. The Company offered to enter into a contract to carry out the work required in any of the schemes, and for supplying the gas and lighting, extinguishing, and maintaining the lamps, for a period of 21 years, at the following annual cost: A, £3686; B, £3737; C, £3937; D, £4020; and E, £4122. Each scheme furnished full details. On these schemes being received, Mr. Wilkinson was requested to submit alternative schemes for a five-years' contract, as the Chairman of the Lighting Committee was extremely doubtful whether the Committee would be prepared to recommend the Corporation to bind themselves to any particular scheme for lighting the borough for so lengthy a period as 21 years. Thereupon Mr. Wilkinson pointed out that the preparation of an estimate such as that required would involve considerable expenditure of time; and he suggested that the Committee should first be asked to decide upon a scheme of lighting, and submit a specification of it, with a statement of the period for which they were prepared to contract. When he was made acquainted with their requirements, he would be glad to submit an estimate based upon them. He added that, of course, provision could be made in a contract for 21 years for its determination at fixed periods; and he assured the Corporation of the Company's desire to meet them in this matter on the basis of a sound business arrangement. A copy of this letter was sent by the Town Clerk to the Chairman of the Lighting Committee, with a request for further instructions; but no communication was received by the Gas Company. Mr. Wilkinson thereupon sent a further letter explanatory of his previous communications. He pointed out that if the Corporation would bear the necessary capital expenditure for the alteration of the public lamps under the respective schemes, the Company would be prepared to undertake the complete lighting of the borough at the following annual cost: A, £3626; B and C, £3615 each; D, £3701; and E, £3832. If the Corporation wished to have the option of determining the contract at the end of the seventh or the fourteenth year, they could do so on payment of certain capital sums specified. Mr. Wilkinson concluded by submitting that, on careful investigation, it would be found that, taking into account the cost of coal and of stoking, and increased depreciation of plant necessary, the current required for lighting the existing gas-lamps with electricity could not be produced at less than 1d. per unit; and assuming it were

charged out at this rate to the Lighting Committee, "the cost of lighting with reduced candle power would be largely increased, and would at the same time prove a burden instead of a benefit to the electricity undertaking." A Sub-Committee of the Lighting Committee considered the scheme of the Electricity Engineer for the conversion of certain of the public lamps in the borough, adjacent to the low-pressure electric mains, from gas to electric lighting; and it was resolved that the scheme be approved and adopted, and that the Electric Light Department be allowed a sum of 17s. per lamp per annum for each lamp changed—the department to bear all the cost of lighting and renewals in connection with the alterations.

The next stage in the proceedings was the submission of the Committee's proposals to the Town Council. This was done at their meeting on the 9th inst. by Mr. Rowntree, in moving the adoption of the Committee's minutes. He explained that there was in existence at present a dual system of street lighting—gas and electricity—in the town. Some three months ago, the Electricity Engineer (Mr. G. Wilkinson) brought forward a scheme for transferring 500 of the gas-lamps, or less than one-third of them, to the low-pressure cables in the town; and the scheme was calculated at the time to save the rate-payers £145 per annum. The Committee submitted the scheme to the Sub-Committee, who gave it very careful consideration, and afterwards reported to the full Committee. The report was sent back and reconsidered, and again brought before the full Committee. It was about to be adopted, when a letter was received from the Gas Company asking to be allowed to submit a competitive price. The Committee, of course, delayed their scheme on account of this letter, and awaited further communications from the Company. The Committee had been found fault with for not asking the Company in the first instance for a competitive scheme. But this, of course, was a ridiculous position to take up, because they were not, as was supposed, starting a new scheme, or proposing to take over the whole of the lighting. The Gas Company's proposal consisted of five alternative schemes lettered A to E. The Committee gave careful consideration to them, and adopted for comparison Scheme B, which presented to them the minimum of their requirements, and which would compare with the one prepared by the Electricity Engineer. This was considered, and the Committee unanimously decided in favour of the electrical scheme. The cost of Scheme B was £3737, to which should be added £150 for the salaries of two inspectors which the Committee thought the Council would have to appoint on behalf of the Corporation, to see to the lighting of the town. All the schemes of the Company were based upon a contract for 21 years, and upon the conversion of all the street-lamps to gas. The Committee compared with Scheme B the electric lighting scheme as originally submitted, though in the meantime the reduced price of lamps materially favoured the electricity scheme. Taking the whole of the lighting together, both small and large lamps, the gas came out at £1362 15s., and the electric light at £881—a saving of £481 15s., or 35 per cent.; and if they added the £150 estimated for the inspectors, it was a saving of 39 per cent. He also wished to impress upon the Council the point that the electric lighting gave a higher average candle power for the lower sum. He admitted that the Committee had not given the Gas Company an opportunity of showing them their scheme. But the Lighting Committee had quoted a higher candle power for a less sum; and the minutes before the Council showed them why the Committee had adopted the electric scheme. First of all with respect to the 21 years' basis of contract, they felt, in view of the almost certain large developments in public lighting, it was inexpedient to contract for this number of years. Secondly, the Committee felt that one great reason for refusing the Gas Company's scheme was the certain damage that would be done to the town's electric lighting undertaking—an undertaking which had been extremely profitable to the ratepayers, for since 1901-2 the average yearly amount placed to the relief of the rates had been £1745. He thought he need not labour the argument that if they handed over to the Gas Company the whole of the lighting, which the town had installed at a considerable cost, the Company would naturally use it as a tremendous lever and advertisement, and they would suffer in the private house supply. The third point was that the interest on the capital invested in the electric light undertaking would be just the same, and they would have to continue to pay on £915, whether or not they adopted the Gas Company's scheme.

The motion having been seconded, Mr. Parker proposed, as an amendment, that the consideration of the question be referred back for the present, for the reason that the full Council had not had an opportunity of judging intelligently the two schemes. There was, however, no seconder to the amendment; and the minutes were confirmed with one dissentient.

IMPROVEMENTS AT THE BIDEFORD GAS-WORKS.

Mr. F. A. Searle, the Chairman of the Bideford Gas Company, in taking the chair at the 75th annual meeting, congratulated the shareholders on the development which had taken place during the past year. Since the last annual meeting, a Provisional Order had been obtained; and under this additional capital had been raised at satisfactory rates. The plant had been extended; and now that these improvements had been effected, a much larger quantity of gas could be sent out. Though a lower price had been charged for gas, the receipts were in excess of those for the previous year. The Directors recommended the payment of a dividend of 12½ per cent. on the original shares, and 9½ per cent. on the additional shares. In many respects, it had been an important year for the Company; and it was matter for congratulation that the management had been able to reduce the price of gas, carry out such important extensions, and produce such a satisfactory financial result. The report and accounts were adopted, and the dividends recommended declared. Thanks were voted to Mr. W. D. Joce, the Secretary of the Company, and Mr. F. Fulford, the Manager.

The improvements effected at the works are of a very substantial character. They include a new retort-house, in which provision is made for four benches of eight retorts on the regenerative principle, with a coal-store under the same roof, in which there is space for the

THE PUBLIC LIGHTING OF CHICHESTER.

Statement by the Gas Company.

The Secretary of the Chichester Gas Company (Mr. V. V. Vick) has addressed to the Mayor and members of the Corporation on behalf of the Company, a long letter on the subject of the public lighting of the city, which, it may be remembered, has lately been transferred to the Electric Light Company.

He first mentions the various contracts made between 1873 and 1903, in which year one was entered into determinable Dec. 31, 1909, or at the end of any previous year, at the option of the Corporation, on giving three months' notice. During the running of this and a former contract, the Company had converted the public lamps to the incandescent system.

On April 19, 1909, the Corporation advertised for tenders, under the 174th section of the Public Health Act, 1875, which enabled them to specify for pecuniary penalties to be paid in case the terms of the contract were not duly performed, and to require sufficient security for the due performance of the same; and the period was for "one year or upwards."

The Company accordingly sent a tender for a term of five years from Dec. 31, 1909, determinable, at the option of the Corporation, at the end of the first or third year, on giving six months' notice. This tender (being the only one) was accepted, and the draft of the contract was prepared. But difficulties arose, first, as to the penal clauses which could be enforced by the Corporation without affording the Company any protection; and, secondly, as to the interpretation of the words "sufficient security"—the Company being of opinion that the Corporation were amply secured by the clauses embodied in the various Acts of Parliament regulating the Company, and were fully protected by the penal clauses which Parliament has imposed upon the Company in the event of their failing to carry out their obligations in relation to the public lighting of the city. The Company expressed surprise at being asked for personal security, especially as, so far as the knowledge of the Directors extended, they did not know, and had not heard of a single instance of a local authority asking a good financially sound statutory gas company for security outside that which Parliament had given for the special protection of such local authority. The Town Clerk, however, adhered to his opinion that the Company, in order to comply with the Public Health Act, must give security, in addition to the penalty named in the contract, of 2s. 6d. per lamp per night, for failing to give effective lighting, which security was fixed at £100; and the Company were placed in the humiliating position of having to ask a gentleman to consent to become security for the due and faithful performance of the contract. The Company having thus complied with the terms of the advertisement, the draft contract was finally settled and executed on Dec. 10, 1909. It was for five years, determinable, at the option of the Corporation, at the end of the first or third year.

Within a period of a little more than two months from the date of the contract—viz., on March 8, 1910—the Corporation again invited tenders from companies or persons desirous of entering into a contract for lighting the public streets and places within the city from Dec. 31, 1910, for "a period of one year or upwards." The contract, among other provisions, was to contain a clause providing for the payment to the Corporation of the sum of £1000 as damages in case default was made in lighting the streets at the commencement of the contract, and a further sum of 2s. 6d. per lamp per night for any failure to maintain the lighting; and it was intimated that no tender would be entertained unless it specifically stated that the company or person was prepared to "enter into a bond with two named sureties (joint and several), or other specifically described security to be approved by the Corporation, in the sum of £500 for the due execution of the contract." On March 30, 1910, the Company sent in a tender for a period of five years, determinable, at the option of the Corporation, at the end of the first or third year on giving six months' notice; the price being £3 10s. per burner per annum. But the Company offered to continue without charge, during the whole of the five years, certain lighting equivalent to 21 burners, which represented a saving to the Corporation of £73 10s. per annum. The Electric Light Company sent in a tender for lighting the public lamps at 5s. per burner less than the price quoted by the Gas Company; but this price was dependent upon the Corporation giving the Company a contract for five years certain. As the wording of the advertisement "one year or upwards" was, in the opinion of the Gas Company, capable of being misconstrued, it would have been more satisfactory if the Corporation had stated what their requirements really were in language not capable of misconstruction.

As soon as the real meaning of "one year or upwards" became apparent, and the facts became known that the Lighting Committee had recommended the Council to accept the tender of the Electric Light Company, the Engineer and Manager of the Gas Company (Mr. T. E. Pye) sent a letter to the Town Clerk pointing out that the advertisement distinctly specified that the tender was to be for a contract for "a period of one year or upwards," and that the tender of the Company was therefore framed to meet the definite requirements of the advertisement. The Directors therefore submitted that the competitive tender was not in order, and that the one sent in by the Company was the only one before the Council which was in accordance with the terms of the advertisement. Mr. Pye added: "If the Council be desirous of considering a tender on the basis of a five years' firm contract, the position is with us a very different one indeed from that indicated by the Council's advertisement; and the Directors beg to submit that, before the matter be proceeded with further, they should, in fairness, be allowed to tender on the same basis as that of the Electric Light Company." Tendering on the basis of "one year" and on a "firm contract for five years" are two different things; and if the Company had not been misled by the wording of the advertisement, they could have quoted a lower figure. This letter was handed to the Town Clerk at the meeting of the Council on April 15, 1910; but he declined to read it. The Mayor moved the confirmation of the proceedings of the Committee meeting of the Council, which included the proposition that there was no reason for transferring the lighting contract. An amendment was,

however, moved to the effect that the tender of the Electric Light Company be accepted, and that the existing contract be determined; and this was carried. In the course of the discussion, Mr. Fowler said, in view of the divergence of opinion on the reading of the advertisement, he thought there was no urgent necessity to finish the matter that night; and he moved that the question be referred back to the Council in Committee, so that both the Companies could tender on the same basis. It was certainly possible to read the advertisement in two ways. The tender of the Electric Light Company was, however, ultimately accepted by twelve votes to five.

Mr. Vick closes his letter by pointing out that for upwards of forty years the Gas Company have been supplying the city with gas for both public and private purposes, and that the various contracts which have been entered into with the Corporation have been (without security) faithfully performed; in fact, the public lighting, in consequence of the large sum expended—viz., £494—in converting the flat-flame into incandescent burners, is to-day so thoroughly effective and up-to-date as to scarcely admit of improvement. All this, however, is to be discarded in favour of electricity (the effect of which, so far as the public lighting of the city is concerned, is an unknown quantity) at a time when public lighting by this means is in many instances being superseded by gas. Moreover, the Company have in many ways contributed very considerably towards the general prosperity and welfare of the city and the city's institutions, as they are one of the largest ratepayers. In the past twenty years their payments in local rates have risen from £178 to £648. Why, in all fairness, the Gas Company would like to ask the Corporation, was not the matter referred back, and fresh tenders obtained upon an advertisement incapable of being misinterpreted? Taking everything into consideration, the Directors feel that they have not been dealt with in the same fair and equitable spirit as that in which they believe they have at all times endeavoured to meet the wishes of the Corporation.

CAPE TOWN DISTRICT GASLIGHT AND COKE COMPANY.

A Rift in the Cloud.

The Ordinary General Meeting of the Company was held last Wednesday, at Egypt House, New Broad Street, E.C.—Mr. J. E. LILLEY, J.P., in the chair.

The SECRETARY (Mr. R. W. Blackburn) read the notice calling the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said he was sorry to say that the health of their Secretary (Mr. H. Yuill) had been so unsatisfactory that he had been unable to continue in office. They were fortunate, however, in having associated with them Mr. Blackburn, who had been in the office for some years, and was intimately acquainted with the working of the Company. The Directors had therefore appointed him Secretary, knowing he could thoroughly and efficiently perform the duties. Turning at once to the business of the year, the receipts for gas amounted to £49,288, as compared with £53,735 the previous year—a decrease of about £4,500. This was the black spot in their working. It would be remembered that he said last year that the changes made in the manufacturing methods and capacity enabled them to do their work more cheaply than they had ever been able to do before; and that, if they could but see a return to normal business conditions in Cape Town, there was not the slightest doubt that the Company would make good profits. But he was sorry at that time to also have to tell the shareholders that, during the early part of the year, they had had decreases of very considerable amounts each month. These went on month by month until they got towards the latter end of the year, and then, partly through the increased number of customers they obtained, and partly he hoped through slightly improved conditions in Cape Town and the surrounding neighbourhood, they gradually reached to about a balance with the corresponding months of 1908. In the early part of the year, the number of consumers became somewhat smaller. This the Directors naturally looked upon as a serious matter; and they at once energetically restarted canvassing. A pause had been made in the canvassing for new consumers because the expense of connecting them, and putting in prepayment fittings, was very great. But seeing the diminution in the number of active consumers, they set to work again, notwithstanding that they had no capital to expend. Feeling sure the profits resulting from their trading would enable them to bear the expense, with certain savings as well, they recommenced development work in this direction. They gave demonstrations in cookery and lectures on the use of gas generally; and these were a prolific source of new customers. For some time past, too, in the public elementary schools and secondary schools in Cape Town, the girls were being taught cookery; and this was chiefly done by gas. Though they had got an additional number of customers, they had not been able to make up for those lost, because the new ones were smaller consumers of gas. In investigating the causes of the heavy decreases in the early part of the year, it was found they had lost about eleven consumers of gas by means of gas-engines. These were important consumers; for although they did not pay so much for gas as for lighting and cooking, still they used large quantities, and paid a price that was remunerative. But the temptations held out by their electrical competitors, the Municipality, were very great—not only in Cape Town, but in the neighbouring Municipality of Woodstock. It seemed to the Directors a strange thing that one Municipality should be able to trade in the area of another. The Corporation also supplied electricity in other municipal districts, and at competitive prices, too. The Directors considered it hard; but they had to meet the competition. Beyond the large users the Corporation drew from them for power purposes, a few users of gas for power had succumbed to the severe and lengthened depression, and had to close their business premises. In all, 366 new customers were obtained during the year; but they failed to reinstate the Company in the amount of gas sold during the previous year to the extent of about 10 million cubic feet. The quantity of gas made was some 15 millions less than during the preceding year. But by careful

attention to the unaccounted-for gas, they had reduced the item by about 2 per cent. in comparison with the previous year; also by carrying on all the manufacturing work at Woodstock instead of Cape Town, the quantity of gas used on the works was somewhat less. The position then was that, with a make of 15 million cubic feet less, they only sold 10 millions less. In residuals they had done a little better. There had been an improved demand for coke; and during one part of the year, their yard was entirely cleared of coke. They put up the price; but the demand was not now beyond their ability to supply, so that it would not be wise to raise the price higher. Colonial coal competed with them very strongly, both in respect of coke and gas, because its comparatively low price (25s. per ton) tempted many people, such as hotel and restaurant keepers and clubs. These had coal-stoves, by which they could do their cooking; and many of them used to pay as much as £80 a month for cooking gas in the good old days. In breeze, they had not done so well; but tar had been in great demand. Better prices had been obtained for it during the year; and at the present time, they were really oversold. Taking residuals and the sale of fittings together, the receipts under these heads were £1900 better than in the previous year. On manufacture they had spent about £4200 less—due to the smaller quantity of gas made, to the fact that they were able to get coal at 18d. per ton less, to the better production of gas per ton of coal carbonized, and to the lower cost for carbonizing wages. In the course of five years, they had reduced the carbonizing expenses by about 50 per cent. Repairs and maintenance of works cost about £800 less; and they hoped that the expenditure would be much less, now that they were seeing the end of the reconstruction work. Having commented on other items, he said the result of the revenue account was a gross profit of £15,880. Adding the amount brought forward, and paying the debenture interest, and carrying forward £1761, the remainder they had used for writing-off for depreciation of plant and machinery. On capital account, they had expended £9525. Actually rather more than this was spent, but this was what was charged to capital account. It consisted chiefly of new mains, services, and prepayment installations, which was all productive work. After writing-off £6000 for depreciation, the increase in the capital account was only £3525. This was met by realizing about £2000 of their stocks, and they had got their money collected up closer by about £1500. Regarding the decreased sales, they were caused by influences against which no gas company could compete. Cape Town and the district had been retrogressive now for some years past. This year the population was down to 65,710; while in 1904, it was 77,668. In Woodstock, again, the population in 1904 was 28,990; while now it was only 25,000. There the shareholders saw at once the result of the depression. The number of their customers at present was 5764, including the increase of 366; and of the total no less than 3668 took gas through prepayment meters. Since 1906 they had obtained 1460 new customers, nearly all of whom took their gas through prepayment meters, the average takings from which were £4 14s. 5d. a year, which was not so much as used to be obtained from the ordinary consumers. During the year the Company had disconnected 1696 meters, which were not

being used; and this showed the unsettled state of the population with which they had to deal. However, the Directors were determined not to lose ground by not taking every step to secure new business. The Municipality had extended their electric cables to Seapoint; and the Company had laid mains into the district. He believed there were indications of a better condition of things gradually coming over the district; and he sincerely hoped that the turn of the tide had come at last. Up to March this year, the returns were about even with those of last year; and the result of the April business was that they were about $\frac{1}{2}$ million ahead of April last year—this notwithstanding that they had lost the Seapoint public lighting. They also heard that in Cape Town business was more active. As to the £6000 put to depreciation, the Directors had been asked whether they could not distribute this as dividend. The shareholders might rely upon it that if the Directors thought it wise to pay a dividend, they would be the first to adopt that course; but they wanted to put the concern in a thoroughly sound condition. The profit made had been spent upon the business; and if they distributed it, they would be compelled to borrow, which would not be wise.

Mr. H. R. SAVORY seconded the motion.

The CHAIRMAN, in reply to questions, said the leakage was now about 13 per cent., as against 15 per cent. the previous year. It was 25 per cent. before they undertook the systematic inspection of the mains. They suffered badly because the roads were made up of easily disintegrated material. Heavier steam-rollers were now used. The Company also suffered from electrolysis, and were powerless to make any fuss about it. They had improved their conditions by putting the mains farther into the ground as occasion allowed. Seeing, too, that they had 111 miles of mains, it was not surprising, with their consumption, that the percentage of unaccounted-for gas was much heavier than was customary.

The motion was adopted.

The retiring Director (Mr. J. E. Lilley) and the Auditors (Messrs. C. F. Kemp, Sons, and Co.) were re-elected; and with the complimentary votes, the proceedings terminated.

SERIOUS GAS EXPLOSION AT DERBY.

Shortly after two o'clock on Monday afternoon last week, a violent gas explosion occurred on the premises of the Midland Drapery Company in St. Peter's Street, Derby; the furnishing department being totally wrecked, and several business premises in the immediate neighbourhood considerably damaged. The explosion blew out the entire front of the shop; and a shower of glass and a general fall of furniture followed. A tramcar passing at the time received the full force of the explosion; and not only were several of the riders on the top cut by the glass, but the car itself was damaged. The more seriously injured passengers and pedestrians were conveyed to the Infirmary; the others

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were treated and taken to their homes. Firemen were promptly on the scene, in the expectation of a conflagration; but a hurried inspection of the premises sufficed to show absence of fire. The premises, however, were wrecked both back and front; and there were few articles of furniture, whether on the upper or the lower floors, which had not been disturbed, if not broken. In view of the severity of the explosion, it is marvellous that there was no fatality. With the assistance of the firemen, workmen from the Gas Company were able to get access to the gas-meter, and turn off the gas. It is difficult to determine the exact cause of the accident. The premises had been closed from the previous Saturday; and they were presumably left in safety. There must have been some unsuspected leakage from the fittings or from a gas-tap accidentally left turned on. The escaping gas had all Sunday and part of Monday in which to accumulate; and it collected in considerable volume. Its ignition by the pilot-light of an incandescent burner is quite feasible. The explosion appears to have originated near the staircase on the ground floor, as at this point the flooring was raised and the damage was greatest. Inquiry at the Infirmary later in the day elicited the gratifying information that, with one exception, the injured had been sent home.

BIRMINGHAM CORPORATION WATER SUPPLY.

Annual Report and Accounts.

The Water Committee of the Birmingham Corporation have submitted their report and accounts for the year ended the 31st of March last. They furnish the following particulars.

The water-rents show a total increase of £5237, or 1·78 per cent., against an increase of 2·05 per cent. last year. It is, however, to be remarked that the present account includes the receipts for the supply to Coventry for a whole year; whereas that supply had been in operation during only half the previous year. Excluding the Coventry supply in each case, the increase in this account would have been 0·92 per cent., against 1·18 per cent. in 1908-9. The analysis of the accounts shows that the domestic rental (which does not include the bulk supply to Coventry) has increased to the extent of 1·59 per cent.; while the measured supplies, as a whole, show a reduction of 0·55 per cent. This reduction is, however, entirely due to reduced consumption under the head of "Railways and street and road watering;" the trade supplies alone having increased 0·62 per cent., against a reduction of 0·30 per cent. last year. The revenue account shows a gross profit of £205,022, as compared with £201,304 a year ago. The charges on account of capital shown in the profit and loss account amount to a net total of £286,080, including a provision of £9499 for redemption of debt, irrespective of £11,402 for the extinction of annuities. The provision for the redemption of debt is £2960 in excess of the amount last year, in consequence of the commencement of the sinking fund in respect of the capital raised under the Act of 1892.

The deficiency for the year is £81,058, against a corresponding sum of £80,657 a year ago. The Committee propose to deal with the deficiency as follows: Contribution from the borough fund and rate account, £65,000; transfer from capital account under section 22 of the Birmingham Corporation Water Act, 1902, £11,235; balance to be carried forward, £4823. The Committee have limited the capitalization so that the total amount capitalized agrees with the sum provided in the forecast table prepared in connection with the 1907 Act; and in order to cover the balance, they recommend that a supplementary contribution of £4823 be transferred from the borough fund and rate account. The Committee say the Council will recognize that the necessity for this increased contribution has been occasioned by the retardation of the rate of growth of the rental; and while they still believe that the anticipated rate of growth will be made good on the average of an extended period, they feel—and they are sure the Council will agree with them—that the prudent course is to provide for the deficiency at once, so as not to disturb the scheme of finance adopted on the passing of the 1907 Act. As regards the coming year, the Committee recommend that provision should be made for a contribution of £65,000 from the borough fund and rate account.

All the works comprised in the first instalment of the Elan supply scheme have now been completed. The total outlay on them has been £5,812,574, including the cost of strengthening the Severn syphon and the Studley tunnel. On March 4, 1902, the Committee presented to the Council a revised ultimate estimate of the cost of the first instalment of the works, amounting to £5,884,918; so that, including the extras, the undertaking has been completed at a cost of £72,344 less than the ultimate estimate.

PORTSMOUTH WATER COMPANY.

The Half-Yearly General Meeting of this Company was held at the Portsmouth Offices, Commercial Road, last Thursday—Mr. W. GRANT, J.P., the Chairman, presiding.

The report showed that the revenue for the half year ending March 31 was £36,460; and the expenditure permitted the transfer of £20,337 to the profit and loss account, the total of which was thus brought up to £29,514. The full statutory dividends were recommended for payment—leaving £6477 to be carried forward. There were 445 additions made during the half year; bringing the total number of premises under constant supply up to 50,116. The quantity of water pumped from Havant and Bedhampton was 1,358,523,194 gallons; being a decrease of 11,971 gallons daily as compared with the corresponding period of the previous year. The new filtration works had been completed; and since Dec. 31 all the consumers had been supplied with filtered water. The action against the Brighton Railway Company though resulting in favour of the Water Company, had caused an expenditure of £1913, after the Taxing Master had ordered the Railway

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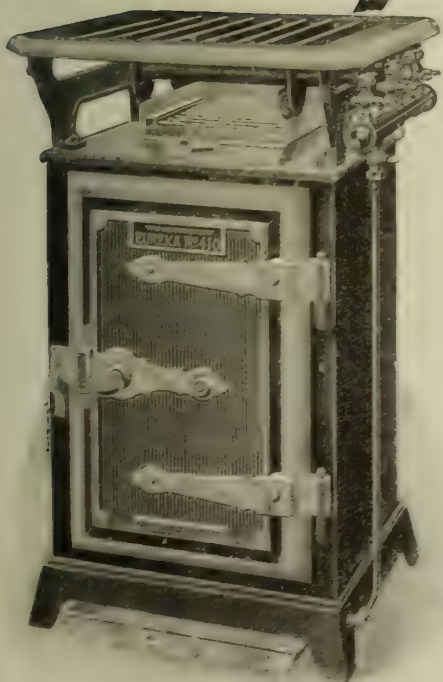
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Company to pay £1129. The salary of the Secretary (Mr. J. L. Wilkinson) had been increased to £700 per annum, and he had been promised increments to £800 a year. Reference was made to the death of Mr. Joseph Quick, the Company's late Consulting Engineer.

The Chairman, in moving the adoption of the report, mentioned that the filtration works had cost £73,000, of which £11,000 remained to be paid. The works were entirely satisfactory. With respect to the recent law-suit, though they had won all along the line, a further action was pending on appeal against the County Court Judge's decision at Portsmouth, in a case by a consumer for repairs.

The resolution was carried unanimously.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the Dunfermline Town Council last week, the Convener of the Gas Committee—Mr. T. Stewart—intimated that the annual meeting of the North British Association of Gas Managers is to be held in Dunfermline on July 28 next, and that the Gas Committee unanimously recommended that the Corporation should give a civic welcome to the Association. The recommendation was adopted.

The Bothwell and Uddingston Gas Company, Limited, which is managed by Mr. L. Hislop, ended their financial year on April 30; and the result of the year's working has already been issued to the shareholders, who are to hold their annual meeting on the 31st inst. The quantity of coal carbonized was 7180 tons, yielding 58,954,200 cubic feet, and costing £3534. The revenue from gas sold amounted to £8407; from the hire of stoves, £52; from coke, £1638; from tar, £343; and from sulphate of ammonia, £850. There were produced 4200 tons of coke, of which 3336 tons were sold, and 864 tons used on the works. Of tar, there were produced and sold 81,860 gallons; and of sulphate of ammonia, 78½ tons. The total revenue was £11,291, and the total expenditure £8681; leaving a balance of £2610. To this there is added £1178 brought forward from the previous year; making together £3662 at the credit of the profit and loss account. The Directors propose to apply £2300 in paying a dividend at the rate of 10 per cent. upon the £23,000 of issued capital of the Company, and to carry £3663 forward.

In the Hamilton Town Council last week, the Gas Committee reported that the Gas Manager—Mr. J. Ballantyne—had submitted a list of coal offers received, together with three selections of 15,650 tons each; and that the Committee had agreed to recommend acceptance of the following: Cadzow Coal Company, Cadzow cannel, 5000 tons at 9s. 11d.—£2479; Bent Colliery Company, Bent cannel, 2650 tons at 9s. 11d.—£1314; A. & G. Anderson, Dykehead main, 1000 tons at 9s. 9d.—£487; Alex. Russell, Udston splint, 2000 tons at 9s. 9d.—£975; and D. A. Penman and Co., Ross splint, 5000 tons at 9s. 8d.—£2417. Total, 15,650 tons; amount, £7672; average price per ton, 9s. 9½d.;

increase over last year, 6½d. per ton. Bailie Anderson, the Convener of the Gas Committee, moved approval of the recommendation; and it was agreed to after some discussion with regard to the comparative prices of coal supplies prior to the railway siding being got into the gas-works. Mr. Moffat explained that while this year there was an average increase of 6½d. per ton in the price, the quality was really very much better.

The Falkirk Town Council on Monday had another discussion upon the state of matters arising out of the dismissal of four workmen from the Corporation gas-works in February last. It will be remembered that it was stated at a meeting a month ago that the men were dismissed because the end of the season had arrived. The action of the Gas Manager—Mr. W. Wilson—was approved by seven votes to five; and a small Sub-Committee was appointed to deal with Mr. Sherwood, the representative of the Gas Workers' and General Labourers' Union, upon the subject of any alleged grievances on the part of the gas workers—presumably the remaining workers. At the meeting of the Town Council on Monday, a letter from the Secretary to the Union was read, in which it was stated that it did not appear to him that the Gas Committee could have sufficiently weighed the evidence laid before them by Mr. Sherwood and the deputation, and stating that Mr. Sherwood would be pleased to visit Falkirk again to go further into the question of the victimized cases with the Sub-Committee. To this letter the Gas Committee agreed to reply that they could not meet Mr. Sherwood on the questions stated in the letter. Bailie Bogle, the Convener of the Gas Committee, moved approval of the minute. Mr. Miskimmin moved that the Committee meet Mr. Sherwood. The position seemed to him to be that the Gas Manager was put on trial; and he became the butt of a great deal of criticism. A number of questions were levelled at him; and the discussions that took place did not, at least to him, appeal as elucidating the subject in dispute at all. In this matter, either the Gas Manager was right or he was wrong. All the facts bearing on the position should be disclosed. The Town Council were being blamed for defending the Gas Manager as against the men; and in a great many influential quarters the belief was firmly maintained that the men had been victimized. In view of the fact that the matter had not been dealt with in quite a satisfactory fashion, and feelings of lack of confidence were broadcast in the town, they ought to avail themselves of this opportunity of dealing with the matter, and have the facts disclosed. He must demand that Mr. Wilson state before the whole Committee what he had stated to some of them individually. If this were done, he thought they would see where they were. Bailie Aitken, in seconding, said it seemed to him that something had not come out that must be brought out. Bailie Russell was afraid they were going to open up a discussion that would serve no good purpose. The Gas Manager must have thorough control over the works. He did not take on other men in place of those who had been dismissed; he only reserved to himself the right to keep on the men who he thought would serve him best. This discussion had been started in the interests of Trades Unionism. Bailie Dillon said they were told that the Gas Manager was carrying out the

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wishes and the orders of the Town Council. He denied this. He was not carrying out his, for he never authorized him to pay some £10 of the ratepayers' money to dismissed men, when they could have had £10 of work for the money. [This referred to the men having been paid their wages in lieu of notice.] Mr. Gilchrist was satisfied, on the evidence, that the Gas Manager had done the best he could under the circumstances. Mr. Sinclair said the charges brought against the Gas Manager of victimizing these men were not, in his opinion, substantiated. Bailie Bogle said it was entirely in the Gas Manager's power to dismiss men when he thought proper. On a vote, the action of the Committee was approved by eight votes to six. I have given this narrative at some length, as it deals with an endeavour to get a pre-dominating influence for the men's Union in the administration of the gas-works. As I read this discussion, the feeling of the mover and seconder of the amendment was not to embarrass the Manager, but to get him to state all he knew, with a view to the justification of his action; but the majority of the Council thought it better that this should not be done—and I think they were right.

The Water Committee of the Glasgow Corporation reported on Thursday a probable expenditure in the current year of £243,944, and a probable revenue of £243,084—leaving a debit balance of £860. For the year 1910-11, the estimated expenditure is £239,323, and the revenue £243,960; leaving, after providing for the debit of the current year, a credit balance of £3577. The Committee recommended that the domestic water-rate upon occupiers within the limits of compulsory supply be continued at 4d. in the pound, and beyond the limits at 10d. in the pound; also that the rate upon owners for pumped water for domestic purposes be continued at 6d. in the pound; that the public water-rate upon owners within the limits be continued at 1d. in the pound; and that the other rates and charges remain the same as at present. In arriving at this resolution, the Committee took into consideration a memorial by a number of users of large quantities of water for trading purposes, in which it was suggested that any further reduction in the charges for supplies of water should be in those levied for trading purposes, and that the Corporation should consider the introduction of a sliding-scale of charges for such water, under which large consumers would obtain a reduction in price in respect of the quantity used by them. The Committee recommended that, inasmuch as the finances of the water undertaking would not permit of the Corporation making any reduction this year in the rates and charges for water supplied for any purposes whatever, consideration of the suggestions in the memorial be deferred in the meantime. Bailie Campbell moved approval of the minute. Mr. Pratt said that the public had for some time past been led to understand that they were to have a free water supply. He asked if the Committee had considered the question of a free water supply, and whether there was any chance of the promises recently made being fulfilled at an early date. Bailie Campbell replied that the charges were low, and that there was no proposal before the Water Committee for the abolition of the domestic water-rate. Such a proposal had never been before them, not even in an informal way. The recommendations of the Committee were adopted.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, May 21.

In consequence of the Whitsuntide Holidays and the funeral of the late King, the past week has been a broken one, and little actual business has taken place. The improvement in demand during the previous week has not been maintained, and prices have been inclined to recede to their former level; the closing quotations being £11 15s. to £11 16s. 3d. per ton f.o.b. Hull, £11 16s. 3d. to £11 17s. 6d. per ton f.o.o. Liverpool, and £11 17s. 6d. to £11 18s. 9d. per ton f.o.b. Leith. There is no new feature to comment upon in the forward position; consumers preferring to wait till later in the year, in the hope of then purchasing at less money than is now required by manufacturers.

Nitrate of Soda.

The market for this article has become rather firmer during the last day or two, and the values on spot now are 9s. 6d. and 9s. 9d. per cwt. for ordinary and refined qualities respectively.

Tar Products.

LONDON, May 23.

The markets for tar products have been very firm during the past week, though, of course, there is very little business doing. Pitch maintains its value—in fact, it is rather harder than was the case when last writing. It is evident that there is still a very considerable quantity wanted for next season's delivery, and, owing to the shortage in this country, it is certain that buyers will have to pay good prices to cover themselves. Creosote is very steady, and there is a fair amount of inquiry; but at the present buyers appear to be holding off in the hope of getting better figures later. Benzol is firm for prompt delivery, while for forward makers are very firm in their ideas. Fifty-ninety per cent. benzol is scarce, as is also the case with toluol. Both are fetching good figures. Solvent naphtha is very firm indeed; and there appears to be a considerable shortage in this article in practically all parts of the country. Heavy naphtha is quiet, and there is not very much inquiry for same. Carbolic acid is unchanged; and Continental consumers decline to pay the prices asked by makers. Naphthalene is quiet; while salts are not in such good demand as they were a little while ago.

The average values during the week were: Tar, 18s. 3d. to 22s. 3d., ex works. Pitch, London, 41s. to 41s. 6d.; east coast, 39s. 6d. to 40s. 6d.; west coast, 38s. 6d. to 39s. 6d. f.a.s. Mersey ports, 39s. 6d. to 40s. f.o.b. others. Benzol, 90 per cent., casks included, London, 8d. to 8½d.; North, 8d.; 50-90 per cent., casks included, London and North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2¾d. Carbolic acid, 60 per

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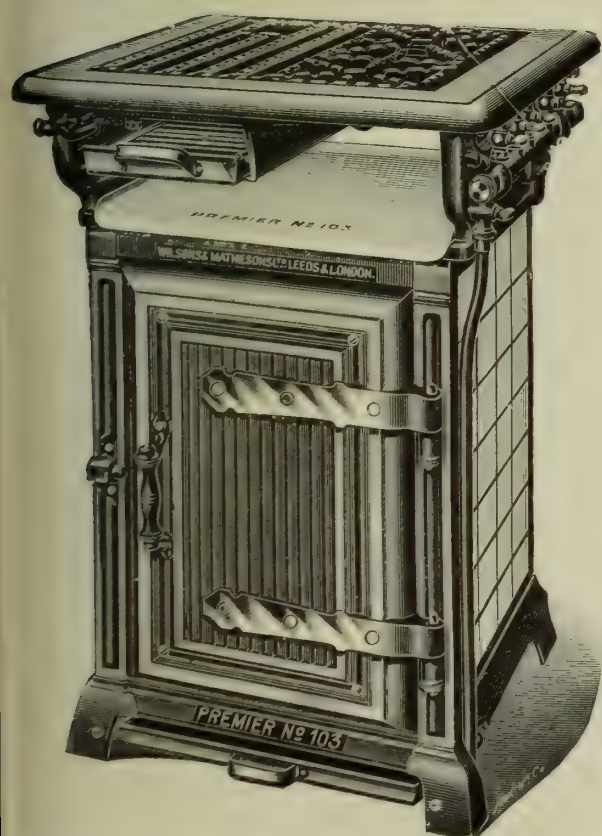
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Sulphate of Ammonia.

There is practically no change in the market for this article. Business certainly has been very quiet. To-day actual Beckton is quoted £12; while outside makes upon Beckton terms are £11 12s. 6d. to £11 13s. 9d. In Hull, £11 16s. 3d. is asked; and in Liverpool, £11 17s. 6d. In Leith and Middlesbrough the quotation is £11 18s. 9d.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a good demand on the whole for coal in the North, but it is partly due to the fact that the holidays have lessened the stocks. In the steam coal trade, the request is fair. Best Northumbrian steams are from 11s. 1½d. to 11s. 3d. per ton f.o.b., second-class steams are 10s., and steam smalls from about 5s. 9d. to 7s.—the latter sort being now rather more plentiful. In the gas coal trade, prices show a little ease. For Durham gas coals, the quotation for the usual classes is from about 9s. 6d. to 10s. 3d. per ton f.o.b., according to quality; and for "Wear" specials, up to 11s. is quoted. There have been more of the heavy contracts placed; and the bulk of those for London are now fixed at about 10d. per ton advance on the rates for last year. The Newcastle and Gateshead Gas Company are also now closing their contracts—the quantity being about 300,000 tons for the year; and it is probable that from 9d. to 10½d. per ton advance may be the average increase in the cost. Tenders have also been sent in for 30,000 tons of coal for the gas-works at Christiana; and other Scandinavian contracts are in the market. In coke, the market is quiet; and gas coke is now quoted from about 12s. 9d. to 13s. 9d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

The coal market shows no sign of improvement. The shipment demand is not sufficient to take up the output, and prices for foreign supplies are, in consequence, easier. For small sorts, the home market is in a healthy condition. The prices now quoted are: Ell, 9s. 3d. to 10s. per ton f.o.b. Glasgow; splint, 10s. to 10s. 3d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 300,853 tons—a decrease of 21,235 tons upon the previous week, and of 13,456 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,656,087 tons—an increase of 686,303 tons upon the corresponding period.

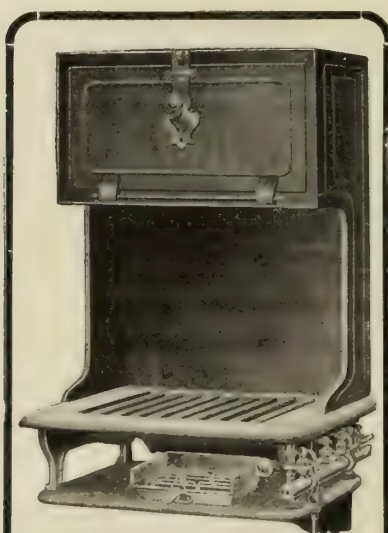
The Electricity Committee of the Manchester Corporation have agreed under pressure to contribute an additional £3000 from their profits in relief of the rates—making a total of £15,000.

Winding-Up of the Mid Oxfordshire Gas Company, Limited.—An extraordinary general meeting of shareholders was held at Bicester last Thursday to pass a resolution to voluntarily wind up the Company.

Gas Profits and Rate Relief at Chorley.—At the recent annual meeting of the Chorley Town Council, at which the rates for the year were made, Mr. Sandham criticized the action of the Council in applying £1500 of the gas profits in relief of the rates. He said consumers of gas had to pay 1s. 1d. per 1000 cubic feet towards the sinking fund charges; and it was unfair to expect them to pay an extra price to relieve the rates. Alderman Whittle, the Chairman of the Gas Committee, pointed out that any surplus on the gas undertaking had, according to their Act of Parliament, to be placed to the credit of the general improvement fund, from which, in case of loss, any deficiency would be made up. It would not be wise to make a reduction in price this year, as there had been an increase in the cost of coal.

Gas Poisoning at Oxford.—Last Tuesday, an inquiry was held at the Radcliffe Infirmary, Oxford, by Dr. H. F. Galpin, the City Coroner, into the circumstances attending the death of Joseph Gregory, 56, a cab shelter attendant, who was found in an unconscious condition in a shelter on the previous Sunday morning. The door was locked on the inside, and the taps in the gas-stove were partially turned on, but the gas was not alight. The man was removed to the Infirmary, where he died next day without completely regaining consciousness. An examination of the body showed that the cause of death was coal-gas poisoning and acute inflammation of the lungs. No information was available as to why deceased was sleeping in the shelter with the gas-stove in the condition in which it was found. He was a man of unsettled habits, but was not likely to take his life. The Jury returned a verdict of "Death by misadventure."

Monte Video Gas Company, Limited.—In the report to be presented at the ordinary general meeting of this Company next Thursday, the Directors state that the profit on the working in the twelve months ended Dec. 31 was £28,107. Adding interest and discount (£1518), profit on exchange (£272), Directors' fees waived (£280), and the balance brought forward (£11,929), the total is £42,107. After providing for interest on debenture stock, income-tax, bad and doubtful debts, and depreciation, and placing £4000 to the renewal account, the balance available for distribution is £30,946. An interim dividend was paid in respect of the half year ended the 30th of June, of 6s. per share, less income-tax, and the Board now recommend the payment of a further amount of 8s. per share, also less income-tax; making together 3½ per cent. for the year. This will absorb £18,967, and leave £11,979 to be carried forward. The balance at the credit of the reserve account remains at £32,000; while the contingency account stands at £21,013, and the insurance fund at £12,500. The sales of gas show a satisfactory increase; but as the reduced prices were in force throughout the whole twelve months, as compared with only five months in the previous year, the revenue from this source has increased by only £565.



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THE PARKINSON STOVE COMPANY, LIMITED

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Suicide by Gas.—An unmarried woman named Bennett, of Ardwick, was found lying dead in her bedroom one day last week. Deceased, who had lived alone, had not been seen for some time by the neighbours; and when a relative went to visit her, the house was found to be full of gas, while Miss Bennett was lying dead on the floor. The gas-bracket had been torn down, and the chimney stopped up.

Bolton Gas Profits in Aid of Rates.—At their last meeting, the Gas Committee of the Bolton Corporation decided that the Finance Committee be informed that the amount to be anticipated in aid of the rates from the gas undertaking for the past financial year will be £17,500; and it was further resolved that the Finance Committee be advised that the estimated amount from the department for the year ending March 31, 1911, available for the relief of the rates will be £17,500.

Sales of Gas Shares.—Messrs. Cronk recently offered for sale 74 shares in the Sevenoaks Gas Company, consisting of 22 "A" and 52 "B" shares, on which dividends of 10 and 7 per cent. per annum have been paid for many years. The former fetched £20 10s. and £21 per share, and the latter £15 each. Last Tuesday, 300 £5 shares (7 per cent.) in the Havant Gas Company were sold by auction at from £7 to £7 5s. each; the total amount realized being £2000.

Fire at a Manchester Gas-Works.—In the early hours of last Thursday morning, a fire was discovered to have broken out in one of the buildings at the Rochdale Road Gas-Works of the Manchester Corporation; and it took a large contingent from the City Fire Brigade a good hour-and-a-half to extinguish the flames. The outbreak occurred in the dining-room over the engine-house, and is believed to have originated from a gas-stove in the place used for cooking purposes. The damage done by the fire was not serious.

Fylde Water Board Accounts.—The annual report and accounts of the Fylde Water Board show a total income of £66,181, compared with £64,229 in the preceding twelve months; while the expenditure amounted to £15,349, against £13,778.

The Swindon Gas Company have renewed their arrangement with the Richmond Gas Stove and Meter Company, Limited, for the sole supply of cookers for a further period of three years.

According to a paragraph in the "Daily News," the Yarborough Oil-Mills at Brigg have been gutted by fire, caused through the fusing of an electric wire. The damage is estimated at £30,000.

In the early part of next month a conference will take place between the Directors of the Northwich Gas Company and representatives of the Local Authority in regard to the proposed purchase by the latter of the undertaking.

The Heat, Light, and Power Syndicate, Limited, has been registered with a capital of £250, in 1s. shares, to manufacture, sell, and supply light at Shoreham Beach, Sussex, and elsewhere, and to carry on the business of a gas company in all its branches.

For the annual outing of the employees at the Cardiff Gas-Works (which took place last Saturday week), the Company provided a special train, and, as the destination fixed upon was London, a ticket for each employee to visit the Japan-British Exhibition. The party, numbering about 300, left Cardiff in the morning, and returned early on Sunday morning. Mr. Langford, the Company's Outdoor Superintendent, and Mr. A. E. Williams, the Works Superintendent, had charge of the arrangements.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS ENGINEER AND MANAGER. Belfast Corporation.
Applications by June 8.
DRAUGHTSMAN (CANADA). No. 5242.
METER INSPECTOR. No. 5244.
WORKING MANAGER. Eyemouth Gas Company.
HEAD STOKER. Brecon Gas Works.

Situation Wanted.

LEADBURNER. No. 5241.

Plant, &c. (Second Hand), for Sale.

GAS OVENS. W. Biggs, Lambeth Hill, E.C.
PIPES, BENDS, &c. Chesterton Gas Works.
MOUTHPIECES, ASCENSION PIPES, &c., BOILERS, ENGINES AND EXHAUSTERS, CONDENSERS, TAR EXTRACTOR, SCRUBBERS, PURIFIERS, GAS HOLDERS, &c. Merthyr Tydfil Gas Company.

Patent Licences.

SPIRALLY WOUND TUBES AND MACHINE FOR MAKING.
Lloyd Wise and Co., 46, Lincoln's Inn Fields.

Meeting.

INSTITUTION OF GAS ENGINEERS. Institution of Mechanical Engineers. June 14-16.

Stocks and Shares.

ASCOT GAS AND ELECTRICITY COMPANY. June 14.
BRENTWOOD GAS COMPANY. June 14.
EAST GRINSTEAD GAS AND WATER COMPANY. June 14.
GUILDFORD GAS COMPANY. June 14.

TENDERS FOR

Coal and Cannel.

BARNOLD SWICK URBAN DISTRICT COUNCIL. Tenders by May 30.
BOLTON GAS DEPARTMENT. Tenders by June 3.
CHESTER GAS COMPANY. Tenders by June 6.
CIRENCESTER GAS COMPANY. Tenders by June 2.
DONCASTER GAS DEPARTMENT. Tenders by June 10.
DROGHEDA GAS DEPARTMENT. Tenders by June 3.
GAINSBOROUGH GAS DEPARTMENT. Tenders by May 27.
GLOUCESTER GAS COMPANY. Tenders by May 30.
HALIFAX GAS DEPARTMENT. Tenders by May 31.
HORNCASTLE GAS DEPARTMENT. Tenders by June 4.
LEEK GAS DEPARTMENT. Tenders by June 3.
MATLOCK BATH AND SCARTHIN NICK GAS DEPARTMENT. Tenders by June 7.
PENRITH GAS DEPARTMENT. Tenders by May 31.
PETERBOROUGH GAS COMPANY. Tenders by June 11.

Coal and Cannel—continued.

SKIPTON URBAN DISTRICT COUNCIL. Tenders by May 28.
SUTTON, REIGATE, AND NEWHAVEN GAS COMPANIES. Tenders by June 3.
SWADLINCOTE GAS DEPARTMENT. Tenders by June 1.
UXBRIDGE GAS COMPANY. Tenders by June 6.
WREXHAM GAS COMPANY. Tenders by June 1.

Lime.

SWADLINCOTE GAS DEPARTMENT. Tenders by June 1.

Tar and Liquor.

ACCINGTON GAS AND WATER BOARD. Tenders by June 6.
DONCASTER GAS DEPARTMENT. Tenders by June 10.
GAINSBOROUGH GAS DEPARTMENT. Tenders by May 27.
LEEK GAS DEPARTMENT. Tenders by June 3.
MATLOCK BATH AND SCARTHIN NICK GAS DEPARTMENT. Tenders by June 7.
STOURBRIDGE GAS DEPARTMENT. Tenders by June 10.
SUTTON, REIGATE, AND NEWHAVEN GAS COMPANIES. Tenders by June 3.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 483.

| Issue. | Share. | When ex. Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue. | Share. | When ex. Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|------------|--------|--------------------|--------------------|------------------------------|-----------------|---------------------|------------------------|-----------|--------|--------------------|--------------------|---------------------------|-----------------|---------------------|------------------------|
| £ | | | p.c. | | | | £ s. d. | £ | | | p.c. | | | | £ s. d. |
| 1,474,000 | Stk. | Apl. 1 | 5 | Alliance & Dublin Ord. | 82-84 | .. | 5 19 1 | 4,940,000 | Stk. | May 12 | 8 | Imperial Continental | 177-179* | .. | 4 9 5 |
| 310,000 | Stk. | Jan. 13 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 1,235,000 | Stk. | Feb. 10 | 3 1/2 | Do. 3 1/2 p.c. Deb. Red. | 94-96 | .. | 3 12 11 |
| 200,000 | 5 | May 12 | 7 | Bombay, Ltd. | 63-64* | .. | 5 9 10 | 195,242 | Stk. | Mar. 16 | 6 | Lea Bridge Ord. 5 p.c. | 122-124 | .. | 4 16 9 |
| 40,000 | 5 | " | 7 | Do. New, £4 paid. | 48-54* | .. | 5 9 3 | 561,000 | Stk. | Feb. 25 | 10 | Liverpool United A. | 222-224 | .. | 4 9 3 |
| 50,000 | 12 | Feb. 25 | 15 | Bourne- 10 p.c. | 29-30 | .. | 5 0 0 | 718,100 | " | " | 7 | Do. B. | 163 1/2-165 1/2 | .. | 4 4 7 |
| 311,810 | 10 | " | 6 | mouth Gas B 7 p.c. | 162-163 | .. | 4 3 7 | 306,083 | " | Dec. 29 | 4 | Do. Deb. Stk. | 103-105 | .. | 3 16 2 |
| 75,000 | 12 | " | 7 | and Water 7 p.c. | 15-15 1/2 | .. | 3 17 5 | 75,000 | 5 | Nov. 26 | 6 | Malta & Mediterranean | 43-5 | .. | 6 0 0 |
| 380,000 | Stk. | " | 12 1/2 | Brentford Consolidated | 251-254 | .. | 4 18 5 | 560,000 | 100 | Apl. 1 | 5 | Met. of 15 p.c. Deb. | 100-102 | .. | 4 18 0 |
| 300,000 | " | " | 9 1/2 | Do. New | 183-190 | .. | 5 0 0 | 250,000 | 100 | " | 4 1/2 | Melbourne 1/2 p.c. Deb. | 100-102 | .. | 4 8 3 |
| 50,000 | " | Aug. 12 | 5 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 0 | 541,920 | 20 | Nov. 11 | 3 1/2 | Monte Video, Ltd. | 123-124 | .. | 5 5 8 |
| 206,250 | " | Dec. 20 | 8 | Do. 4 p.c. Deb. | 101-103 | .. | 3 17 8 | 1,775,892 | Stk. | Feb. 25 | 4 1/2 | Newt'le & G'tesh'd Con | 104-106 | .. | 4 2 7 |
| 220,000 | Stk. | Mar. 16 | 11 | Brighton & Hove Orig. | 213-216 | .. | 5 1 0 | 529,435 | Stk. | Dec. 29 | 3 1/2 | Do. 3 1/2 p.c. Deb. | 91-93 | .. | 3 15 3 |
| 246,320 | " | " | 11 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 55,940 | 10 | Feb. 25 | 7 | North Middlesex 7 p.c. | 134-136 | .. | 5 1 10 |
| 490,000 | 21 | Apl. 1 | 10 1/2 | British | 41-45 | .. | 4 14 8 | 300,000 | Stk. | Apl. 29 | 8 | Oriental, Ltd. | 135-140 | .. | 5 14 4 |
| 109,000 | Stk. | Feb. 25 | 6 | Bromley, A 5 p.c. | 118-120 | .. | 5 0 0 | 60,000 | 5 | Apl. 1 | 8 | Ottoman, Ltd. | 6-6 1/2 | .. | 6 8 0 |
| 165,700 | " | " | 4 1/2 | Do. B 3 1/2 p.c. | 88-90 | .. | 5 0 0 | 31,800 | 53 | Feb. 25 | 13 | Portsea Island | 134-136 | .. | 5 1 0 |
| 82,278 | " | " | 5 1/2 | Do. C 5 p.c. | 105-107 | .. | 5 2 10 | 60,000 | 50 | " | 13 | Do. B. | 126-128 | .. | 5 1 7 |
| 51,000 | " | Oct. 29 | 3 1/2 | Do. 3 1/2 p.c. Deb. | 87-89 | .. | 3 18 8 | 100,000 | 50 | " | 12 | Do. C. | 119-121 | .. | 4 19 2 |
| 500,000 | 10 | Dec. 14 | 7 | Buenos Ayres (New) Ltd. | 98-100 | .. | 4 0 0 | 114,800 | 50 | " | 10 | Do. D and E. | 100-102 | .. | 4 18 0 |
| 250,000 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 98-100 | .. | 4 0 0 | 398,490 | 5 | Apl. 29 | 7 | Primitive Ord. | 74-74 1/2 | .. | 4 10 4 |
| 100,000 | 12 | " | — | Cape Town & Dis., Ltd. | 4-5 | .. | — | 796,980 | 5 | Jan. 27 | 5 | Do. 5 p.c. Pref. | 54-58 | .. | 4 10 11 |
| 50,000 | 50 | May 3 | 0 | Do. 4 p.c. Pref. | 49-50 | .. | 6 0 0 | 488,900 | 100 | Dec. 1 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 100,000 | Stk. | Dec. 29 | 4 1/2 | Do. 6 p.c. 1st Mort. | 87-89 | +1 | 5 1 2 | 1,000,000 | 10 | Oct. 14 | 8 | River Plate Ord. | 99-101 | .. | 3 19 3 |
| 157,150 | Stk. | Feb. 25 | 5 | Chester 5 p.c. Ord. | 109-111 | .. | 4 10 1 | 312,650 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 1,513,280 | Stk. | Feb. 25 | 5 1/2 | Commercial 4 p.c. Stk. | 106-108 | .. | 4 16 4 | 62,500 | 10 | Apl. 1 | 9 | San Paulo, Ltd. | 154-154 1/2 | .. | 5 14 3 |
| 470,000 | " | " | 5 | Do. 3 1/2 p.c. do. | 103-105 | .. | 4 15 3 | 125,000 | 50 | Jan. 1 | 6 | Do. 6 p.c. Pref. | 112-124 | .. | 4 18 0 |
| 600,000 | Stk. | Dec. 29 | 3 | Do. 3 p.c. Deb. Stk. | 81-83 | .. | 3 12 3 | 135,000 | Stk. | Jan. 16 | 10 | Do. 5 p.c. Deb. | 504-512 | .. | 4 17 1 |
| 200,000 | Stk. | Dec. 10 | 5 | Continental Union, Ltd. | 98-100 | .. | 5 0 0 | 209,984 | " | " | 10 | Do. B. | 232-234 | .. | 4 5 5 |
| 429,270 | Stk. | " | 7 | Do. 7 p.c. Pref. | 138-140 | .. | 5 0 0 | 523,500 | " | " | 10 | Do. C. | 232-234 | .. | 4 5 5 |
| 59,000 | " | " | 4 | Derby Con. Stk. | 121-123 | .. | 4 9 5 | 70,000 | 10 | Oct. 14 | 10 | South African | 12-12 1/2 | .. | 8 0 0 |
| 147,995 | " | Apl. 1 | 5 | Do. Deb. Stk. | 104-105 | .. | 3 16 2 | 6,429,895 | Stk. | Feb. 10 | 5 1/2 | South Met., 4 p.c. Ord. | 120-122 | .. | 4 9 7 |
| 486,092 | 10 | Jan. 27 | 12 | East Hull 5 p.c. Ord. | 96-98 | .. | 5 2 0 | 1,895,445 | " | Jan. 13 | 3 | Do. 3 p.c. Deb. | 81-83 | .. | 3 12 3 |
| 354,060 | 10 | " | 12 | European, Ltd. | 242-244 | .. | 4 17 0 | 209,820 | Stk. | Mar. 16 | 11 | South Shields Con. Stk. | 157-158 | .. | 5 1 3 |
| 16,192,677 | Stk. | Feb. 10 | 4 1/2 | Do. £7 ros. paid. | 184-184 1/2 | .. | 4 16 0 | 605,000 | Stk. | Feb. 25 | 5 1/2 | S'th Suburb'n Ord. 5 p.c. | 121-123 | .. | 4 12 0 |
| 2,600,000 | " | " | 3 | Gas 4 p.c. Ord. | 103 1/2-104 1/2 | .. | 4 9 3 | 60,000 | " | " | 5 | Do. 5 p.c. Pref. | 121-123 | .. | 4 1 4 |
| 4,092,235 | " | " | 3 1/2 | light 3 1/2 p.c. max. | 88-90 | .. | 3 17 9 | 117,058 | Stk. | Jan. 13 | 5 | Do. 5 p.c. Deb. Stk. | 122-124 | .. | 4 0 8 |
| 4,531,774 | " | Dec. 29 | 3 | and 4 p.c. Con. Pref. | 104-106 | .. | 3 15 6 | 502,310 | Stk. | Jan. 12 | 5 | Southampton Ord. | 110-112* | +2 | 4 9 3 |
| 258,740 | Stk. | Mar. 16 | 3 | Coke 3 p.c. Con. Deb. | 81-83 | .. | 3 12 3 | 120,000 | Stk. | Feb. 10 | 6 1/2 | Tottenham A 5 p.c. | 133-135 | .. | 5 1 9 |
| 42,500 | " | " | 6 1/2 | Hastings & St. L. 3 1/2 p.c. | 93-95 | .. | 5 3 3 | 453,940 | " | " | 58 | and B 3 1/2 p.c. | 113-115 | .. | 4 13 6 |
| 70,000 | 10 | Apl. 29 | 11 | Do. do. 5 p.c. | 117-119 | .. | 5 9 3 | 149,470 | " | Dec. 29 | 4 | Edmonton 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 131,090 | Stk. | Mar. 16 | 7 | Hongkong & China, Ltd. | 17-17 1/2 | .. | 6 5 9 | 182,380 | 10 | Dec. 29 | 8 | Tuscan, Ltd. | 94-93 | .. | 8 4 2 |
| 65,783 | " | " | 5 1/2 | Ilford A and C | 145-147 | .. | 4 15 3 | 249,990 | 10 | Jan. 3 | 5 | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 19 0 |
| 65,500 | " | Dec. 29 | 4 | Do. B | 108-110 | .. | 5 0 0 | 136,476 | Stk. | Feb. 25 | 5 | Tynemouth, 5 p.c. max. | 113-115 | .. | 4 6 11 |
| | | | | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 255,036 | Stk. | Feb. 25 | 6 1/2 | Wands- B 3 1/2 p.c. | 139-141 | .. | 4 14 0 |
| | | | | | | | | 79,416 | " | Dec. 29 | 3 | worth 1/2 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |

Prices marked * are "Ex div."

The accounts of the Rickmansworth and Uxbridge Valley Water Company for the year ended March 31 last show a disposable balance of £8304, out of which the Directors recommend a dividend of 5½ per cent. on the 10 per cent. maximum shares, and £3 17s. per cent. on the 7 per cent. maximum shares—as the previous year.

The Directors of Messrs. Fletcher, Russell, and Co., Limited, report that, after charging depreciation, debenture interest, and part of the Pendleton to Warrington removal expenses, there is a profit of £2536, while £964 was brought forward. The preference dividend for the year has been paid; leaving £500 to carry forward.

A bowling club, with a membership of more than 80, has been formed by the employees of the Hornsey Gas Company; and on Saturday, the 14th inst., the green was formally opened by the Engineer

and Manager of the Company (Mr. J. W. Buckley, Assoc.M.Inst.C.E.), who is the President of the club. There was a large gathering of members and their ladies. In declaring the green open, Mr. Buckley expressed his great pleasure at being present, and described the game of bowls as being an ideal recreation. On behalf of the members of the club, the Secretary of the Company (Mr. W. E. Roberts) presented Mr. Buckley with a cake-dish suitably inscribed, to mark their appreciation of his kindness in putting the green at their disposal, and the great interest he had taken in the formation of the club. Mr. Buckley, in thanking the members, announced that both he and Mrs. Buckley were willing to offer prizes. The successful inauguration of the club is due largely to the energy of Mr. W. H. Owen, the general foreman, who is the Captain of the Club. It is intended to provide tennis courts, &c., in addition to the bowling green.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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See Advertisement on p. 469.

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See Advertisement, May 10, p. II, of Centre.

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HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic

Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West

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TYNE.

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BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.

SULPHURIC ACID.

SPECIALLY prepared for the Manu-

facture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD.

86, MARK LANE, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND

CONTRACTORS,

18 & 20, FARRINGTON ROAD, LONDON, E.C.

Telegrams:

"DACOLIGHT LONDON."

Telephone:

2886 HOLBORN.

BRISTOL RECORDING GAUGES

AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 28, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORKS.
Telegrams: "CHEMICALS."

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER

WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Re-

pairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,

BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 0648.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding

Oxide Lightly.

See Illustrated Advertisement, April 5, p. 8.

J. E. C. LORD, Ship Canal Tar Works,

Waste, Manchester. Pitch, Creosote, Benzol,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

SATURATORS made or Repaired.

Reasonable Terms (workmanship guaranteed) by a
30 Years' Saturator Maker (Labour and Plant only),
at per Hour or Contract. Saturators improved. Per-

fect Mixing and Noiseless.

DAVIES, General Chemical Plumber and Leadburner,
118, Gallaway Road, SHEPHERD'S BUSH, W.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

**KRAMERS AND AARTS WATER-
GAS PLANT.**

K. & A. WATER-GAS COMPANY, LTD.
89, VICTORIA STREET, S.W.

**JOHN RILEY & SONS, Chemical Manu-
facturers,** Hapton, near Accrington, are MAKERS
of Special SULPHURIC ACID, for Sulphate of Am-
monia Making. Highest percentage of Sulphate of
Ammonia obtained from the use of this Vitriol, which
has now been used for upwards of 50 Years. References
given to Gas Companies.

GAS TAR wanted.
BROTHERTON and Co., Ltd., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, and WAKEFIELD.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS v. PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS, Mechanical and Chemical," 6d.;
"SUBJECT-MATTER OF PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telephone: No. 243 Holborn.

AMMONIA.
Consumers in any form are invited to correspond
with CHANCE and HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

GAS-WORKS requiring Extensions
should Communicate with FIRTH BLAKELEY,
SONS, AND CO., LIMITED, Dewsbury, who make a
Speciality of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
faction Guaranteed.

CAST-IRON Pipes. Spigot and Socket
or Flanged. Special Quality—9 feet or 12 feet
Lengths. When buying, Write us.
A. LOWCOCK, Limited, SHREWSBURY.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 15, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

F. BOYALL, Contractor for Painting
GASHOLDERS, OIL-TANKS, ROOFS, and all
kinds of LOFT and other PAINT WORK.
70, Balcombe Street, Well Street, HACKNEY, N.E.

IT is Worth Your While to Buy Direct.
THE RELIANCE LUBRICATING OIL COMPANY
supply the best value in NON-CORROSIVE LUBRI-
CANTS—viz., Motor Wagon Oil, 1s.; Motor Car Oil,
2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil,
10d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;
650 T. Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas
Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;
Renown Engine Oil, 11d.; and Astral Disinfectant,
2s. 6d. per gallon. Barrels free, carriage paid. Solidified
Oil, 2s. 6d. cwt.
THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20,
Water Lane, Tower Street, LONDON, E.C.

APPOINTMENTS.—Ambitious Men of
Parts invited to write—
HERBERT GREATORX,
APPLICATION SPECIALIST,
BEECHWOOD, MATLOCK.
Specimen of many results:—
"Have got the job. Quite a good start.
To you the credit is due, and I think your
fee the best investment I ever made."
BUSINESS IS REVIVING. WRITE NOW.

GAS ENGINEERING AND GAS SUPPLY.
MR. CRANFIELD has Correspondence
COURSES starting now as well as in the
Autumn. Last Year's Courses met a felt want, and are
being widely recommended. Assistance ample, in-
dividual and Private. 11, Avondale Place, HALIFAX.

THE Numerous Applicants for the
Appointment of "ASSISTANT TO THE EN-
GINEER," which was advertised on April 26, 1910,
under No. 5228, are Hereby THANKED, and informed
that the Appointment HAS NOW BEEN MADE.

THE Institution OF Gas Engineers.

THE ANNUAL GENERAL MEETING

WILL BE HELD ON
TUESDAY, JUNE 14 (10.30 a.m.),
WEDNESDAY, JUNE 15 (10 a.m.),

AND
THURSDAY, JUNE 16 (10 a.m.),

AT THE
INSTITUTION OF MECHANICAL ENGINEERS,
STOREY'S GATE, ST. JAMES' PARK,
WESTMINSTER,

By kind permission of the Council of that body.

The Chair will be taken by the President,
JAMES W. HELPS, Esq., M.Inst.C.E.

In connection with the Meeting, a Visit of Inspection
to the Croydon Gas-Works will take place on Friday,
June 17.

WALTER T. DUNN,
Secretary.

THE BENEVOLENT FUND.

The Annual General Meeting of the Contributors
to the Benevolent Fund will be held at the Institution
of Mechanical Engineers on Wednesday, the 15th of
June, at Ten a.m.
39, Victoria Street, Westminster, S.W.,
May 23, 1910.

**BOGNOR (SUSSEX) GASLIGHT AND COKE
COMPANY.**

ALL-ROUND FITTER.

THE Directors of the above Company
beg to THANK Applicants for the above Post
and to inform them that THE POSITION HAS NOW
BEEN FILLED.

GAS Manager (Working) wanted for
Eyemouth Gas-Works. Salary, £75, with Free
House, Coals, &c. Applicants to State Experience and
Earliest date upon which they can begin duty.
Testimonials, &c., to JOHN WOOD, Solicitor, EYE-
MOUTH, Secretary.

WANTED, a reliable Head-Stoker,
used to Boiler, Exhauster, and Engine. Must
understand Regenerator Furnaces. Married Man pre-
ferred. Twelve Hour Shifts Seven days per Week.
Wages 33s. 3d. per week, with One Week's Holiday.
Apply, stating Age and Height, with References, to
G. ROBINSON, Gas-Works, BRECON.

**LEADBURNER (Journeyman), Sul-
phate of Ammonia, Leadwork Repairs, &c.,**
Cheap, with Plant. Workmanship Guaranteed. Six-
teen Years' References. Worked at Beckton, Sheffield,
Dublin, &c.
Address No. 5241, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

METER INSPECTOR.
REQUIRED, an Inspector thoroughly
acquainted with the Testing of Meters, Taking
Illuminating Power Tests, and the Ordinary Work of
Meter Taking. Wages, 35s. per Week.
Copies only of Three recent Testimonials to be for-
warded to No. 5244, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

DRAUGHTSMAN wanted (for Canada)
Experienced in the Design of Modern Gas-
Works Plant. Age not to exceed 28 Years. Gas-Works
Experience a Recommendation.
Apply, in first instance, by letter, giving full Par-
ticulars, &c., to No. 5242, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

CITY AND COUNTY BOROUGH OF BELFAST.

GAS ENGINEER AND MANAGER.

THE Corporation of Belfast invite
APPLICATIONS, from Highly Qualified and
Experienced Persons, for the Appointment of GAS
ENGINEER AND MANAGER.

Candidates should be Competent to Design and
Superintend the Erection of Gas-Works of the most
Modern Type.
Applications must be made on Official Forms, and
should reach my Office not later than Twelve o'clock
Noon on June 8.

R. MEYER,
Town Clerk.

City Hall, Belfast,
May 21, 1910.

FOR SALE—Two Large Gas-Ovens
(Fletcher, Russell, and Co.'s make). Good as
new. List price £10 each. Will sell for £3 10s. each.
W. BRIGGS, Engineer, LAMBETH HILL, E.C.

FOR SALE—about Five Tons of 12-inch
and Five Tons of 10-inch new Socket and Spigot
Cast-Iron PIPES—£4 per Ton; also 12-inch and 10-inch
BENDS, TEES, COLLARS, and CAPS—£8 per Ton.
State Requirements to the MANAGER, Gas-Works,
Chesterton, STAFFORDSHIRE.

STORAGE Tank to be Sold Complete,
28 feet in diameter by 11 feet deep. £100 accepted
for Prompt Sale. Tank on Rails, Yorkshire, or delivered
and fixed if required, with Gasholder.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

**GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete**
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can be
seen temporarily erected. Re-erected Cheap for
immediate Sale.
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

THE Merthyr Tydfil Gas Company have
the whole of the COAL-GAS MANUFACTURING
PLANT AND APPARATUS, at their Pictou Street
Works, FOR DISPOSAL, comprising RETORT
MOUTHPIECES, ASCENSION and BRIDGE PIPES,
HYDRAULIC, FOUL, and TAR MAINS, BOILERS,
ENGINES and EXHAUSTERS, ANNULAR CON-
DENSERS, PLOUZE and AUDOUIN TAR-EX-
TRACTOR, TOWER SCRUBBERS, PURIFIERS,
GASHOLDERS, VALVES, &c., the whole of which are
in Good Condition.

Permission to Inspect and further Information may
be obtained by Applying to the undersigned.
J. E. KENSHOLE,
General Manager.

Gas Offices, Merthyr Tydfil,
May 12, 1910.

SUTTON, REIGATE, AND NEWHAVEN GAS COMPANIES.

**THE Directors of the above are pre-
pared to consider TENDERS for the Supply of**
31,000 Tons (or thereabouts) of GAS COAL suitable for
the Manufacture of Gas without Enrichment or added
Water Gas, over a period of Twelve Months as from
the 30th of June next.

The approximate Quantities are as follows:

Sutton, 22,000 Tons to be delivered at Sutton
Station on the London, Brighton, and South
Coast Railway.

Reigate, 6,500 Tons to be delivered at Reigate
Station on the South Eastern and Chatham
Railway.

Newhaven, 2,500 Tons to be delivered at Newhaven
Town Station on the London, Brighton, and
South Coast Railway.

Tenders to be sent in by the 3rd of June next,
marked "Tenders for Coal," and addressed to the
SECRETARY, Gas Office, SUTTON.

The Directors do not bind themselves to accept the
lowest or any Tender.

**THE Directors of the Sutton, Reigate,
and Newhaven Gas Companies, invite TENDERS**
for the Surplus TAR produced at their Works during
a period of Twelve Months commencing the 1st of July
next and ending June 30, 1911, amounting to 300,000
Gallons or thereabouts. Alternative Prices to be quoted
at per Gallon on the Company's Works in Contractors'
Tank-Waggons or Barrels.

Tenders to be sent in on or before Friday, the 3rd of
June next, and addressed to the SECRETARY, Sutton
Gas Company, SUTTON, SURREY.

LEEK URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Lighting Committee are prepared
to receive TENDERS for the Supply of 10,000
Tons of Screened GAS COAL, or Washed or Unwashed
NUTS, to be delivered at Leek Station in Quantities as
directed, for the period of Twelve Months ending June
30, 1911.

Forms of Tender may be obtained from the under-
signed.

Sealed Tenders, endorsed "Tender for Gas Coal,"
and addressed to the Chairman of the Lighting Com-
mittee, to be delivered at the Town Hall, Leek, not
later than Friday, June 3, 1910.

The lowest or any Tender will not necessarily be
accepted, and the Committee reserve the right to
purchase the whole or any portion of the quantity
offered.

By order,
HAROLD HENSHAW,
Clerk to the Council.

Town Hall, Leek,
May 21, 1910.

WREXHAM GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Wrexham Gas
Company are prepared to receive TENDERS for
the Supply of 10,000 Tons of Best Approved GAS
COALS, to be delivered during the year ending June 30,
1911, in such Quantities and at such times as may be
required, and to weigh 20 cwt. to the Ton over the Gas
Company's Weighbridge.

Tenders to be accompanied by Practical Working
Analysis, stating the Price of Coal delivered: (1) At
Wrexham Station (Great Western Railway); (2) At
the Gas-Works, Wrexham, Free of all Charges.

The Directors do not bind themselves to accept the
lowest or any Tender.

Forms of Tender and further Particulars may be ob-
tained from Mr. J. Braithwaite, Engineer and Manager.
Sealed Tenders, endorsed "Tenders for Coal," Spec-
ifying the Description and Quality of Coal, to be sent on
or before the 1st of June next, addressed to the Chair-
man, Gas Offices, Wrexham.

WM. HEYWARD,
Secretary.

Gas Offices, Wrexham,
May 14, 1910.

DROGHEDA CORPORATION GAS-WORKS.

TENDERS are invited for the Supply of COAL for the Year ending June 30, 1911. Specification and Form of Tender can be obtained on Application to the undersigned.

Scaled Tenders, addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Drogheda, not later than Ten a.m., June 3, 1910.

H. W. SAVILLE,
Manager and Secretary.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation invite TENDERS for the Supply of GAS COAL to be supplied in such Quantities as may from time to time be determined by the Gas-Works Committee during the Year ending the 30th of June, 1911.

Forms of Tender and further Particulars may be obtained on Application to Mr. J. Wilkinson, Engineer, Gas-Works, Halifax.

Tenders, endorsed "Coal," must be sent to the undersigned on or before Tuesday, the 31st of May, 1910.

HERBERT ASHLING,
Town Clerk.

PENRITH URBAN DISTRICT COUNCIL.**COAL.**

THE Gas Department of the above Council are prepared to receive TENDERS for the Supply of COAL and CANNEL during Twelve Months ending June 30, 1911.

Tenders to be delivered to Mr. Geo. Wainwright, Clerk, Town Hall, Penrith, not later than Tuesday, May 31, 1910.

Form of Tender and other Information may be obtained from the undersigned.

E. SHAUL,
Manager.

Gas-Works, Penrith,
May 20, 1910.

LEEK URBAN DISTRICT COUNCIL.**(GAS DEPARTMENT.)**

THE Lighting Committee invite TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at the Gas-Works during the Twelve Months ending June 30, 1911.

Scaled Tenders, addressed to the Chairman of the Lighting Committee, to be delivered at the Town Hall, Leek, not later than Friday, June 3, 1910, endorsed "Tender for Tar or Liquor," as the case may be.

Full Particulars with Form of Tender to be obtained from the undersigned.

By order,
HAROLD HENSHAW,
Clerk to the Council.

Town Hall, Leek,
May 21, 1910.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THIS Board invites Tenders for the Surplus TAR and AMMONIACAL LIQUOR which may be produced at the Accrington and Great Harwood Gas-Works of the Board, during the Year from the 1st of July next to the 30th of June, 1911.

The Estimated Quantity of Tar is 2000 Tons, and of Liquor 6000 Tons.

Scaled Tenders, endorsed "Tar and Liquor," addressed to the Chairman of the Board, must be in my hands on or before Monday, the 6th of June.

Forms of Tender may be obtained on Application.

By order,
CHARLES HARRISON,
General Manager.

General Offices, Accrington,
May 19, 1910.

COUNTY BOROUGH OF BOLTON.**(GAS DEPARTMENT.)****TENDERS FOR COAL.**

THE Gas and Lighting Committee invite TENDERS from Colliery Proprietors only, for the Supply of Screened and Unscreened GAS COAL, COBBLES, and NUTS, required during the Year ending June 30, 1911.

Specifications and Forms of Tender may be obtained on Application to the Superintendent, Gas-Offices, Bolton.

Scaled Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the above Committee, to be delivered at the Gas Offices, Bolton, not later than Nine a.m., on Friday, June 3, 1910.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton,
May 18, 1910.

BOROUGH OF DONCASTER.**TENDERS FOR COAL.**

THE Gas Committee of the Borough of Doncaster are prepared to receive TENDERS for the Supply of 24,000 Tons of Best Screened GAS COAL NUTS during the Year ending June 30, 1911.

TENDERS FOR TAR.

They also invite TENDERS for the Purchase of their Surplus TAR during the Year ending the 30th of June, 1911.

Particulars and Tender Forms may be obtained on Application to the undersigned.

Tenders, endorsed "Coal" and "Tar" respectively, should be sent, under seal, to the Chairman, and received at the Corporation Gas-Works, Doncaster, not later than Ten a.m. on Friday, the 10th of June next.

By order of the Gas Committee, who do not bind themselves to accept any Tender.

ROBT. WATSON,
Engineer and Manager.

Corporation Gas-Works,
Doncaster, May 19, 1910.

PETERBOROUGH GAS COMPANY.**TENDERS FOR BEST SILKSTONE GAS COAL.**

THE Directors of the above Company invite TENDERS for One Year's Supply of Best Screened Silkstone NUTS. Delivery to commence July 1, 1910.

The Tenders must state

Price per Ton in Waggon at Pit,
Railway Rate to Peterborough,
Waggon Hire to Peterborough.

Tenders must be sent in by June 11 next, endorsed "Coal," and addressed to the Chairman of the Company, Gas-Works, Peterborough.

The Directors do not bind themselves to accept the lowest or any Tender.

Please note: Special Tender Forms are not provided.
JOHN BARTON,
Secretary and Manager.

Peterborough, May 10, 1910.

MATLOCK BATH AND SCARTHIN NICK URBAN DISTRICT COUNCIL.**(GAS DEPARTMENT.)****TENDERS FOR COAL.**

THE Council are prepared to receive TENDERS for the Supply of 1800 Tons of Best Screened GAS COAL or NUTS, to be delivered at Matlock Bath Station during the Year ending the 30th of June, 1911, in Quantities as required.

The Council reserve the right to divide the Quantity into one or more Contracts.

Tenders to be accompanied by Working Analysis.

No Special Form of Tender; and the Person whose Tenders are accepted will be required to enter into the usual Contracts for the due performance thereof.

Further Information may be obtained from Mr. W. Frost, Manager, Gas-Works, Matlock Bath.

Tenders, sealed and endorsed "Tenders for Coal," should be sent to the undersigned not later than Tuesday, June 7.

E. RANDLE,
Secretary.

Council Chambers, Matlock Bath,
May 19, 1910.

MATLOCK BATH AND SCARTHIN NICK URBAN DISTRICT COUNCIL.**(GAS DEPARTMENT.)****TENDERS FOR TAR AND AMMONIACAL LIQUOR.**

THE Council are prepared to receive TENDERS for the Surplus TAR and AMMONIACAL LIQUOR produced at their Works, together or separately, for the Twelve Months ending June 30, 1911.

Tar (approximate quantity) 100 Tons; Liquor (approximate quantity), 350 Tons, not less than 5° Twaddell, price scaled on 3° above, and delivered into Buyer's Tanks at Matlock Bath Station.

The Persons whose Tenders are accepted will be required to enter into the usual Contracts for the due performance thereof.

Tenders, sealed and endorsed "Tenders for Residuals," should be sent to the undersigned not later than Tuesday, June 7.

E. RANDLE,
Secretary.

Council Chambers, Matlock Bath,
May 19, 1910.

UXBRIDGE GAS COMPANY.**TENDERS FOR COAL.**

THE Directors of the Uxbridge Gas Company invite TENDERS for the Supply of about 9000 Tons of Clean and Fresh Wrought GAS COAL, deliveries of which are to commence in July, 1910, and finish in June, 1911.

Tenders to be made out for the above Quantity of the best description of Screened or Unscreened Gas Coal, either in whole or part, from, or divided between, the Durham or South Yorkshire Pits, delivered by Barge, free alongside the Company's Works on the Grand Junction Canal, or by rail to Uxbridge Station (Great Western Railway).

Tenders are to state the names of the Pits from which the above Description of Coal will be supplied.

Deliveries to be according to the instructions of, and to the entire satisfaction of, the Company's Engineer.

Tenders to be received on or before June 6, addressed to the Chairman, Gas Offices, Uxbridge, Middlesex, and endorsed "Tender for Coal."

No Form of Tender supplied.

GEORGE J. BRISTOW,
Secretary.

Uxbridge, Middlesex,
May, 1910.

URBAN DISTRICT COUNCIL OF HORNCASTLE.**(GAS DEPARTMENT.)****TENDERS FOR GAS COAL.**

THE Council are prepared to receive TENDERS for the Supply of 1800 Tons (more or less) of Best Screened Silkstone GAS COALS, to be delivered at Horncastle Railway Station during the Year ending June 30, 1911, in such Quantities and at such Times as the Council may from time to time direct.

The Coal must be delivered in a Dry Condition, free from Hards, Smudge, Dirt, Pyrites, or other Impurities.

Scaled Tenders, marked "Gas Coal," must be sent to me, the undersigned, so as to reach me not later than Two o'clock in the Afternoon of Saturday, the 4th day of June prox.

The Council do not bind themselves to accept the lowest or any Tender.

The Firm whose Tender is accepted will be required to enter into the usual Contract for the due Delivery of the Coal, and to give security for the due performance of such Contract.

Forms of Tender are not supplied.

Further Particulars may be obtained on Application to the Manager, T. Davies, at the Gas-Works, Horncastle.

R. W. CLITHEROW,
Clerk to the Council.

The Court House,
Horncastle, May 19, 1910.

CHESTER UNITED GAS COMPANY.**TENDERS FOR GAS COAL.**

THE Directors of the above Company invite TENDERS for the Supply of about 23,000 Tons of GAS COAL for One, Two or Three Years from the 1st day of July next, in such Monthly Quantities as may be required by the Company.

Special Conditions and Forms of Tender can be obtained from, and sealed Tenders endorsed "Tender for Coal," must be addressed to the undersigned, not later than Monday, the 6th of June prox.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
FRED. A. PYE,
Secretary and General Manager.

Gas Offices, Cuppin Street,
Chester, May 19, 1910.

GAINSBOROUGH URBAN DISTRICT COUNCIL.**(GAS DEPARTMENT.)****TENDERS FOR TAR.**

THE Gas Committee of the above Council are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Gas-Works for a period of Twelve Months from July 1, 1910.

Probable Quantity, 450 Tons.
Further Particulars may be obtained on Application to the undersigned.

Scaled Tenders, endorsed "Tender for Tar," addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Gainsborough, not later than the 27th inst.

The Committee do not bind themselves to accept the highest or any Tender.

JOHN BALDWIN,
Manager.

Gas-Works, Gainsborough,
May 11, 1910.

GAINSBOROUGH URBAN DISTRICT COUNCIL.**(GAS DEPARTMENT.)****TENDERS FOR GAS COAL.**

THE Gas Committee of the above Council invite TENDERS for the Supply of 8000 Tons of Best GAS COAL (Screened, Unscreened, and Nuts), to be delivered at the Great Central Railway Station, Gainsborough, between the 1st of July, 1910, and the 30th of June, 1911, in such Quantities, Monthly, as may be required.

Scaled Tenders, endorsed "Tender for Gas Coal," giving full Particulars of the Coal offered, to be addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Gainsborough, not later than the 27th inst.

No Special Form of Tender issued.
The Committee do not bind themselves to accept the lowest or any Tender.

JOHN BALDWIN,
Manager.

Gas-Works, Gainsborough,
May 11, 1910.

SWADLINCOTE DISTRICT URBAN DISTRICT COUNCIL.**(GAS DEPARTMENT.)**

THE Gas Committee of the above Council are prepared to receive TENDERS for:—
LIME.

The Supply of about 150 Tons Best Hand-Picked Buxton Lime to be delivered at the Gas-Works in such Quantities and at such times as may be required during the Twelve Months ending June 30, 1911.

GAS COAL.

The Supply of 4000 Tons (more or less) of Best Screened Gas Coal, to be delivered in such Quantities as may be required during the Twelve Months ending June 30, 1911.

All Particulars and Form of Tender may be obtained from Mr. G. B. Smedley, Engineer and Manager.

Tenders must be on the Council's Form and Envelope, and accompanied by Analysis, and delivered to the undersigned on or before Twelve Noon, June 1, 1910, endorsed "Lime," or "Gas Coal," as the case may be.

The Council do not bind themselves to accept any Tender.

W. A. MUSSON,
Clerk to the Council.

Gas-Works, Swadlincote,
May 12, 1910.

GLOUCESTER GASLIGHT COMPANY.**TENDERS FOR GAS COAL.**

THE Directors of the above Company invite TENDERS for the Supply of about 34,000 Tons of GAS COAL for One Year from the 1st day of July next, in such Monthly Quantities as may be required by the Company.

Tenders to state the Price delivered at the Midland Railway Sidings, Hempsted, near Gloucester, or the Great Western Railway Wharf, Llanthony, Gloucester; or, if sent (as preferred) by Water, the price f.o.b., and also the price delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Scaled Tenders, endorsed "Tender for Coal," specifying the Description and Quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than Monday, the 30th day of May inst.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
May 2, 1910.

**URBAN DISTRICT COUNCIL OF
STOURBRIDGE.**
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for
the Purchase of their Surplus TAR during the
Twelve Months ending June 30, 1911.

Tenders (on our own Tender Form), endorsed
"TAR," and addressed to the Chairman of the Gas
Committee, to be sent to me on or before Friday,
June 10, 1910.

By order of the Committee,
CHARLES H. WEBB, M.Sc., Assoc.M.Inst.C.E.,
Engineer and Manager.
Gas-Works, Stourbridge,
May 13, 1910.

SKIPTON URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Council invite Tenders for the
Supply of about 8000 Tons of Best GAS NUTS, to
be delivered free into the Council's Boats at the Pit
Wharf, or at the Railway Station, Skipton, or at the
Council's Wharf adjoining the Gas-Works in Skipton,
on the Leeds and Liverpool Canal, between June 30,
1910, and July 1, 1911, in Monthly Quantities.

Full Particulars as to Periods and Quantities of
Deliveries, &c., and Form of Tender, may be obtained
from the Manager, Mr. J. H. Woodward, Gas-Works,
Skipton, and Tenders, endorsed "Gas Coal," are to be
sent to him on or before May 28, 1910.

The lowest or any Tender not necessarily accepted.
RICHARD WILSON,
Clerk to the Council.

**URBAN DISTRICT COUNCIL OF
BARNOLDSDWICK.**

THE above Council invite Tenders for
the Supply of 5500 Tons of Best Screened GAS
COAL or NUTS, delivered free on rail Barnoldswick
(Midland Railway), between June 1, 1910, and May 31,
1911, in such Quantities Monthly as stated on Form of
Tender.

The Council do not bind themselves to accept the
lowest or any Tender.

Form of Tender supplied on Application to the under-
signed.

Tenders must be on the prescribed Forms, and ad-
dressed to the Chairman, Gas Committee, Town Hall,
Barnoldswick, via Colne, and delivered not later than
Monday, May 30, 1910.

J. W. THOMPSON,
Engineer and Manager.
Town Hall, Barnoldswick.

**SALES BY AUCTION OF GAS AND WATER
STOCKS AND SHARES.**

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION OF NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to MESSRS.
A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
**ASCOT DISTRICT GAS AND ELECTRICITY
COMPANY.**

NEW ISSUE OF 950 £10 NEW ORDINARY
SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, June 14, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
BRENTWOOD GAS COMPANY.

NEW ISSUE OF £9000 ADDITIONAL STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, June 14, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
**GUILDFORD GASLIGHT AND COKE
COMPANY.**

NEW ISSUE OF £5000 ORDINARY STOCK,
AND
£2500 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, June 14, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
**EAST GRINSTEAD GAS AND WATER
COMPANY.**

NEW ISSUE OF 400 £10 "C" SHARES,
AND
£1000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, June 14, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

CIRENCESTER GAS COMPANY, LIMITED.

THE Directors are prepared to receive

TENDERS for the Supply of 4000 to 5000 Tons of
GAS COAL to be delivered free to their Siding at the
Watermoor Station of the Midland and South Western
Junction Railway Company during the Twelve Months
commencing July 1, 1910, at such times and in such
Quantities as may be required by their Manager.

Tenders to be sent in by June 2 next, Forms for
which can be obtained from

J. P. BEECHAM,
Secretary.
12, Silver Street, Cirencester,
May 9, 1910.

THE Owner of Patents No. 90, of 1906,

and No. 14,189, of 1906, relating to "Improvements
in Tubes made of Spirally Wound and subsequently
Soldered Metallic Strips and Process of Manufacturing
the same," and "Improvements in Machines for the
Manufacture of Tubes from Metal Strips," desires to
Negotiate with Manufacturers with the view of Granting
LICENCES under them upon Reasonable Terms. For
Information, Apply to LLOYD WISE AND Co., Chartered
Patent Agents, 46, LINCOLN'S INN FIELDS, W.C.

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COLUMNS of every description, Hydraulic,
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Results obtained which have never been Sur-
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Plants at Work and under Construction for
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Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality
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in diameter, and make and erect to order
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These are cast in one piece, without Chap-
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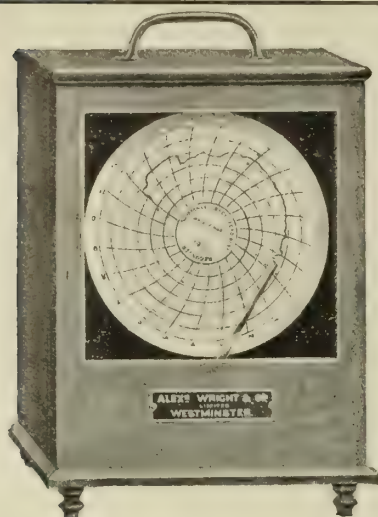


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For FOUL GAS.

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**SIMMANCE-ABADY
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No Liquid.
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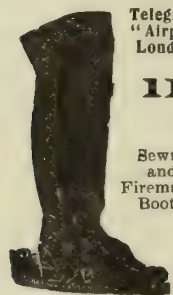
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CAST-IRON PIPES FOR GAS, WATER, & STEAM,
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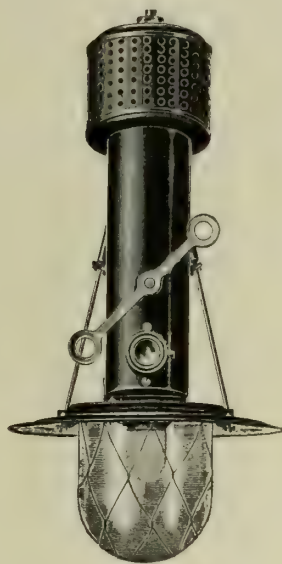
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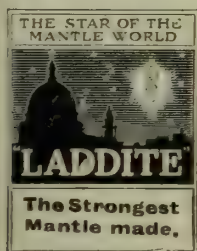
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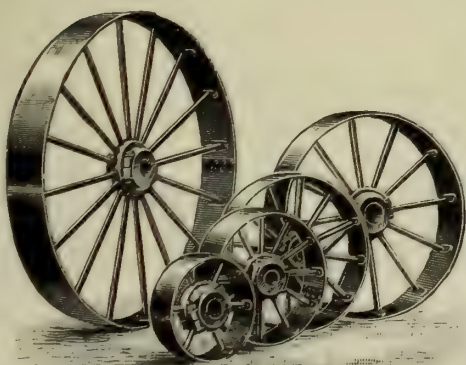
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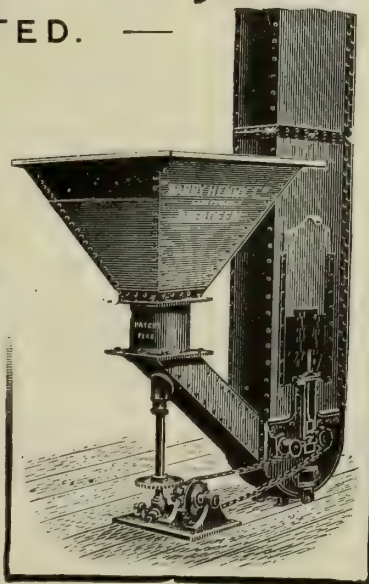
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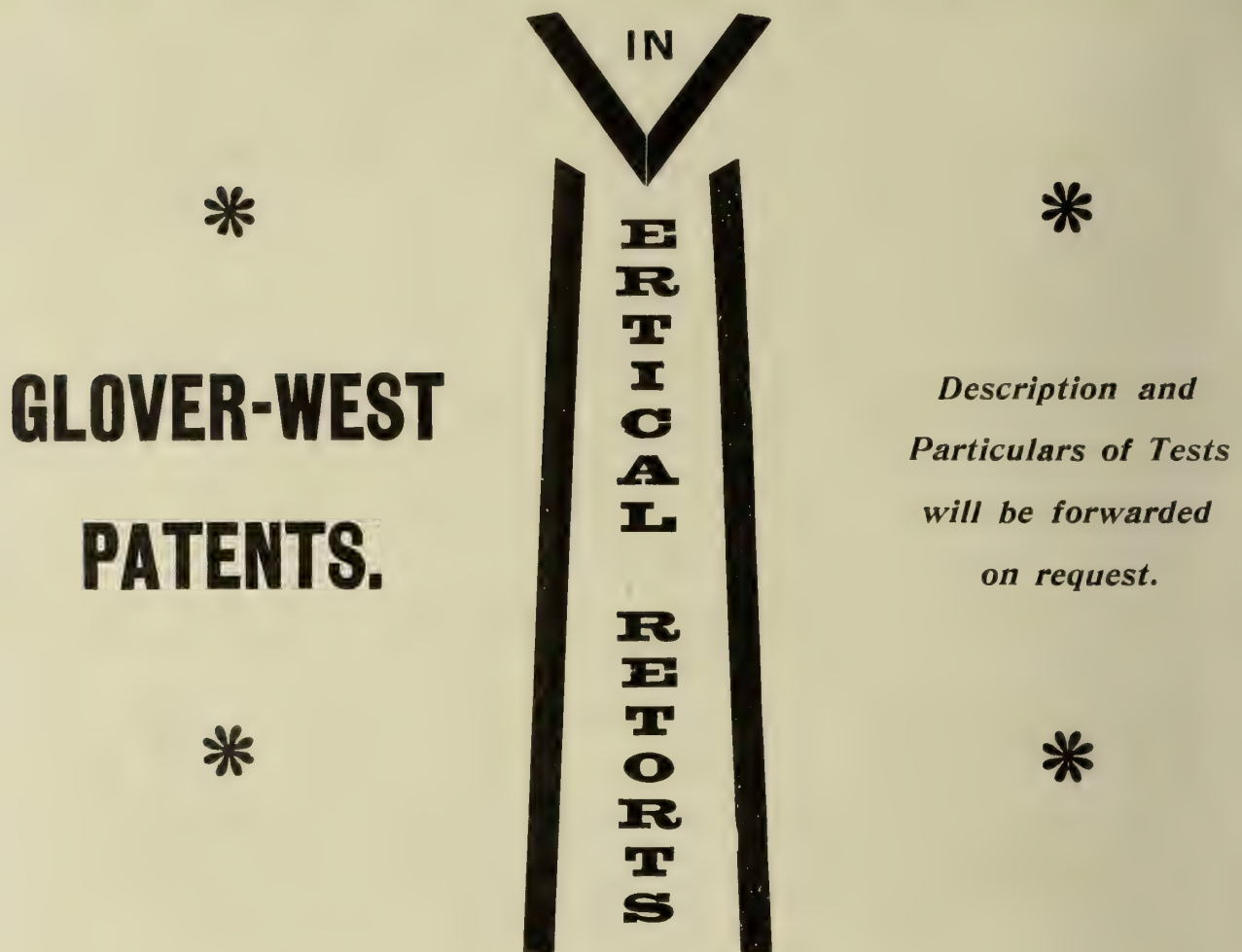
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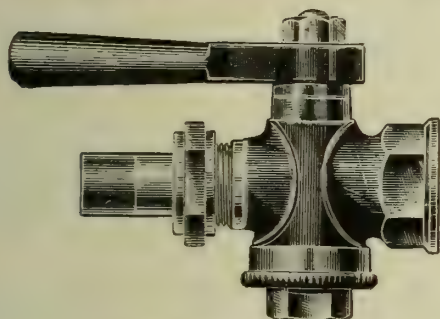
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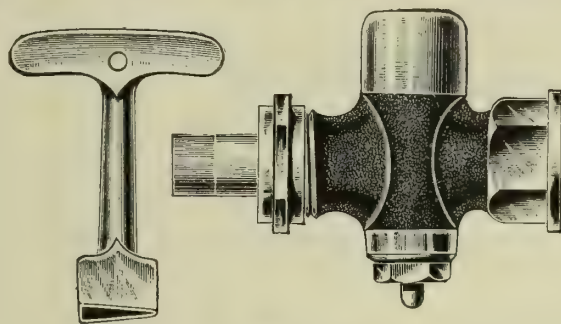
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With Protecting Cap and Loose Key.

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Specially trained Staff kept for the manufacture of Taper Inclined Retorts.

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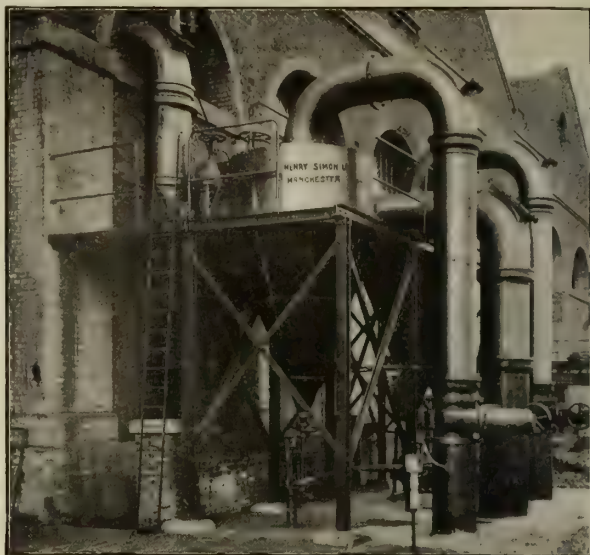
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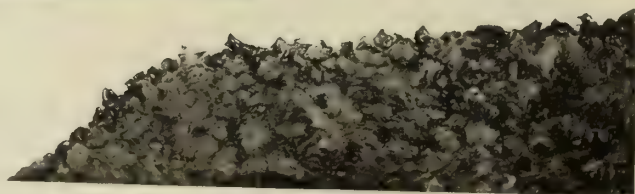
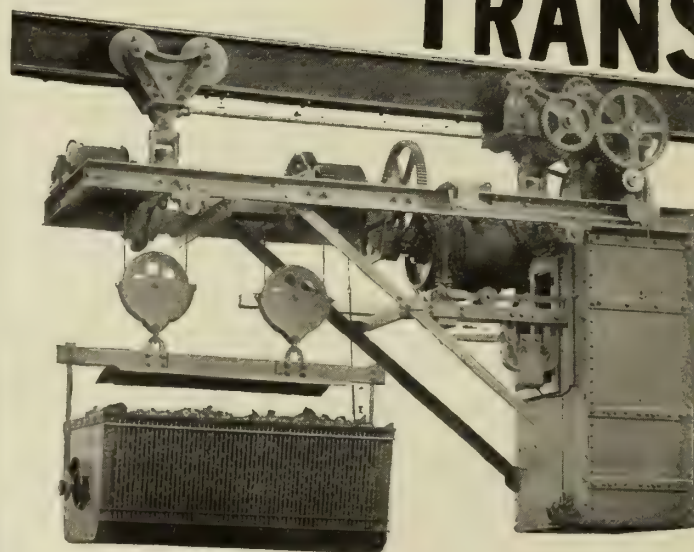
[See Illustrated Advertisement, May 10, p. 352.]



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No Steam.
No Moving Parts.
No Power.

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TRANSPORTERS
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Large Installations

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At work and
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Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

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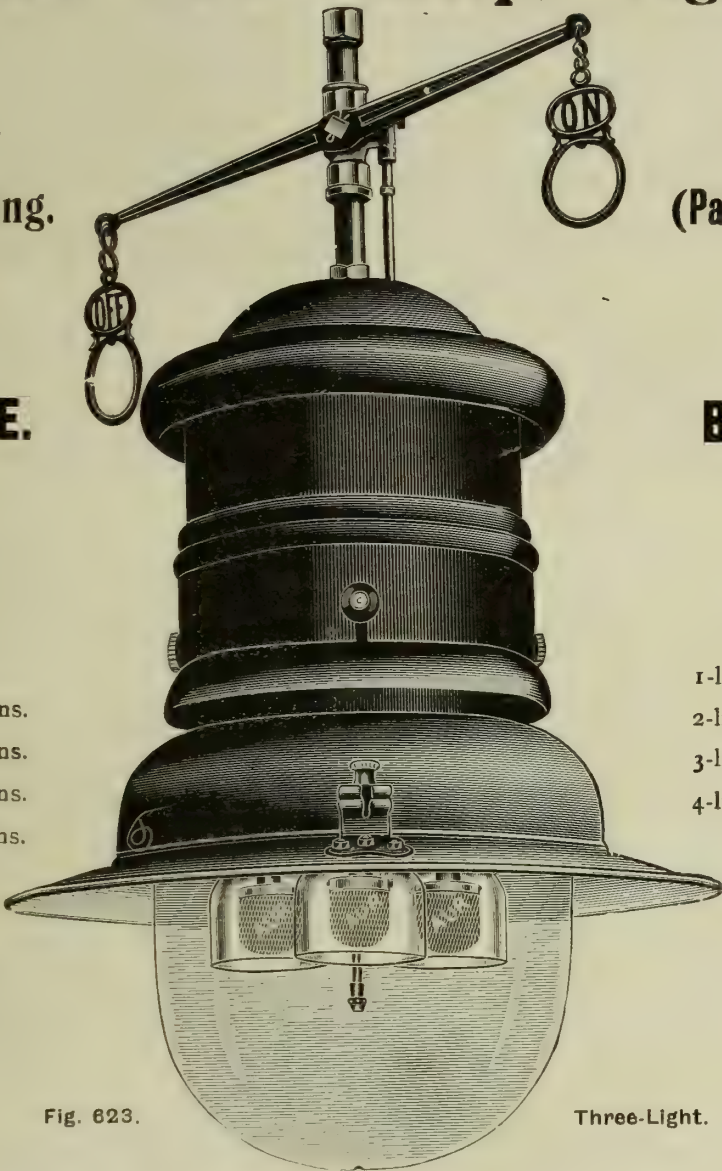


Fig. 623.

Three-Light.

Height over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 8 ins. |
| 2-light | . . . | 2 ft. 4 ins. |
| 3-light | . . . | 2 ft. 4 ins. |
| 4-light | . . . | 2 ft. 7 ins. |

Width over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in. |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

| | Gas per hour. | C.P. | Steel. | Copper Case. | | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
| 2-light | 8 feet | 260 | 47/6 | 6/- extra. | 4-light | 16 feet | 550 | 72/6 | 9/- extra. |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

| | 1-Light. | 2-Light. | 3-Light. | 4-Light. | | 1-Light. | 2-Light. | 3-Light. | 4-Light. |
|---------------------------------|----------|----------|----------|----------|----------------------------|----------|----------|-------------------|--------------|
| Clear Glass Globes, each | 2/3 | 5/9 | 5/9 | 9/- | Wired Globes, extra | each | 2/- | 2/- | 2/9 3/6 |
| " " " " In Case lots per dozen. | 19/6 | 57/9 | 57/9 | 93/- | Parabolic Reflector, extra | " | 3/6 | 6/- | 7/6 Not made |
| Case contains | 80 | 18 | 18 | 12 | Welsbach Mantles, each | | 6d. | subject as usual. | |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
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REGISTERED.

THE NEW RETORT

Will withstand high temperatures and is **Guaranteed not to Contract or Soften** under Heat.

**GREATER CONDUCTIVITY THAN ANY
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STEAM-CONTROLLER for Water-Gas-Plants
RAISES the Calorific Value up to 3000 Calories.
REDUCES the CO₂ Contents to 2 per cent.
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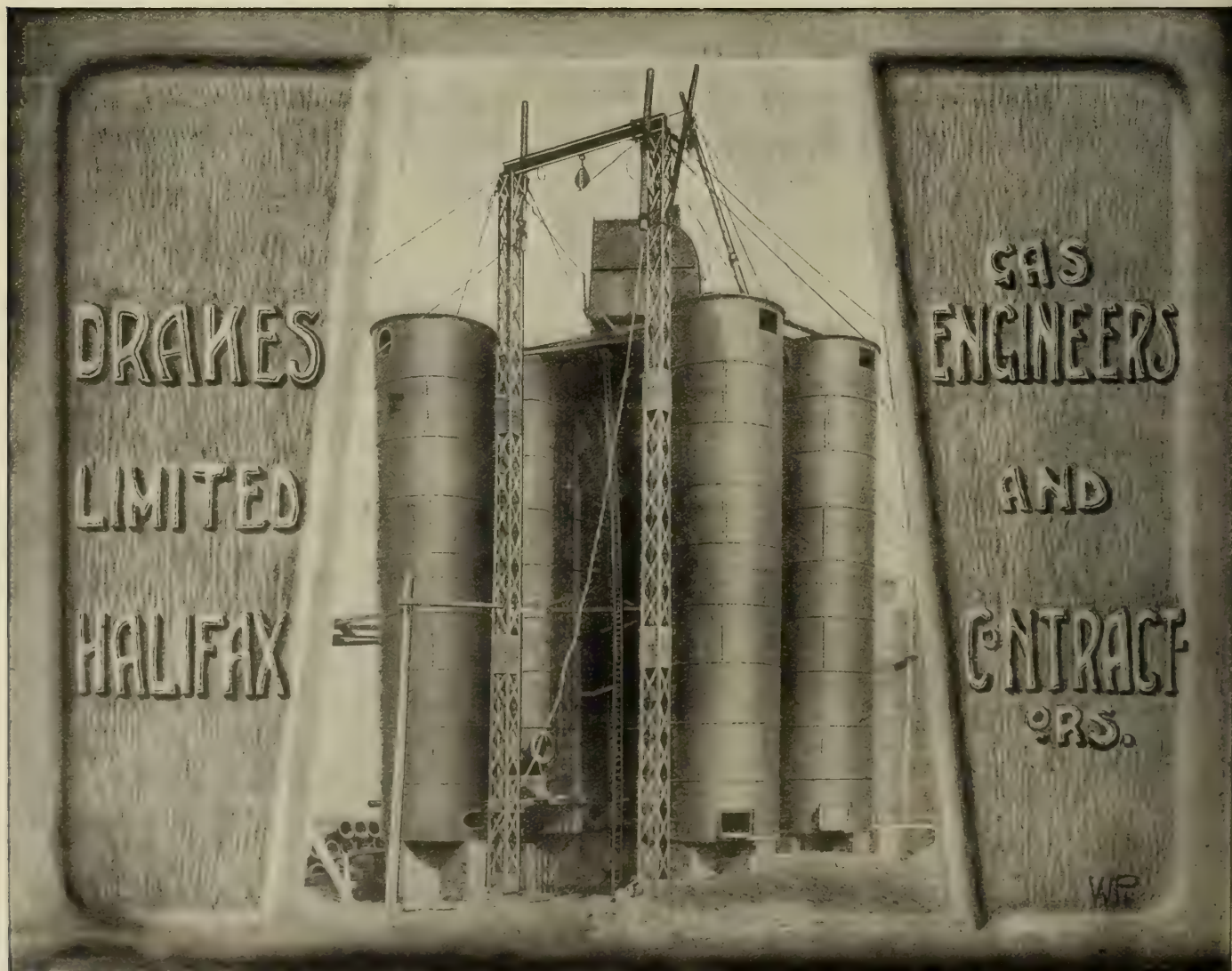
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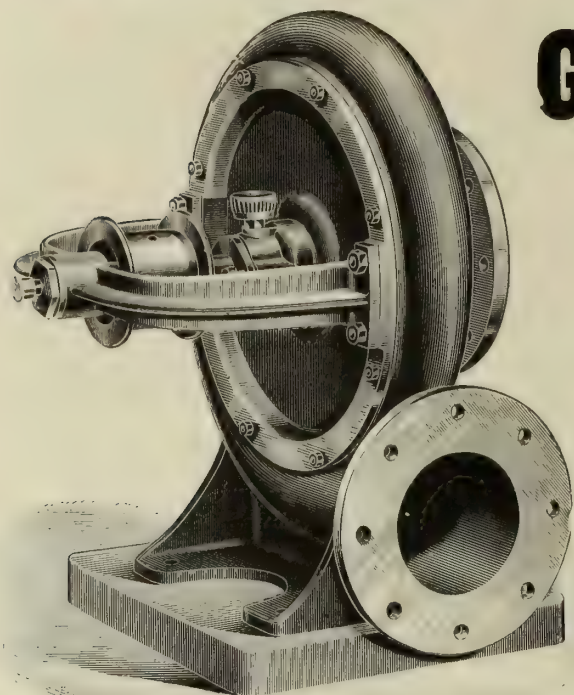
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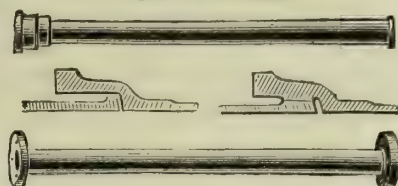
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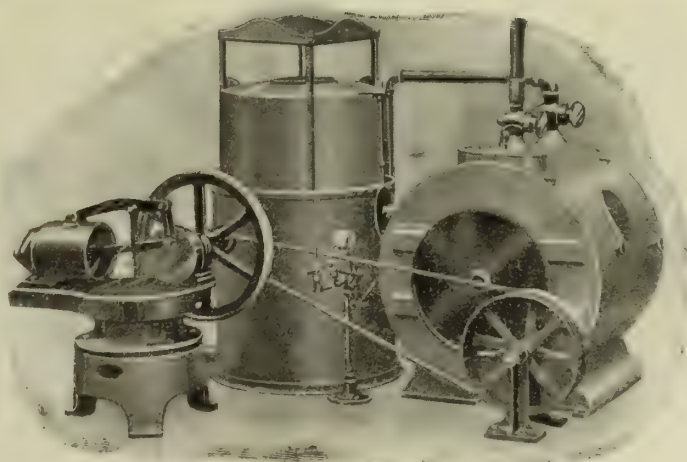
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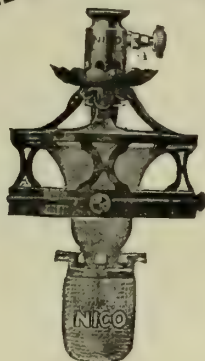
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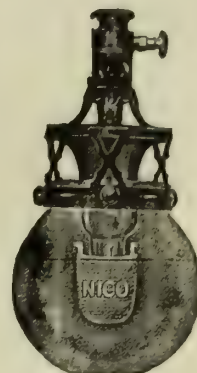
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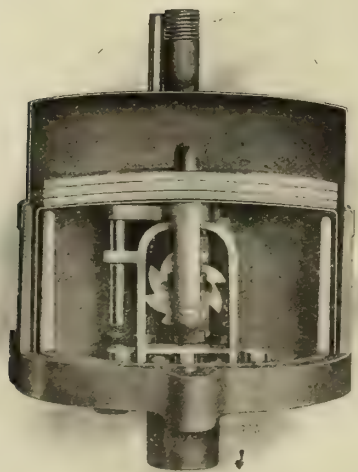
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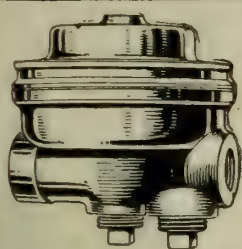
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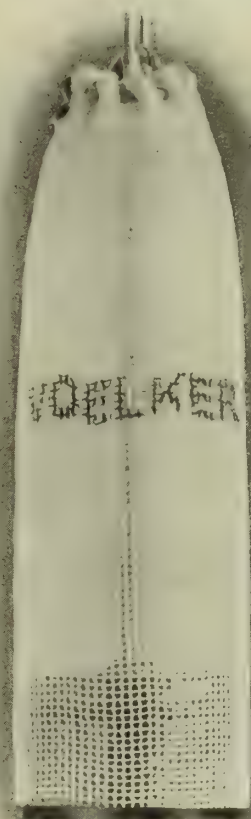
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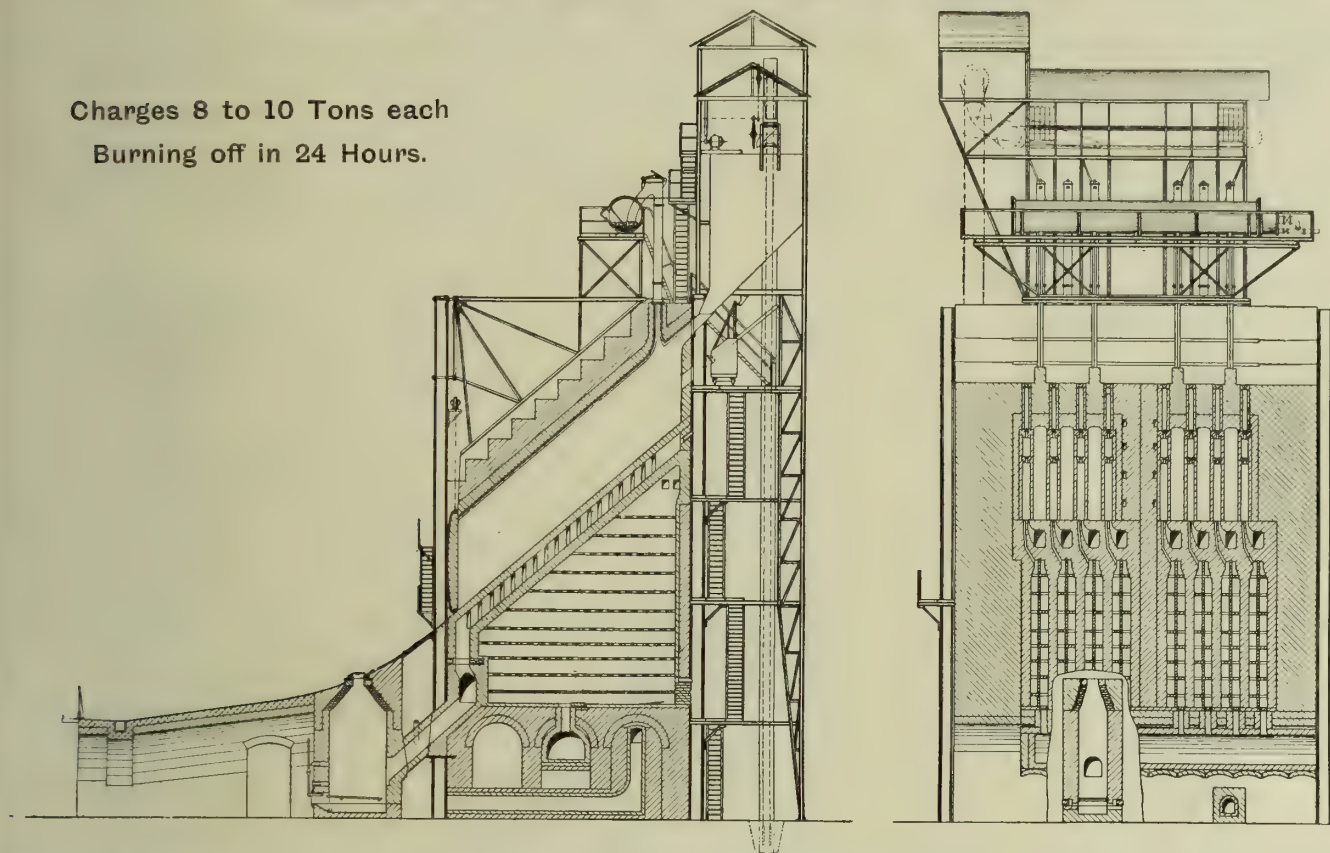
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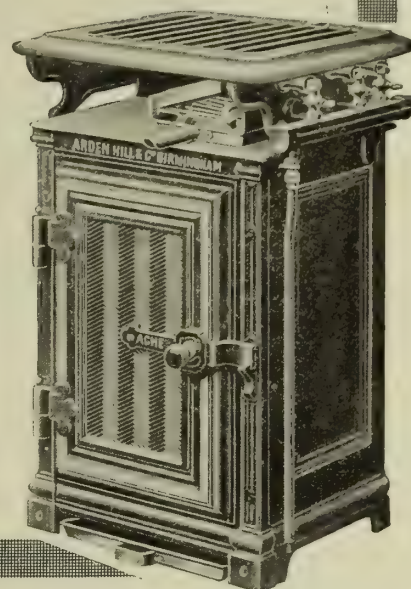
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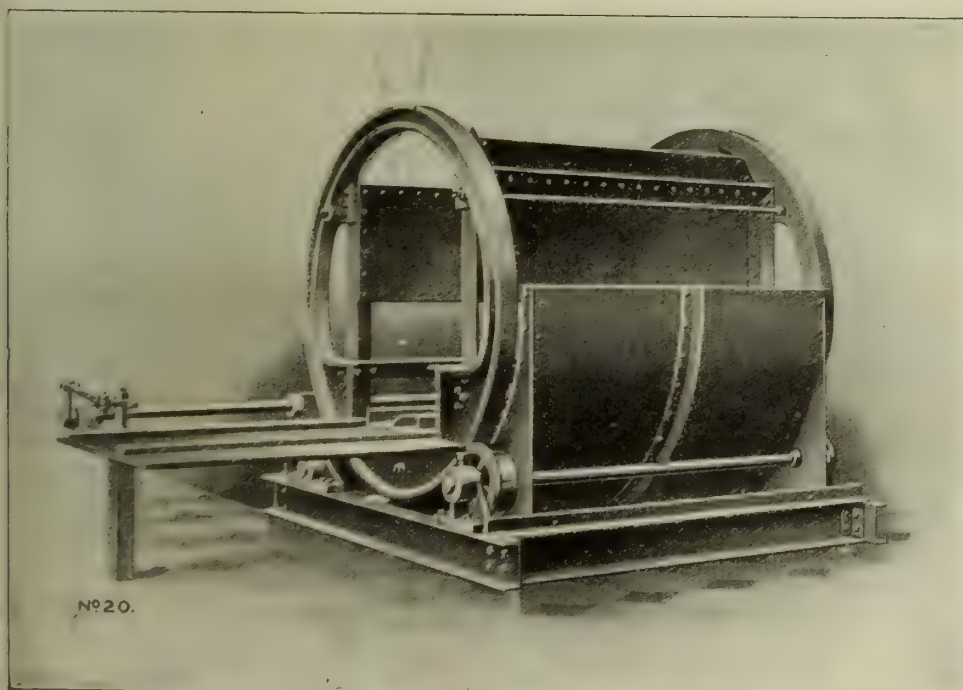
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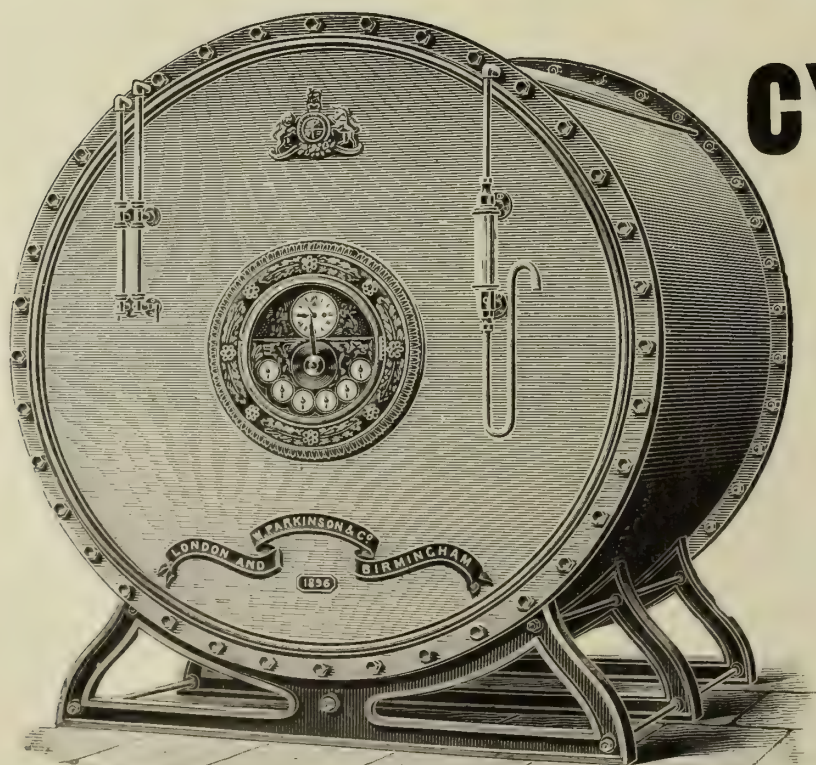
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EDITORIAL NOTES—GAS, &c.

Annual Meeting of the Institution.

MEMBERS of the Institution have received the programme for the annual meeting to be held in London from the 14th to the 17th prox. Though shorn of one of its customary social features owing to the national mourning, the programme promises so much that has, technically and commercially, pre-eminence in thought at the present time that there may be the utmost confidence that the number of members the President (Mr. James W. Helps) will welcome from all parts of Great Britain and Ireland will be a considerable one. Take the programme through, it reflects, even in its bald sketch of the arrangements, the mutation that has come upon the gas industry. Both in manufacture and in commercial work, the past of the gas industry is almost a closed book. Little in either branch has any sequence or likeness with what has gone before; and, practically speaking, a new era has set in for the industry. It will be advantageous if this particular meeting is entered upon with the feeling of change uppermost, and with the feeling dominating the proceedings throughout. There is indeed great need at the present time for, in common assembly, the concentration of the minds of the executive heads of the industry upon the present position, in order to produce new directive influences.

The President will, we believe, in his Inaugural Address give the proper note to the proceedings. He incidentally, at a meeting of a District Association some time since, lifted the veil upon what he purposed making the chief topic in his deliverance. With a full sense of his responsibility as the titular head of the gas profession for the time being, he will, if his intimation holds good, attack the question of the sufficiency of the Institution—in its representative capacity, in its activities, and in its resources—to meet the needs of the gas industry in these days of technical change and increasing competitive pressure. Should his resolve of some months ago exist to-day, we hope most earnestly the result will be to put fresh breath, new life, and new activity into the gas industry as a whole. "Union is Strength;" and there is no doubt that what is now wanted in the gas industry, for future protection and for the maintenance of prosperity, is a more active spirit of co-operation, in both technical and commercial work. The way that work is being done at the present time, more or less effectually, in technical directions, in trading defence and business propagation, is not (we say it deliberately) economical, nor does it reach the highest possible point of efficiency. That has to be recognized, and united action has to be taken. The necessity of better organization and more united work will be emphasized when, at a conference of the Commercial Sections of the District Associations (to which all members of the Institution are invited), in the afternoon of the first day's meeting, the question of the systematic advertising of gas and cognate matters will be discussed.

Look again at the titles of the papers that are to be presented for discussion; and there we find further evidence of the changes that have to be met in these times. In public lighting, gas was at one time supreme. Economically and in point of efficiency, it is so now. But new influences have come into play. The bulk of the electricity supply undertakings of the country are municipally owned; and there is a growing eagerness on the part of the Electric Lighting Committees of such municipalities to subordinate the interests of the ratepayers to those of the electricity concern. And with what result is well known. But where competition has had a free field, with no favour to either competitor, gas has won new laurels, to the discomfiture of its competitor. It was so in Westminster. The Chairman of the Works Committee of the Westminster City Council is Mr. Jacques Abady; and Mr. Abady is coming before

the Institution as an absolutely disinterested Municipal Councillor to deal with "Public Lighting from a Municipal Point of View." As a Municipal Councillor, Mr. Abady wants to buy illumination, no matter the source, for the streets—illumination subject to contract and measurement tests; and what he contracts for, he means to have. That is fair. It is a form of competitive business the gas industry is prepared to meet, but not the procedure to which it is subject through municipal ownership of electricity undertakings. We anticipate that the line of Mr. Abady's argument will be that of the purchase of illumination for street purposes; and his paper will give scope for a good examination of the whole public lighting question, and of the disadvantages under which the gas industry to-day operates through municipal possession of a competitive service.

Examining the titles of the other papers, there are the further emphases of change. Two communications are to be welcomed from America; but whether both authors will be present is for the moment an open question. A large field is before the gas industry in which to purvey gaseous fuel; and our friend, who has taken such prominence in gas commercial work in America, Mr. H. L. Doherty, is communicating a paper on the subject of "Gas as a Universal Fuel." Fuel and calorimetry have intimate association; and in the latter there is a prospective, if not imminent, change that will require close watching by the technicians and administrators of the industry. Mr. J. B. Klumpp will tell us something about "Gas Calorimetry in the United States." It is a subject that has been occupying a great deal of attention there of late, and upon which, it will be remembered, a Committee of the American Gas Institute have reported. Whether Mr. Klumpp will be in a position to add to the information in that report, we cannot say; but anyway it will be very useful to have before the meeting the views of our American friends. Reference to fuel and calorimetry, leads up to a feature of the work produced by a somewhat meagre display of united effort and finance. That is the report of the Gas-Heating Research Committee, which promises, according to an intimation in the report of the Council, to be a somewhat elaborate document. Small gas undertakings as well as those of greater magnitude have in these times their troubles and difficulties; and it will be interesting to learn what Mr. F. J. Ward, of Knowle, has to say on the general subject of their administration and working, and it will perhaps be still more interesting to hear what his contemporaries in the management of other small concerns will have to communicate in the discussion.

Turning to technical affairs appertaining to works and manufacture, the Carbonization Committee will present a report; but it will not be an extensive one. Unfortunately, but we are not surprised, they have failed (according to the report of the Council) in their endeavours to bring about a series of tests in parallel of the three prominent vertical retort systems; but some compensation will be found in a supplement that Mr. J. Ferguson Bell proposes to make to his paper of last year (for which, by the way, he is to receive the London Gold Medal) on the economical and productive value of heavy charges in horizontal retorts. There will also be a report by the Refractory Materials Committee; but not a complete one. That will come before the time arrives for making contracts for next season's requirements. But it must not be imagined that the Committee have been remiss in the duties entrusted to them. A unique investigation has been made of retort-setting temperatures; and a statement as to the result will probably serve as an interim report at the meeting. The report of the Council also speaks of interviews with the retort and firebrick manufacturers through the Society of British Gas Industries. Thus it may with confidence be expected that much value will emanate from the work of the Committee. The whole of the technical matters relating to works treat of carbonization in one form or another. Besides those we have

already mentioned, Dr. W. B. Davidson will be heartily welcomed by the members when he appears before them to detail the results and conclusions derived from "Experiments in Carbonization on the Birmingham Coal-Testing Plant." At the South Suburban Gas Company's works, there is a fine installation of De Brouwer stoking machinery and coke-handling plant; and Mr. S. Y. Shoubridge, the Company's Engineer, will in a paper describe the plant and the working results.

Though this will exhaust the technical and commercial topics to formally come before the meeting, there will be additional interest found in the same lines when the members and their lady friends visit the President's works at Croydon, where considerable extensions and changes have been made during the last few years. At Croydon, the visitors will be hospitably entertained by the Chairman (Mr. Charles Hussey) and the Directors of the Company. And though Mr. and Mrs. Helps are, under the circumstances of the time, foregoing the pleasure they would otherwise have obtained from the ordinary reception and entertainment, they will (by their invitation) be meeting the members and their lady friends at tea at the Japan-British Exhibition on the Friday afternoon.

Looking at the programme from the points of view of changed conditions and changed necessities, we do hope that much good for the gas industry generally will ensue from this particular meeting. At any rate, the President, we feel confident, will do his part in an effort to that end.

A Full Programme at Burnley.

THE members of the Manchester District Institution of Gas Engineers had a very full day on Saturday last at Burnley, where they were received heartily and hospitably by the Gas Committee of the Corporation and their Engineer (Mr. J. P. Leather). Burnley, like Sunderland and St. Helens, will be a much-visited place by gas men for some time to come, for as Sunderland demonstrates the Dessau system of carbonization and St. Helens the Glover-West plant, so Burnley presents us with, on the large working scale, practically the latest development in detail of the Woodall-Duckham system. Members of the District Institution are to be congratulated on having within the province of their organization such installations of the two continuous processes of carbonization in vertical retorts. Only six months ago they were at St. Helens examining the Glover-West plant, and learning from the experiences there; and now they have had the like opportunity of seeing the Woodall-Duckham plant, and receiving direct independent testimony as to working. This alone would have provided sufficient interest for the meeting in Burnley; but a programme was provided that was altogether out of proportion to the time available for the business meeting. There was the paper by Mr. J. L. Hodgson on "Venturi Meters for Measuring Large Volumes of Gas," in addition to Mr. Leather's description of the Woodall-Duckham installation. Then the address delivered by the President (Mr. H. Kendrick) last February was down for discussion; and when the plethoric character of that deliverance is remembered, hours instead of minutes seem a more appropriate time to set apart for its discussion by a body embracing apt debaters in abundance. Even there the entries on the *agenda* did not finish. Other topics for consideration were the University scheme of the Manchester Junior Association, the education and the authorization of gas-fitters, and the Institution of Gas Engineers and the work of the Commercial Sections.

It was inevitable that there could only be a hasty flight over the subjects, or the postponement of some of them. And the result was the expected. The discussion on Mr. Leather's paper was a disappointing one; but this was probably due to two circumstances. The first was that, during the inspection of the bench of verticals, and the working generally, the informal discussion with, and interrogation of, Mr. Leather about exhausted the information the members desired to obtain; the second, that Mr. Leather's prepared contribution—through the fact that he had not had an opportunity of sequestering the verticals from the ordinary works operations till two or three days before the meeting—stopped short just at the point where the visitors had looked for, and hoped to have had, particulars as to production, illuminating power, costs, and such-like data to which the usual criteria for judgment could be applied. However, Mr. Leather has experienced the difficulties usually incidental to setting a new plant to work. But it is gratifying to find that he is

satisfied that the initial troubles have all now passed, and that he looks as hopefully as ever to obtaining the results he anticipated when the decision was arrived at to adopt the system. Information was elicited at the meeting as to the capital cost of the installation. This was stated to be equivalent to £125 per ton of carbonizing capacity, exclusive of the conveying plant. But this figure must only be taken for what it is worth as applying to the time the contract was entered into, and to Burnley conditions. Admiration was expressed for the progressive enterprise of the Burnley Corporation and the Gas Department. Burnley was to the front in the adoption of inclined retorts, and now lead with the Gaslight and Coke Company in the application of the first practical continuous system of carbonization. Among the members of the Manchester Institution, Mr. Leather and his Committee have well-wishers, who desire for them the realization of their hopes to the full. With regard to the lecture scheme promoted by the Manchester Junior Association in conjunction with the Manchester University, the senior organization gave it their endorsement and benison during the meeting, accompanied by a vote of material value. Approval was also granted to a proposal regarding the education and authorization of gas-fitters.

The paper by Mr. Hodgson is the second introduction in our pages of the real novelty in gas-works plant of which the author is joint inventor. The previous reference to the use of the Venturi meter for the measurement of gas appeared in our issue for March 29 last (p. 869), in the description then given of the extensions that had been made at the Bromley and Crays Gas-Works, where the first meter on this system had been installed by the Chief Engineer (Mr. William Woodward) in connection with the Humphreys and Glasgow twin-generator water-gas plant. The history of the evolution of the meter for gas-measuring purposes is an interesting one. For many years the Venturi meter has been employed in the measurement of water at several of the largest water-works in the country; and subsequent to its introduction for this purpose, it was developed by Messrs. George Kent, Limited, to a form suitable for the measurement of the compressed-air supply to South African mines. Now, through the instrumentality of Mr. Hodgson and the firm, with suggestion by Mr. Woodward, it has been applied to the measurement of gas; and Mr. Woodward's experience for some months in the measurement by it of carburetted water gas confirms the confidence with which he, after careful consideration, adopted the new invention. It should find a very useful field in gas-works equipment, not only on account of the lowness of the initial cost in comparison with ordinary station meters, but on account of the facts that it requires no special housing (the recorder can be placed in any available existing building up to a distance of 500 feet from the pipe-line in the open), and there are no working parts in the path of the gas flow to get out of order. But with all the advantages set forth in our previous description and in the more extended one that is now presented by Mr. Hodgson, it is too early to categorically assert that it will take the place on a gas-works of an ordinary station meter for the final measurement of the production of gas.

The principle of the new meter is fully explained in the paper; but briefly it is that the flow of gas is measured by the fall of pressure between the upstream and the throat of the Venturi tube. The gas engineer will examine the idea critically; and one of the first things that may raise doubt in his mind is as to deposit on the interior surfaces of the tube causing (as it were) a drag on the flow of the gas, and so accentuating the fall of pressure. The difficulty has been foreseen; and a steam or hot-water jacket round the throat and the upstream during the colder months of the year is the recommended preventive. An interchangeable throat—changeable at a moment's notice—can also be provided; so that there can be examination and cleaning if fouling is apparent. Then there is a disadvantage where there is any great variation in the flow, in that there is a line below which the recorder will not register; and though this only represents a low fraction of the full capacity (one-thirtieth), it might debar the use of the meter in small works. There again the use of two Venturi tubes—one large, the other small—would get over the difficulty. In that case, however, the capital cost would be increased; and it would constitute an important reason for raising the question as to the advisability of installing an ordinary station meter. But the objections, which, it will be seen, have been recognized and legislated for, have set against them various advantages that

are a strong commendation. An interesting feature is that the meters are constructed in three types. There are those which correct for both temperature and pressure; those which correct for pressure only; and those which, like the ordinary station meter, correct neither for pressure nor temperature. Mr. Hodgson thinks the last type of meter will probably prove most useful for gas-works; but Mr. Woodward at Bromley adopted the type that automatically corrects for variations in both temperature and pressure. We shall expect to hear more of this meter, which is likely to soon gain a further footing in the control by registration of gas-works operations.

Gas Engineers on Municipal Competition.

INSTEAD of being at an ordinary meeting of shareholders of the South African Lighting Association last Wednesday, one might have fancied himself, both in regard to the personal and the subject-matter elements, at a meeting of one of the gas profession's organizations. The topic of discussion was the competition with municipal electricity supply, with its backing of the rates and ability, through personal and administrative influences, to transfer to itself important custom. The speakers in the discussion having identity with, or part in, the gas profession (in the order in which they spoke) were Sir Daniel F. Goddard, Mr. H. E. Jones, Mr. Alex. Mitchell, and Mr. Corbet Woodall; and these are names that will cause—the subject, too, being one that presses in many places—the proceedings of the Company on this occasion to rise to unusual prominence. The Company have suffered tremendously from the municipal competition of electricity; and, this coming at a time of a general acute depression in South Africa, resulted in the consumption of gas declining last year in Port Elizabeth by no less than 18 per cent. This is not due to any want of activity on the part of the Company's Manager (Mr. William Arnott). He has been very much alive to the situation; and he must have had a very perplexing time this last few years. Show-rooms, lectures, demonstrations, and canvassing—all the customary methods of stimulating and developing business—have been, and continue to be, brought to aid in the effort to produce a counterweight of gain to loss. But the Municipality are powerful and influential; and the mere fact of garnering business at a loss does not affect them personally beyond their individual monetary responsibility as units in the general body of ratepayers. They have taken over the public lighting, the lighting of the public buildings, and the traceable connection between State and Municipality has formed the channel along which has flowed to the Municipal Electricity Department the important business of lighting the railway station and the General Post Office. Ordinary commercial principles do not apply under such circumstances; and how can the Gas Company, run on commercial lines, contend against such strange and monstrous conditions? Here, if anywhere, is found an excellent illustration of some of the effects of communism, in which private enterprise is pushed back by every unfair means and artifice. This is not the ordinary competition of trade; it is extraordinary. It hits the Company, as was pointed out in the discussion, in a double sense. It not only withdraws much of the cream of the gas business from the Company, but such loss handicaps the Company when competing in other directions, through—when there is any considerable loss of business—standing and other charges increasing per unit of gas sold.

Admittedly this South African case is an extreme one. But by such extremes an impressive portrayal is obtained of what is going on in this country by a more gradual process; and that enables one to take a better perspective view in the avenue along which events are moving. Now what is to be done? Mr. Jones believes the position can only be dealt with by spirited militancy—by a substantial reduction of price, even, if needs be, to the sacrifice of dividend for a year or two; while Mr. Corbet Woodall and Mr. Alex. Mitchell are not satisfied this would be the wisest course. The competition really only affects lighting and power; and all three speakers look cheerfully to the future of the gas industry in both these respects. A critical position such as this municipal competition off ordinary commercial lines confessedly needs drastic treatment. But, however large might be a reduction of the price of gas, where such competition exists, the reduction would only have effect beyond and not within the limits of municipal influence. And out-

side those limits both Mr. Woodall and Mr. Mitchell really go with Mr. Jones part of the way in obtaining the remedy for application. Naturally the prices of both gas and electricity are heavy in South Africa; and have no comparison with charges here. But whether it be in South Africa or at home gas prices must, whatever the purpose, be on a competitive basis; and, if they are, all the engineers who took part in the discussion are satisfied that, where personal partiality does not prevail, and where municipal influences have no power, gas will retrieve much of the lighting that, for one reason or another, has passed over to the competitor. Where economy has no influence, personal preference cannot be controlled; and, of course, no one in the gas industry is so senseless as to say that gas, however economical and efficient as a lighting medium, will ever entirely wipe out electric lighting, any more than anyone—save a few prophets and visionaries—in the electrical industry, will say that electric lighting is going to eradicate from the field of illumination the economical and even popular gas lighting methods of to-day.

But the general feeling at the meeting was that a reasonable price—a competitive price—a price governed by local circumstances, for gas for lighting was all that was needed to meet ordinary competition; but as to the extraordinary competition of municipal bodies, no one seems to have any clear idea as to how customary and rational commercial principles can be twisted and directed to meet such conditions. Mr. Jones's idea of a price fight, with extreme reductions, will not, as we have said, help where municipal influence has sway; and what is more, at the best, the cutting down of prices—even if necessary, to the point where the dividend temporarily disappears—can only be of passing avail when a municipality is unscrupulous and has the ratepayers' pockets perpetually at hand. The resources of a company do not comprise any such unlimited pecuniary fount. But where there are such municipalities, every conceivable process must be brought into operation to counteract their designs and unconventional trading ways; and all the skill and legitimate arts of commercial life must be brought to bear upon the work of producing compensation for the losses resulting therefrom.

Welcome Home.

The many friends of Mr. James C. Watson, the Engineer of the Oriental Gas Company, and of Mr. Philip Holmes Hunt, the Engineer of the Metropolitan Gas Company of Melbourne, will be pleased to learn that they have both safely reached home on holiday, and in the best of health after their long journeys. Mr. Holmes Hunt arrived at Liverpool last Friday, and was met at Euston by his father, Mr. Charles Hunt, who, after his son's considerable absence and success in his profession in Australia, must have welcomed him home again with deep warmth and feeling. Mr. Watson is here on six months' leave of absence. It will be remembered that, at the last meeting of the Oriental Gas Company, the Chairman (Mr. R. Hesketh Jones) told the shareholders how thoroughly Mr. Watson deserved this extended freedom from the immediate cares and anxieties of his office.

Why Is It?

Special attention has again to be directed to the position of the Benevolent Fund of the Institution of Gas Engineers. This deserving fund, it is a sorry thing to have to say it, requires a good deal of periodical stimulating to ensure its maintenance. Is it that there are members of the Institution who are less humane than their fellows, or what is the cause? We do not know; but the fact remains that the fund is not, and cannot be, carried on free from anxiety and with that larger degree of benefit that the Committee of Management would desire. Last year ended with a deficit of £19 18s. 1d.; and the Committee were unable to deal with all the applications for assistance received at the close of the year. This is anything but satisfactory. Various expedients have been brought to bear to replace lethargy by interest in the fund; and now the effect is being tried of adding the Hon. Secretaries of the District Associations affiliated with the Institution to the Committee of Management, and provision has also been made for nomination by contributors for service on the Committee. The District Hon. Secretaries should make capital agents for the fund; and we hope the result will prove effective.

Results at Birmingham.

Just at this season of the year, the municipal authorities, whose accounts are usually made up to March 31, are always busy considering the financial results of their trading undertakings—in which category gas-works take a prominent, and practically without exception highly satisfactory, place. Already some few accounts have been noticed in our pages; and more call for attention to-day. There are both increases and decreases to be recorded; but the latter are in no case of a serious nature, and may be amply accounted for by slack trade conditions that have been prevailing in the period under review. To take Birmingham first, the figures in the balance-sheet were stated by Alderman Sir Hallowell Rogers, when submitting the Gas Committee's report to the Corporation, to be "very satisfactory, as they constituted another record." The contributions of the department for public purposes during the year reach the respectable figure of £92,000, of which no less than £72,500 went in aid of the improvement rate, and £4000 interest on reserve fund; while £15,500 was allocated in aid of public and court lighting. The receipts from the sale of gas amounted to £702,873, compared with £698,712 in the preceding year; the total income being £940,459, against £935,636. On the other hand, the expenditure was £750,525, compared with £745,335 in 1908-9. This left a balance of £189,934 to be carried to the profit and loss account, against £190,301; the net balance being £72,491, compared with £71,459. The quantity of gas sold shows an increase of 3·27 per cent. over the figure of the preceding year; while during the twelve months some 8000 new consumers were added. It might be remarked, said Sir Hallowell Rogers, that in giving so large a cash contribution to the rates, they were doing so at the expense of the consumers; but he would like to point out that, had the price of gas been the same as in 1908, their turnover would have been £45,000 more. Not forgetful of the need for giving credit where credit is due, he added that the good profits of the past year were due to various causes. In the first place, the late Mr. G. Hampton Barber bought his coal exceedingly well twelve months ago; and then the Engineers at the works had got the best out of the coal, and every member of the staff had worked excellently.

And Other Municipal Gas-Works.

Looking at some of the other statements that have so far come forward for publication, it is seen that an increase of 2 million cubic feet in the make of gas for the year is shown at Evesham; the net receipts from sales of gas being up by £270. Short time in the cotton trade has made its mark on the gas consumption in mills and factories at Heywood; but the receipts from gas sold for all purposes (£16,600, against £16,991) show a falling off of less than £400, practically the whole of which was represented by a reduction in price to prepayment consumers. The gas made per ton of coal was 11,068 cubic feet, as compared with 10,859 feet in the preceding year. The quantity of gas delivered in the twelve hours from six in the morning to six at night was 42·37 per cent. of the total. At Leigh (Lancs.) there is recorded an increase in the total quantity of gas sent out of 2·63 per cent.; the amount sold being 2·7 per cent. more than in the year before, which is stated by the Engineer (Mr. James Gibson) to be largely due to the progressive policy of the Gas Committee in fixing slot fittings. The make of coal gas was 11,110 cubic feet per ton. The income of the undertaking (£22,429) will, it is pointed out, be considerably lower in the current year, owing to a reduction in the price of gas for street lighting and to prepayment consumers; while the expenditure is expected to be higher. Once more (the seventh year in succession) the St. Helens Gas Department are handing over £5000 in relief of the rates; and the Engineer (Mr. S. Glover) is heartily congratulated by the Committee on his successful management of the undertaking during the past financial year. In spite of the slackness of trade, which caused a decrease of $\frac{1}{2}$ per cent. in the output of gas, the profits amount to £9299, compared with £9112 for the twelve months before. A factor which is pointed to as having contributed to the economical working of the undertaking is the Glover-West system of vertical retorts. A reduction of £1185 in the receipts from sales of gas at West Bromwich is entirely due to reduced consumption for lighting purposes; and it is attributed, no doubt correctly, in a large measure to the indifferent state of trade and the adoption of newer and im-

proved appliances for more economical incandescent gas lighting, both by manufacturers and by private consumers. As against this, more gas was supplied for power purposes; the result being a net decrease of 2·38 per cent. in the amount of gas sold when compared with the previous year. Out of 15,086 houses in the borough in November last, 11,369 were supplied with gas. The yield of gas was 11,414 cubic feet per ton of coal carbonized (compared with 11,141 feet), which is the highest figure that has been reached in the history of the undertaking. The Engineer (Mr. Harold E. Copp) states that this increased yield was due to less difficulty being experienced with stopped ascension-pipes. Break-ages of lamps in parts of the borough are, we learn, so frequent that it has not been found expedient to fix incandescent burners.

In Quest of Knowledge.

If the Illuminating Engineering Society have done nothing more in the matter of tangible result during the past winter than to prove to the members how little they, and others who are concerned in the subject, know about the science and art of illumination, then credit must be given for having accomplished a good work, and for having created a desire to know more, and to push out into fields at present not thoroughly explored. We take it from Professor Silvanus Thompson's remarks at the annual meeting that this is the position; and it is a healthy recognition. When the members of such a Society are conscious of their own deficiencies, they can the better appreciate how far are those on whom fall the responsibility for the design and construction of buildings, and who have studied less the art of illumination, from a perfect understanding of necessities and requirements. The interest and co-operation of such men it is desired to enlist; and the Council have therefore determined that next session there shall be a number of practical papers on such questions as the lighting of streets, shops, libraries, schools, &c. In this, we think the Council are wise. They are likely by these means to secure the adhesion of a larger circle, embracing all interests identified in any way with interior and outside illumination. From the practical subjects, ascent can be made by easy gradation to the more technical and abstruse ones. It is much better than the reverse order of things for a new Society, which must, to make itself popular, arrange for attractive proceedings, and carry on its educational work from the points of general understanding. This is following the natural order of things. From the figures presented by the Hon. Secretary (Mr. Leon Gaster), it will be seen how unevenly divided at present is the membership between the various interests concerned in illumination; and this is a matter that the promoters of the Society must seek to alter by the attractiveness given to their work. Though the Society started on the principle of a "common platform," it cannot be denied that the influence of the promoters was more electrical than anything else. Hence it is seen that no less than 39 per cent. of the membership consists of electrical engineers and others identified with electric lighting; and only 18 per cent. gas engineers and manufacturers of gas appliances—the remaining 47 per cent. comprising professional men in other branches of scientific and industrial work and manufacturers of appliances, with, in all cases, some direct interest in illumination. Curiously, "architects, surveyors, &c.," are only represented by 3 per cent.; and there is the evidence lying around of incomplete knowledge in those directions. Such singularly disproportionate representation indicates that there is something wrong, and that something requires the application of a remedy. We are pleased the Society have prevailed upon Professor Silvanus Thompson to continue his presidency for another year.

Natural Gas in England.

Mr. William H. Booth comes before us with excellent credentials. He is a Fellow of the Geological Society, a member of the American Society of Civil Engineers, and the author of a book on "Liquid Fuel and its Combustion." This expert's advice to those who are thinking of falling victims to the alluring prospects held out by the (Sussex) Natural Gas Company promoters is "Don't." Mr. Booth knows the Heathfield district geologically as he knows his alphabet. And from an examination of the whole position, he says that, if gas is ever to be discovered in Great Britain, it would appear to be more rational to explore the deep-seated rocks of Cheshire, in hope of a store of gas being found that has been

evolved from the carboniferous rocks which probably underlie that county at a depth of some thousands of feet. But no hopes of commercial success by way of oil or gas can be held out for Sussex. So far, the gas appears to have behaved as would be expected of it. It is there; it is good in quality. But its volume is unlikely ever to prove large; and boreholes have shown that the reasoning of the writer and of others has not been far from the truth.

The London and Southern Junior Session.

The completion of the eighth year's work, finds the London and Southern District Junior Gas Association in a position which must be extremely gratifying to those who have worked so hard on its behalf. Such a large measure of success as the Association have attained, could not have been secured without effort; and the hearty vote of thanks which was accorded to the President at the annual meeting last Friday, was a well-deserved recognition of Mr. W. J. Liberty's unflagging zeal in the interests of the members during his two years of office. Following in the footsteps of other Presidents to whom the Association also owes a great deal—a debt which the members have not at the proper time failed to acknowledge—Mr. Liberty has fully realized the possibilities of his position. A feature of his presidency has been a systematic endeavour to increase the membership roll; and his plan of communicating with the engineers of works outside London has resulted in accessions from districts quite a long way from the Metropolis. In fact, as he pointed out at the last meeting, seeing the wide area from which the members are now drawn, the Association is in strict truth, as well as in name, a "Southern" Association. A list of 37 new members during the session is quite a good record; and though there were 23 resignations, this still leaves a net gain of 14. In his campaign to secure further supporters among the Juniors in London and the Home Counties, Mr. Liberty has possessed a strong argument in the excellence of the programme arranged for the session. An opening address by Mr. Corbet Woodall and lectures by Mr. Jacques Abady and Dr. Harold G. Colman, have been special features; and, in addition, several very useful papers have been read. Among the latter may be specially mentioned the contribution of Mr. J. G. Clark, of the Gaslight and Coke Company, on "Some Practical Aspects of Radiation; Having Reference to the Uses of Illuminating Gas." The preparation of this paper must have entailed a very large amount of work; and it is safe to say that the author's investigations on the subject with which he dealt have received careful consideration among a much larger number of men engaged in the gas industry than is comprised in the Association to which they were communicated. His reply to the questions asked during the discussion when the paper was read a month ago, will be found in another portion of this issue, as it will be remembered time compelled its postponement until the annual meeting. Numerous visits to works constituted a valuable portion of a programme which was a first-class one in every respect. In congratulating the officials and members on the work that has thus been accomplished, we may say that we look quite as hopefully towards the next session, which will be under the presidency of Mr. L. F. Tooth, of the Commercial Gas Company.

Brussels Exhibition.

We learn from the current number of the "Journal de l'Eclairage au Gaz" that, though the Belgian and French Sections of the Brussels Exhibition are far from complete, several firms have goods in position. The Compagnie Continentale pour la Fabrication des Compteurs à Gaz (M. Brunt et Cie.) show a "Duplex" meter of about a million cubic feet capacity intended for the Gas Company at Mons. The Compagnie Belge des Compteurs and the Imperial Continental Gas Association also show both wet and dry meters of various sizes. In the Machinery Hall there are engines of all kinds—horizontal and vertical—worked by ordinary or producer gas; noticeable among them being some high-speed motors which occupy but little space. In the grounds are special pavilions occupied by the Paris firm of Arthur Martin (gas-stoves, fittings, &c.) and the Auer Company of Belgium. The Belgian Association of Gas Managers have collected in a kiosk, decorated on the interior with a portrait of Minckelers, examples of various applications of gas for lighting, heating, and motive-power, coke-stoves, &c. The lighting of the exhibition is particularly brilliant; all systems—upright and inverted gas-burners of high and low pressure, and electric arc and incandescent lamps—contributing to produce a fine effect.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 576.)

THE Stock Exchange had a quiet and uneventful—not to say humdrum—week. There was, however, no tendency to weakness; a good, cheerful tone confidently awaiting the resumption of that activity which has not shown itself yet. A notable and pleasant feature was the advance in Consols, which closed with several bargains at 82½. The opening day was good. The demand for gilt-edged investments hardened prices; and Railways were in request. But in some of the more speculative lines there was less strength. On Tuesday, the fortnightly settlement demanded attention; and it proved to be a fairly heavy one. The chief markets were quiet and generally firm; but the rest were somewhat uneven. On Wednesday, the tendency was cheerful; the settlement promising well. The Government issues were well supported, and Railways were still on the up-grade, while even the delicate American Market was stronger. Business fell quiet on Thursday, and there was some move to realize profits. Gilt-edged things did not suffer; but Railways were affected to some extent. On Friday, the settlement was satisfactorily concluded. Business was quiet and dull in most lines; but the choice class were strong, and scored some advances. Americans fell back again. Saturday was as quiet as usual. Consols advanced again, and Railways were stronger, but the rest were somewhat mixed. In the Money Market, there was a strong demand which hardened rates materially right up to the close. Business in the Gas Market was much more active in the aggregate; but it was more than usually restricted to a small number of issues in which all attention seemed concentrated. There were hardly any changes in quotations. In Gaslight and Coke issues, the ordinary was active and steady; the figures of the previous week being practically unchanged—that is to say, a range from 103½ to 104¼. The secured issues showed dealings in the maximum at 88½, in the preference at from 104¼ to 105½, and in the debenture at 82 and 82½. South Metropolitan was more active but unchanged, realizing from 120½ to 122. The debenture fell a point, and was done at 80½. In Commercial, the 4 per cent. fetched 107 and 107½, and the 3½ per cent. 103½ and 104½. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 82½, British at 44 and 44½, Ilford debenture at 100½, South Suburban at 122, and Tottenham and Edmonton "A" at 134½. In the Continental companies, Imperial was firm at from 177½ to 178½, ditto debenture made from 94½ to 95½, Union preference 139½, and European part-paid 18½ and 18½. Among the undertakings of the remoter world, Monte Video realized from 12½ to 13½ *cum div.* and 12½ *ex div.*, Oriental 130½, Primitiva from 7¼ to 7½ (a fall of ½), ditto preference from 5½ to 5½ (a fall of ½), ditto debenture 99½ and 100, and San Paulo 15½.

ELECTRICITY SUPPLY MEMORANDA.

The Much-Abused Inspector—Landlords to be Responsible for Renewals—Gleanings from Contemporaries—The "Important Rays"—Artificial Presentment.

WHEN the electrical history of our times comes to be written, a prominent figure in it should be Mr. H. Ross Hooper, one of the Inspectors of the Local Government Board, who has shown that he has the courage of his convictions, and a very proper appreciation of his duties as an official of the Board. He does not believe (as our electrical contemporaries would have him do) that perfunctoriness and official duty and responsibility in any way harmonize. His thoroughness and frankness result in a large crop of anathema. But he goes on his way undisturbed by this; and the Local Government Board are, through him, relieved of the stigma of being a central authority in name only and not in act. Electricians would wish to have written up over the doors of the offices of the Local Government Board in which the affairs of the electrical industry are dealt with, "Ask and ye shall receive;" and they would have only one instruction to the Inspectors—*i.e.*, "Agree to all loans, and put no pertinent questions." The work of the Board in sanctioning loans must be reduced to a perfect farce before the managers of the electrical industry will be satisfied. But Mr. Hooper is not going to allow himself to be shackled hand and foot, or to be dumb, and merely nod his acquiescence. All the electrical papers that we have seen have had a shot at him over the Grimsby affair. The Corporation have asked for a loan of £2000 to squander in lighting certain side streets by metallic filament electric lamps, without gaining anything in the way of increased efficiency or annual economy. The electrical undertaking is in the hands of the Corporation; and the Public Lighting Committee and the Electrical Engineer are quite prepared to assert that a 63-watt metallic filament will give a light of 50-candle power, and will give a better illumination than any incandescent gas-lamp the running costs of which are on a par. Mr. Hooper—speaking with a big experience and observation in all quarters of the country—says he is not satisfied that these submissions are altogether true; and if Mr. Hooper is right in this, then there is no justification for spending £2000 to obtain something that is less efficient than that which is existing, while the annual price (ignoring capital charges) is the same. Before Mr. Hooper makes his recommendation to the Board, the Public Lighting Committee have

to show that the metallic filaments will yield an improvement in the lighting, and that it will be done as cheaply as gas. It is the old story. The claim is always advanced that the metallic filament lamp is going to make some wonderful difference in the illumination of the streets. It does; but the difference is a depressing one for those who have to use the streets at nightfall. Mr. Hooper also questions the reputed durability of metallic filament lamps. The Electrical Engineer of Grimsby says that he has lamps that show a life of 1900 hours. What is the good of quoting such a figure? Do electrical engineers think Mr. Hooper is going to be deceived in that way? Such life figures are not representative of the whole genus. If one takes the average of the life figures of a street installation of metallic filament lamps, it will not be represented by anything like 1900 hours. Electrical engineers know this; and their knowledge is that of Mr. Hooper, who has a marvellous way of keeping himself above the accretive heap of abuse.

Electrical committees appear to have very simple notions as to what people are prepared to do to help forward the interests of the electrical industry. If an electrical undertaking were some philanthropic institution instead of a commercial venture, they could not expect people to do more for it, without grumbling. The Electricity Committee of Fulham have been considering how they can supplement the custom of their undertaking, which indicates that they have been making slow progress. In the borough, there are 22,000 houses; but only about "3000 electricity consumers, including flats" (it is most unkind to suggest that the "consumers" include "flats"), are connected to the mains. The Committee (the Council have endorsed the proposal) intend to free wire for approximately six lights per house—using prepayment meters, and surface wiring, which is ugly. The estimated capital cost of the wiring and supplying fittings, including a transformer, is £3 3s. per consumer. Here comes one drawback to the scheme. That is the old question of responsibility for renewals. It is difficult to get the poorer class of consumers to renew; and so the Committee say that only when the landlord accepts responsibility for all renewals (other than those necessitated by ordinary wear and tear) can the supply of the requisite lamps be included in the scheme, and, failing an undertaking by the landlord, the tenants will be required to provide their own lamps. That is one rock on which the scheme will come to grief. There have been several instances in which it has been proposed to get landlords to shoulder the responsibility for electric lamp renewals; but we have never been able to learn how many soft-headed landlords have been hooked in this way. However, the Fulham Council are going to make a trial by spending £2000. Good-bye to the profitable use of that particular sum.

Some of our electrical friends have been critical lately; and, as they generally do when the fit for this sort of thing comes upon them, they have been falling into all sorts of errors, and making some singularly random statements. In a paragraph to which thoughtfully as little prominence as possible is given, the "Electrical Times" questions our veracity in stating that the latest forms of high-pressure inverted gas-lamps give an efficiency of 60-candle power per cubic foot of gas. The sarcastic individual who penned the paragraph can only dispute the assertion by the aid of his chief characteristic. Our declaration is not a difficult one to prove in a practical manner if the writer of the paragraph so desires. We also, in his view, appear to have erred in omitting to insert the word "hours" after candle power. This assumption of photometrical erudition is amusing. Among photometrists, when one speaks of an efficiency of no matter the number of candles or candle power per cubic foot of gas, it has been, and is, always understood to mean the candle power per cubic foot of gas consumed per hour. And such criticism as that in the "Electrical Times" passes in its office for technical journalism! In the "Electrician," reference is made to a recent article in the "JOURNAL," regarding the use of small gas-lighting units in houses. One of the points of usefulness of small lighting units suggested by us was that of economically maintaining a brightness and comfort about a house by having a light in almost every room. The profundity of our contemporary's comment on this is absolutely staggering. Read and judge: "We fail to see how the inmates can see the house look brighter unless all the doors are thrown wide open; whilst the effect on the atmosphere of a gas-jet in every room is not pleasant to contemplate." The first part of this quotation may stand as a piece of simplicity of the first water; and as to the second part, we should like a practical explanation. Let the writer of the words take an ordinary house of any specified cubical capacity, and tell us by illustration what he has in mind that is not pleasant to contemplate. Many houses are night after night lighted throughout by gas; gas lighting has been in existence over a century; and the civilized races are not extinct. If they had been cleared off the face of the earth by gas lighting, there would have been no electrical industry, no need for all the struggling that that industry has been experiencing the past thirty years, and—perish the thought!—there would have been no "Electrician," no "Electrical Times," and we should not have been here to enjoy the occasional flights of imagination that find expression in their pages. Another curious error into which our contemporaries have been falling is that they seem to regard the Welsbach Company as the only mantle-making concern in the world; and the justifying remarks from Lord Weardale, at the recent meeting of shareholders, for entering into the metallic filament lamp business have been hailed with much joy, and have, like a well-known brand of cocoa, produced a "grateful and comforting" feeling. Turning from our electrical contem-

poraries to "Surveying and Civil Engineering," we find there a friendly article headed "The Case for Gas," in which appears these words: "Who could have prophesied twenty years ago . . . that a great revival would take place in the use of gas, or that gas was again to assume its rank among the prominent illuminants." Though, over a great number of years, we have endeavoured, with scrupulous care, to keep ourselves *au courant* with all that is passing in the lighting world, we never before heard that gas ever lost its rank among the prominent illuminants. That piece of information has escaped our notice.

Various people have different ways of doing things. The electrical people have at times introduced some curiosities in the way of photometrical measurements. We have heard of such things as taking the candle power from the four cardinal points, and giving the sum of the measurements as the candle power of the lamps. Then, again, we were told by the "Electrician" only lately that the ratings that have appeared on electric lamps are notoriously not their actual values; we know too about the discordant illumination measurements for which electricians have been responsible; and we know also that they have a nasty habit of not using incandescent gas-burners in the manner that will give their utmost efficiency when taking photometrical measurements, but allowing them to run wild as it were, and then finding out what they will do. Not long ago, an attempt was made, at the Society of Arts, to measure from the floor the illumination of the large sun gas-light in the ceiling—an ancient contrivance that had not been used for ages, with the flat-flame jets throttled with the dust and the rust of time, and the pipes obviously filled with air. This experiment, without explanation, was regarded as a fair matter for sarcastic comment in the "Electrical Times"—so hard-driven are our friends for matter for derogatory talk in connection with the latest developments of gas lighting! Mr. Haydn Harrison was the experimenter. The same gentleman presents us with a further innovation in photometrical measurement. It is that by measuring the "important rays" of electric lamps, a considerable increase in efficiency can be obtained. Mr. Harrison should be proclaimed a benefactor to his generation of electrical illuminating engineers. There has been hopeful talk of a 0.5 watt per candle power metallic filament lamp; and Mr. Harrison points out that such lamps are already with us if the "important rays" are measured, and the others discarded. At Croydon, grouped tungsten lamps are being used in lanterns; and the total number of watts absorbed is 300. Photometrical tests show that "the candle power on the important rays is raised to over 500 by means of a special registered design of reflector." That is all. Perhaps some gas enthusiast will make a selection of the "important" from the unimportant rays proceeding from our latest types of high-pressure gas-lamps; apply special types of reflectors; and then ascertain what the efficiency of the "important rays" is per cubic foot of gas consumed. We recommend the experiment to those who have time to dabble in photometrical disuniformity and fictitious values.

The Electricity Publicity Committee is hard at work producing posters and show and other cards containing some striking absurdities, by trying to eliminate the practical in order to make the use of electricity look as artistic and artificial as possible. We have not seen the posters or the cards, but are quite willing to accept the following criticism from the "Electrical Times": "Another of the Committee's show-cards has now been published. It sets out to illustrate electric ironing, and forms the first of a series dealing with the uses of electricity for domestic purposes. The poster (which is 40 in. by 25 in. in size, and is in five colours) is of a design to make an effective display on the hoardings; but what will the good housewife who gazes at it think of the elegant young lady who chooses a polished Chippendale table to do her ironing on, and that without even an ironing-cloth to protect it! Art is all very well, but a picture of the real thing is much more impressive to the matter-of-fact person, such as the average middle-class housewife usually is. Besides the poster and a show-card similar to it, there is a mail-card also illustrating the electric iron. If one may criticize this also, the two-light bracket on the wall panelling is in dangerous proximity to its mistress's head—most people have their wall brackets well above the height of the average person's head. The young lady who is ironing in this picture has also chosen a most unsuitable table, and again dispenses with the table protection. The aim of the poster and the show card is to get people who are already consumers for lighting to use it for other purposes. . . . The circular and mail-card should be of considerable service to supply undertakings, since they provide the material for advertising in a most useful direction without incurring any expense in distribution. They mark a distinct step in electricity advertising of this kind, in that the three-colour process has been used—this being usually considered too expensive for matter on a small scale. With the big issues which the Joint Publicity Committee can make, however, we may probably look forward to seeing further high-class productions in this method, since it is so eminently suited to the needs of the case. Let us hope, though, that in future pictures the incongruity of the *mise en scène* may be removed."

A combined water tower and tank has been built of concrete blocks near Brussels, where it is to be used in connection with the International Exhibition. The tower and tank have a height of 145 feet, and the latter has a capacity of 280,000 gallons. The structure is circular, and is built entirely of concrete blocks.

OBITUARY.

ALFRED COLSON.

FROM among the living, there has passed one whose removal we all profoundly deplore. Last Friday morning, Mr. Alfred Colson breathed his last; and no more shall we look upon that tall spare figure, with its grave but kindly face, no more will there be the hearty grip of the hand, no more the enjoyment from the same source of that courtesy which was an inseparable characteristic, no more those animated conversations on themes of mutual interest. All has passed. The voice is still; the life spent. For some time past, it has been known that our deceased friend had been suffering, and that for a period he was in a nursing home in London. It has also been known that after his return to Leicester his condition was such as to cause grave concern to his family and medical advisers; and in the earlier part of last week, the fear became pronounced that there was little hope. The fear was all too well-founded.

Though Mr. Colson in his professional activities did not get far afield, his personal and professional influences were great. He was richly endowed—humanly and mentally. Those native qualities of which we have spoken drew men to him. His was a nature that made friends; and his was a nature that retained the friends he made. He knew how to deal with those with whom he came into contact; and he also knew how to lead. *Suaviter in modo, fortiter in re* applied to him without qualification. His gifts served him, and those for whom and with whom he worked, well. His talents would not permit him to linger about the lower rungs of the professional ladder. He could no more resist working his way to the top than he could resist those natural impulses that contribute to the maintenance of life. For long years, he stood a conspicuous figure in the professional ranks of the gas industry; and for long years the name of Colson has been honoured and held in the highest esteem. His engineering ability was great; as was also his chemical knowledge in the sphere of gas-works products. He knew how to construct works with economy, and with a large reward in efficiency. The Aylestone Road works at Leicester are a monument to his skill and ingenuity. His ability was by no means circumscribed. It was capable of much and ready expansion. Not only was he Engineer of the gas undertaking, but when the Corporation entered upon the business of electricity supply, he dropped into the engineering and management with perfect ease. Between the two undertakings, he exercised a circumspect management; and he made of both a success. He served Leicester well; and Leicester has cause to regret his loss, just as much as has the gas profession, though the profession of late years, through the busy unostentatious life Mr. Colson led, has not seen so much of him as would have been universally preferred. He had his share of trial, domestic and otherwise; and it left its marks on a sensitive and kindly nature. He leaves one of his sons—Douglas—in the responsible management of the gas-works at Weymouth. With him and with all the family, the members of the gas profession in common mourn.

The late Mr. Colson was born at Newport (Mon.), on Jan. 31, 1849. His father—Mr. Henry Colson—was one of the Engineers of the London and South-Western Railway Company. The son was educated privately; but his school work was directed to fitting him for the engineering profession. He was articled to his father; but he removed to the Metropolis, and commenced his career with Messrs. John Aird and Sons. In 1871, he was engaged by Mr. Robert Morton, the Engineer of the London Gas Company, as Clerk of the Works for the construction of the first gas-holder at Battersea, to serve as an adjunct to the Nine Elms works. At that time, Mr. Charles Hunt was in the Company's service at the works; and from what he saw of Mr. Colson he formed a high opinion of his energy and ability. In 1872, Mr. Hunt went to Birmingham; and in the following year it was decided, upon his recommendation, to appoint an Assistant Engineer to the Birmingham Gas Company. Mr. Colson obtained the appointment; and during the next ten years he was closely associated with Mr. Hunt in the management of the Windsor Street works, and fully shared his counsels. That period covered the construction of a very large portion of the new works.

In 1882, the position of Gas Engineer to the Corporation of Leicester became vacant by the retirement of Mr. C. S. Robinson; and Mr. Colson, who was then about 34 years of age, applied for it, and was unanimously selected by the Committee who examined the applications. When recommending him to the Town Council, Alderman Bennett, the Chairman of the Gas Committee, laid stress upon the value of Mr. Colson's experience under Mr. Hunt at Birmingham, where, he said, every attention had been given to the most scientific and economical means of producing, purifying, and distributing gas. Mr. Colson had also paid special attention to street lighting; so that his experience and advice would prove serviceable to the town. The Committee's selection was unanimously confirmed by the Council. Before leaving Birmingham, Mr. Colson was presented by a number of the officials and employees with a handsome centre-piece, bearing a suitable inscription, two *compotiers*, and a dessert service of white china, accompanied by their congratulations on his appointment and their

best wishes for his success. Mr. Hunt presided on the occasion; and among those present were Mr. Henry Hack and Mr. Shoubridge. Writing to us last Saturday on the subject of Mr. Colson's death, Mr. Hunt, to whom we are indebted for some of the preceding particulars, said: "I never parted with more regret from anyone who has been similarly associated with me. The ten years at Windsor Street gave full promise of the conspicuous success which awaited him."

On taking up his duties at Leicester, Mr. Colson entered most enthusiastically into the work of developing the gas undertaking; and at a meeting of the Town Council held early in 1883, Mr. Bennett stated that the new Manager was fulfilling the expectations of the Gas Committee. His experience at Birmingham was proving of great value; and his devotion to duty was admirable. He first of all took steps to develop the consumption of gas by writing a little pamphlet on its advantages for cooking. The publication of this *brochure*, of which something like 30,000 copies were sent out by gas authorities in various towns, was attended by most satisfactory results. The next thing was to improve the manufacturing plant, so as to render it equal to meeting the increased demands upon it. Consequently, early in 1884, he submitted a long report on the extension of the Aylestone Road works, at an estimated cost of about £26,000. In the following year he directed the attention of the Gas Committee to the inadequacy of the chemical plant, which was contiguous to the works at Belgrave Gate, and emphasized the necessity for the establishment of new residuals works. These were eventually carried out according to his designs and under his superintendence, at a cost of upwards of £20,000. They cover about 3½ acres of ground.

Owing chiefly to the more extended consumption of gas for industrial purposes, the demand so increased that in 1887 Mr. Colson was again compelled to advise the Corporation to undertake further enlargement of the works. The designs for these works, which were carried out entirely by him, were approved early in the above-named year; and he was congratulated on the able statement he had submitted on the subject. The extension consisted of a section capable of manufacturing and storing 4 million cubic feet of gas per day, and costing about £150,000. Subsequent extensions included the erection of new offices and shops, &c., in Millstone Lane. In 1890, the Corporation obtained power to supply electricity; and Mr. Colson was appointed as Engineer. Buildings to contain the necessary machinery for the generation of current were put up under his superintendence; and the supply was commenced in December, 1894. Three years later, further large additional expenditure on the Aylestone Road works was sanctioned; and the necessary parliamentary powers were obtained. In the summer of 1899, water-gas plant was introduced, as the result of a visit of a deputation of the Gas and Electricity Committee, accompanied by Mr. Colson, to places where it was in use. Coming to more recent times, it may be mentioned that two years ago the Corporation were applying for further powers in connection with their gas undertaking, including an extension of the area of supply and the application of modern gas-testing clauses. To these, the Police and Sanitary Committee, who considered the Bill, had no difficulty in assenting, after Mr. Colson had shown the excellent position of the undertaking and its development in the past thirty years. Some idea of the progress of the Gas Department under his management may be formed from the following figures: In 1882, the quantity of coal carbonized was 62,000 tons; of gas made, 650 million cubic feet; and the consumers numbered 20,000. Now the figures are 180,000 tons of coal, 2100 million cubic feet of gas, and 58,500 consumers.

All through Mr. Colson's long connection with Leicester in his official capacity, his services were fully recognized by the Corporation. He had not been four years with them when he received an increase of salary, in consideration of the work entailed in carrying out the large extensions at Aylestone Road, and in doing this without any engineering or architectural assistance. Another increase was granted a few years later. In the summer of 1891, he was invited to take charge of the Beckton station of the Gaslight and Coke Company; but, while highly appreciating the compliment, he felt it to be his duty to remain at Leicester, in consideration of the kindness and appreciation he had received from his Committee, and in view of extensions in progress at Aylestone Road. Next year, his salary was raised to £1000 per annum. While Mr. Colson was a strict disciplinarian, he was always exceedingly just and fair to all who worked under him. He was a man of very high character, and while earning the complete confidence of the Committee under whom he served and the staff who served under him, he at the same time gained the esteem of all who knew him. His concern for the employees was specially shown: at the time of the South African War; and in the spring of 1904, those who had been on active service presented him with a silver Irish loving-cup, in gratitude for his generous thought in safeguarding their interests while they were abroad. Early in 1901, he had to bear very heavy trouble brought about by having his works flooded. Photographs given in the "JOURNAL" at the time show the serious nature of the inundation; but in these trying circumstances he was loyally supported by the staff and workmen. Almost his last words were the expression of a desire to be kindly remembered to the Committee and the staff with whom he had been so long associated. He was the President of the Ambulance Corps connected with the Gas Department. His usefulness in Leicester was not confined to his professional work. In October, 1898, he was elected as

President of the Literary and Philosophical Society; and his year of office was a very successful one. On the occasion of the meeting of the British Association at Leicester in 1907, he was Chairman of the Reception Committee, and did much useful work for the entertainment of the members and visitors.

A conspicuous feature in Mr. Colson's career was his solution of the naphthalene problem at Leicester. Prior to 1904, the complaints received in regard to stopped pipes ranged from 100 to 600 a day; but, after many experiments, he succeeded in completely removing the cause of the trouble by the treatment of the gas with light creosote oil. The publication of the particulars of the process and the results obtained with it gave rise to much correspondence in the "JOURNAL" at the time. Another useful device for which the gas industry are indebted to Mr. Colson is his prepayment meter cash-box, which was described and illustrated in our "Register of Patents" on Oct. 23, 1906, and was the subject of an article early the following year.

Mr. Colson was always interested in the problems which came before his professional colleagues; and early in his career he endeavoured to assist in their solution. With this object in view, and with a desire to extend his knowledge, he joined the British Association of Gas Managers in 1876, while he was at Birmingham, and in due course passed into the Gas Institute; but he left with other members to form the first Institution in 1891. He was a member of the Council of the new organization, and President in 1894. At the first meeting, he read an interesting paper on "The Leicester Gas-Works Extensions." On the amalgamation of the two bodies, he joined the new Institution, and at the second annual meeting (in 1904) read a paper giving the results of his "Ten Years' Experience with the Prepayment Meter at Leicester." His name was on the list of members at the time of his death. He was one of the oldest members of the Midland Association of Gas Managers, which was founded in 1877, with his Chief (Mr. Charles Hunt) as first President. In 1886, he read a paper on "Letting Gas Cooking Stoves on Hire;" and it was followed next year by one on "The Leicester Gas Undertaking." This was the first occasion of an association of gas managers visiting Leicester; and Mr. Colson gave his colleagues a very interesting account of the undertaking. He was elected an associate member of the Institution of Civil Engineers in 1876, and was transferred to the class of members in 1889. He was also a member of the Institution of Electrical Engineers.

Mr. Colson came from a family of engineers. As stated at the outset, his father was a railway engineer. One of his brothers was for a long period principal agent of Messrs. John Aird and Sons, for which firm he constructed many important works; and another brother is Mr. Charles Colson, C.B., an Engineer to the Admiralty. He also has, or had, two other brothers in the engineering profession. He was twice married. His first wife, by whom he had one daughter, who survives him, died when he was at Birmingham. He also leaves two sons and one daughter by his second marriage; another son having been killed by an accident some years ago. One son—Mr. Douglas F. Colson, who was at one time his chief Assistant—as mentioned in our introductory remarks, is Engineer and Manager of the Weymouth Gas Company; and the other is in the Army. The youngest daughter is married to an officer in the Army.

The preceding sketch of Mr. Colson's life-work cannot be better closed than by giving two appreciations of him. His former Chief, Mr. Charles Hunt, says: "He was every inch an engineer. Although by instinct and training he was essentially a constructing engineer, it should be recorded of him that he showed very marked business capacity as Manager of a gas undertaking, and also adaptability in other directions. For example, one of the first things he had to undertake at Leicester was the working up of residuals, as to which he had had no previous experience. He applied himself to this with such success as to speedily earn a name for himself as a tar distiller, in which capacity his advice was for many years sought in connection with other gas undertakings. Similarly, he took up electricity, the success of which department of the Leicester Corporation is largely to be attributed to its being united with the Gas Department under his management and control."

Referring to the death of Mr. Colson, the "Leicester Daily Post" on Saturday said: "The Corporation has lost one of the ablest and most successful officials on its staff. During the twenty-eight years he was the Engineer of the municipal gas-works, he rendered services as remarkable as they were invaluable. When the visitors to St. Paul's inquired for a monument to its distinguished Architect, they were told to look around. So with Mr. Colson. He leaves behind him no more commanding and eloquent memorial to his achievements than the gas and electric lighting works at Aylestone. From time to time they have been visited by some of the most eminent members of his profession; and their emphatic verdict has been invariably the same. The entire undertaking is a model of its kind. Again and again has it been extended according to the designs which he not only matured but carried out. The result has been that its production has been raised from 650 million to a colossal 2106 million cubic feet of gas, and the consumers have bounded from 20,000 to 58,500. The municipal profits have grown in proportion, and have been found side by side with repeated concessions to the consumers. Throughout his career, indeed, Mr. Colson demonstrated in many ways that he was in the front rank of his profession. One of the more striking proofs of this was the remarkable success with which he grappled with the naphthalene problem.

When, again, the Corporation determined to generate its own electric light as well as the older illuminant, instead of allowing the monopoly to pass into private hands, it found Mr. Colson admirably qualified to launch and manage the new installation. Few can be surprised, therefore, that he should have been elevated to the chair of the Institution of Gas Engineers, as well as widely recognized as one of the most distinguished consulting experts on gas-works management. He did not, however, confine his interest and efforts to his profession. In the work of the Leicester Literary and Philosophical Society, of which he became President, in the reception (still pleasantly memorable) of the British Association in 1907, and in other spheres of local activity, he did exceptionally useful service. Adding to these his admirable traits in the management of his workmen at the gas-works, his scientific attainments, his remarkable culture, and other characteristics, we have some of the secrets of the respect and esteem he inspired, as well as of the sincere regret now evoked by his death."

Professor ROBERT KOCH, the eminent bacteriologist, died last Friday night at Baden-Baden, whither he had gone for change of air after an attack of heart trouble. His name frequently appeared in the "JOURNAL" at one time in connection with water examinations. He was in his 67th year.

The Wandsworth and Putney Gas Company have lately lost one of their Directors in the person of Mr. EDWIN R. RANSOME, who joined the Board in 1873, and discharged his duties with zeal till his death, which took place at the advanced age of 87. Deceased was a member of the Society of Friends, and he was interred in the little burying-ground behind their historic Meeting-House in High Street, Wandsworth. Many Friends who honoured his life and will treasure his memory gathered with his family round the grave; among those present being the Secretary (Mr. C. W. Braine), the Engineer (Mr. H. O. Carr), and other members of the staff of the Gas Company.

The death occurred at Liverpool last Tuesday, in his 69th year, of Mr. JOHN SHIRESS WILL, K.C., whose name is well known to most of our readers from its association with that of the late Mr. W. H. Michael in the production of their joint work on "The Law Relating to Gas and Water Supply." After Mr. Michael's death, the third edition was edited by Mr. M. J. Michael, and Mr. Shiress Will edited the subsequent editions alone. In the fourth, which was brought out in 1894, he included the Electric Lighting Acts of 1882, 1888, and 1890, and the Board of Trade Rules and Regulations. These, however, were subsequently published in a separate volume. The fifth edition of the original work was published in the year 1901. Mr. Shiress Will was a native of Forfarshire. He entered for the Bar at the Middle Temple, and was called in 1864. He practised for a number of years at the Parliamentary Bar, from which he retired in 1885, when he stood as a Liberal for the Montrose district burghs, and was returned by a large majority. He easily retained the seat at the succeeding General Elections of 1886, 1892, and 1895. At the election in the last-named year, however, Mr. John Morley (now Lord Morley of Blackburn) was defeated at Newcastle-on-Tyne; and Mr. Shiress Will accepted the Chiltern Hundreds, and made way for him. He then quietly resumed the practice of his profession, and was retained in a number of important compensation cases under the Lands Clauses Consolidation Act and rating appeals. In 1906 he obtained his appointment as County Court Judge of Circuit No. 7.

Personal.

On the recommendation of the Gas Committee, the Bingley Urban District Council have decided to temporarily fill the vacancy shortly to be created by the resignation of their Gas Engineer and Manager, Mr. H. Smith, by the appointment of one of the present employees in the Gas Department, Mr. JULIAN STEPHENSON, junr., to take charge of the works, with a salary at the rate of £125 a year.

Electrolysis of Reinforced Concrete.—The possibility of electrolytic action corroding steel embedded in concrete has suggested many experiments, during one of which three specimens were made by embedding 2-inch tube to a depth of 8 inches in the concrete. Two of the specimens were placed in water, and a steady current of 0.1 ampere was passed through them from a storage battery—the current entering through the tube, and leaving through the concrete; while the third specimen was not subjected to current, in order that a comparison might be made. The current was maintained continuously for thirty days, and it was found that unexpected deterioration of the concrete took place, large cracks appearing in it, while a layer of rust formed on the tubes, and pitting was very noticeable with an appreciable loss in weight. Some other tests made were on 1½-inch tube buried to a depth of 9 inches in a 1:3:5 concrete, and a current of 0.05 ampere was passed through and continued for seventy days. The electrolytic action was found to be very strong, and the softening of the concrete very marked. While specimens not subjected to current remained clean and bright, the others developed a coating of rust, the thickness of which increased with the duration of the flow of current, and a coating of rust was also developed on the walls of the cracks.

INSTITUTION OF GAS ENGINEERS.

Programme of the Annual Meeting.

The Programme of the Annual General Meeting of the Institution of Gas Engineers, which, as already announced, is to be held at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, from the 14th to the 16th prox., under the presidency of Mr. James W. Helps, the Engineer and General Manager of the Croydon Gas Company, has been issued by the Secretary (Mr. Walter T. Dunn).

The proceedings on the first day will be opened at 10.30 a.m. with the passing of a resolution on the occasion of the death of His Majesty King Edward the Seventh; and then will follow the submission of the minutes for confirmation, the appointment of Scrutineers, and the presentation of the Council's report (given below), with the accounts, and also the medals awarded for papers read last year. Mr. Helps will next deliver his Inaugural Address, and the reading and discussion of papers and communications will be commenced. The following is a list of them :—

- Report of the Carbonization Research Committee.
- Report of the Gas-Heating Research Committee.
- Report of the Refractory Materials Research Committee.
- "Public Lighting from a Municipal Point of View," by Mr. Jacques Abady, of London.
- "Experiments in Carbonization on the Birmingham Coal-Test Plant," by William B. Davidson, D.Sc.
- "Gas as a Universal Fuel," by Mr. H. L. Doherty, of New York.
- "Gas Calorimetry in the United States," by Mr. J. B. Klumpp, of Philadelphia (Penn.).
- "The Latest Installation of De Brouwer Stoking Machinery and Coke-Handling Plant," by Mr. S. Y. Shoubridge, of Lower Sydenham.
- "The Management of Small Gas Undertakings and Works," by Mr. F. J. Ward, of Knowle.

On Tuesday afternoon, there will be a meeting of the Joint Commercial Sections of the United Kingdom, to which all members of the Institution are invited. On Wednesday morning, the annual general meeting of the donors and subscribers to the Benevolent Fund will be held, at which the report of the Committee of Management for 1909-10 will be presented, together with the accounts for the year ended Dec. 31, 1909, two members of the Committee will be elected to succeed those retiring by rotation, and other business connected with the fund will be disposed of. On Thursday, the remaining papers will be taken, and the usual concluding business transacted.

As already announced, in consequence of the national mourning, there will be no reception and dance by the President and Mrs. Helps at the Galleries of the Royal Institute of Painters in Water Colours, Piccadilly, on the evening of the first day of the meeting; but they will entertain the members at tea on Friday afternoon, at the Japan-British Exhibition. In the morning, a visit will be paid to the Croydon Gas-Works, at the close of which the members will be invited to partake of luncheon by the Chairman and Directors of the Gas Company. Arrangements will be made for the subsequent conveyance of the party to the Exhibition; and after tea the evening will be at their disposal.

Annual Report of the Council.

Before proceeding with the annual report, the Council desire to express their profound sorrow for the loss which not only this country but the whole civilized world has sustained by the death of His late Majesty, King Edward the Seventh. A resolution of respectful sympathy with the Queen Mother and the other members of the Royal Family and of loyalty to King George V. will be submitted for the adoption of the members at the forthcoming meeting of the Institution.

Membership.—As will be seen from the statement below, the total membership at the close of the year 1909 was 829—an increase of four as compared with the previous year. The additions to the register comprised one honorary member, seventeen members, eight associate members, one associate, and seven students.

| Class of Member. | At Dec. 31, 1908. | Elected and Transferred during 1909. | Deceased, Transferred, and Erased during 1909. | At Dec. 31, 1909. | Increase. |
|-----------------------------|-------------------|--------------------------------------|--|-------------------|-----------|
| Honorary members | 22 | 1 | .. | 23 | 1 |
| Members | 693 | 17 | 19 | 691 | —2 |
| Associate members | 94 | 8 | 7 | 95 | 1 |
| Associates | 1 | 1 | .. | 2 | 1 |
| Students | 15 | 7 | 4 | 18 | 3 |
| Totals | 825 | 34 | 30 | 829 | 4 |

The Council regret that since the presentation of their last report the deaths of the following members have occurred :—

Honorary Member.
Emile Leclerc Paris

Members.

| | |
|-------------------------------------|------------------|
| Samuel James Acland | Newport, Mon. |
| John Henry Cox | Sunderland |
| Charles A. Craven | Dewsbury |
| George Cutler | Stroud |
| George Keyte | Workington |
| Edward Lord | Whitworth |
| John Marsland | Sowerby Bridge |
| John Meiklejohn | Yorktown, Surrey |
| D. C. Niven | Glasgow |
| Robert Sharpe | Belfast |
| Francis William Torpey | St. Ives |
| William A. M'Intosh Valon | London |
| George Wilson | Middlesbrough |

Livesey Memorial Fund.—It was announced in the Council's last report that this fund, opened with the object of perpetuating the memory of the late Sir George Livesey, by the establishment of a Professorship of Coal Gas and Fuel Industries at the Leeds University, had reached the amount of £9793 1s. 7d.—the minimum required being £10,000. Since then it has been increased to £10,820 1s. 11d., made up as follows :—

| No. of Subscribers. | | | |
|---------------------|--|---------|------|
| 14 | Institution, District Associations, and Junior District Associations | £342 | 1 6 |
| 228 | Members of the Institution of Gas Engineers | 946 | 10 7 |
| 160 | Gas companies | 7,102 | 3 0 |
| 24 | Gas committees of corporations | 540 | 16 0 |
| 55 | Members of the Society of British Gas Industries | 538 | 1 0 |
| 29 | Other manufacturers, coal owners, &c. | 308 | 13 0 |
| 95 | Other subscribers | 745 | 3 6 |
| 605 | | £10,523 | 8 7 |
| | Interest on deposit account | 98 | 11 2 |
| | Interest on current account (by special arrangement with bank) | 198 | 2 2 |
| | | £10,820 | 1 11 |

A meeting of the subscribers was held in the hall of the Institution of Mechanical Engineers, kindly lent for the purpose, on the 18th of May, at which the final arrangements were made for the establishment of the professorship. The management of the department endowed by the fund will be in the hands of an Advisory Committee, consisting of representatives of the University of Leeds, the Institution of Gas Engineers, and the Society of British Gas Industries, under the general control of the University Council. A Deed of Gift has been prepared by the Institution's Solicitors, and submitted to the University for approval.

Portrait of Sir George Livesey.—The portrait of the late Sir George Livesey, subscribed for by the members of the Institution, and painted by Mr. Edward March, now adorns the Council-room. It has been universally admired as a faithful likeness and fine work of art.

Annual General Meeting.—The annual general meeting of the Institution (the forty-sixth since its establishment in 1863 as the British Association of Gas Managers) was held at the hall of the Institution of Mechanical Engineers, Westminster, kindly lent by the Council of that body, on Tuesday, Wednesday, and Thursday, June 15, 16, and 17, under the presidency of Mr. Thomas Glover, of Norwich. The following communications were read and discussed :—

- Report of the Carbonizing Committee.
- Report of the Gas-Heating Research Committee and Explanatory Note by the Chemist to the Committee, Mr. E. W. Smith, M.Sc., of Leeds.
- "Carbonizing," by Mr. J. Ferguson Bell, of Derby.
- "Illuminating Efficiencies of Carbon Monoxide and Hydrogen used in Conjunction with Incandescent Mantles," by Mr. Arthur Forshaw, M.Sc., Institution Fellow, of Leeds.
- "A Study in Working Costs," by Mr. Herbert Lees, of Hexham.
- "Carbonization in Chamber Settings," by Dr. Rudolf Lessing, of London.
- "Relative Capital Accounts of Gas Undertakings Owned by Companies and Local Authorities," by Mr. Arthur Valon, of London.
- "Some Advantages and Disadvantages of a Hot-Coke Conveyor," by Mr. Robert Watson, of Doncaster.

The three medals which are offered annually in connection with the papers read have been awarded by the Council as follows: The London Gold Medal to Mr. J. Ferguson Bell, for his paper on "Carbonizing;" the Institution Silver Medal to Dr. Rudolf Lessing, for his contribution on "Carbonization in Chamber Settings;" and the Institution Bronze Medal to Mr. Robert Watson, for his communication on "Some Advantages and Disadvantages of a Hot-Coke Conveyor."

A reception and dance were given by the President and Mrs. Glover on Tuesday, the 15th of June, at the Galleries of the Royal Institute of Painters in Water Colours, and were greatly enjoyed by the large number of members and friends who attended.

On Friday, the 18th of June, an excursion was made to Norwich and the works of the British Gaslight Company visited, through the courtesy of the Chairman and Directors, by whom the party were generously entertained at luncheon. The afternoon's programme, including a visit to the famous Broads and an inspection of the Cathedral, was kindly provided by members and officers of the Norwich Corporation.

Affiliation.—During the year another District Association—the Wales and Monmouthshire District Institution of Gas Engineers

and Managers—has become affiliated with the Institution, bringing the number of affiliated Associations to eight.

The representation of the District Associations on the Council for the year 1909-10 was as follows:—

| | |
|--|---------------------|
| Eastern Counties Association. . . | Mr. C. F. Ruggles. |
| Irish Association | Mr. T. Frizelle. |
| Manchester District Institution . . | Mr. W. Whatmough. |
| Midland Association | Mr. W. Langford. |
| North British Association. . . . | Mr. W. Blair. |
| North of England Association . . | Mr. W. Ford. |
| Southern District Association . . | Mr. James Paterson. |
| Wales and Monmouthshire District Institution | Mr. T. Canning. |

Examinations in "Gas Engineering" and "Gas Supply," 1910.—Mr. W. Doig Gibb having resigned the position of Examiner in "Gas Engineering," the Council were invited by the Technological Committee of the City and Guilds of London Institute to nominate a successor. Mr. Thomas Glover, Immediate Past-President, was accordingly approached, and he kindly consented to accept the post, and was duly appointed by the Committee. With reference to his first examination, which was held on the 16th of April last, Mr. Glover reports that 304 candidates presented themselves; 106 taking the Honours, and 198 the Ordinary paper, compared with 311 last year (116 Honours and 195 Ordinary). Mr. J. H. Brearley, the Examiner in "Gas Supply," reports that there were 303 candidates examined in that subject on the 23rd of April last, comprising 93 in the Honours and 217 in the Ordinary Grade, against 315 last year (80 Honours and 235 Ordinary).

Gas Standard Burner.—With further reference to the statement in the Council's last report in regard to efforts which were being made for introducing a Bill into Parliament to prescribe a standard burner (the "Metropolitan" argand No. 2) to be used throughout the United Kingdom for the official testing of the illuminating power of gas, the Council note with satisfaction that the Gas Companies (Standard Burner), (No. 1), (No. 2), and (No. 3), Bills, which were promoted by the Gas Companies' Protection Association, have passed the House of Lords, and await the second reading in the House of Commons on the re-assembling of Parliament. These Bills, if passed into law, will be an important step in the direction of unification of the testing standard, which is so greatly desired by the gas industry.

Accounts of Local Authorities.—The Council have had their attention drawn to the action of the Institute of Municipal Treasurers and Accountants in appointing a Committee to consider regulations for financial organization and administration, the effect of which, if adopted, would be to place the financial control of every department, whether trading or non-trading, in the hands of the Finance Committee and the Financial Comptroller, who would override the powers now exercised by the other committees and chief officers of the various departments. Believing that the adoption of such proposals would be detrimental to the interests of the gas departments concerned, the Council directed that a circular should be issued to the members of the Institution, expressing the hope that they would use every effort to strenuously oppose the movement suggested. The Municipal Tramways Association, who are taking a leading part in the opposition, report that a Sub-Committee has been appointed to endeavour to obtain an interview with the President of the Local Government Board on the subject in question.

Income-Tax and Depreciation.—The attention of the Council has also been directed to a circular issued by the Board of Inland Revenue, with regard to the allowance of income-tax in respect of depreciation of gas undertakings. They referred the matter to the Parliamentary Committee, who, in considering it, were kindly assisted by Mr. W. A. Schultz, F.C.A., whose knowledge and experience they found of great advantage.

In support of the view that an allowance should be made from the profits assessable under Schedule D, in respect of depreciation for wear and tear of plant and machinery, the Committee report:

The Income-Tax Act, 1842 (5 & 6 Vict., Cap. 35), Section 60, Schedule A, Rule No. 3, provides—

"The annual value of all the properties hereinafter described shall be understood to be the full amount for one year, or the average amount for one year, of the profits received therefrom within the respective times herein limited."

The properties are described in the third sub-section, which includes "Gas-Works." Gas-works are therefore assessed under Schedule A, Rule 3.

The Revenue Act, 1866 (29 & 30 Vict., cap. 36, sec. 8), provides—

"The several and respective concerns described in No. 3 of Schedule A of the said Act (above quoted) passed in the 5th and 6th years of Her Majesty's reign, chap. 35 (A), shall be charged and assessed to the duties hereby granted in the manner in the said No. 3 mentioned (the preceding one year's profit), according to the rules prescribed by Schedule D of the said Act, so far as such rules are consistent with the said No. 3."

This in effect transfers the assessment from Schedule A to Schedule D. The allowance of depreciation is made obligatory in the Customs and Inland Revenue Act, 1878 (39 & 40 Vict., cap. 16), Part 2, Taxes, Section 12, which provides—

"Notwithstanding any provision to the contrary in any Act relating to income-tax (A), the Commissioners for general or special purposes shall, in assessing the profits or gains of any trade, manufacture, adventure, or concern in the nature of trade chargeable under Schedule D (b) or the profits of any concern chargeable by reference to the rules of the schedule (c), allow such deduction

as they may think just and reasonable as representing the diminished value, by reason of wear and tear during the year, of any machinery or plant used for the purposes of the concern, and belonging to the person or company by whom the concern is carried on," &c.

The principle of allowance for depreciation is re-affirmed in the Finance Act, 1907, 7 Edw. 7, cap. 13, section 26, which provides—

"(1) For the purpose of enabling deductions for wear and tear to be allowed by the additional Commissioners, claims in respect of those deductions shall be included in the annual statement required to be delivered under the Income-Tax Acts of the profits or gains of the concern for the purpose of which the machinery or plant is used, and the additional Commissioners in assessing those profits and gains shall make such allowances in respect of those claims as they think just and reasonable."

"(4) In this section the expression 'deduction for wear and tear' means the deduction allowed, or which would be allowed under section 12 of the Customs and Inland Revenue Act, 1878, as representing the diminished value, by reason of wear and tear during the year of machinery or plant used for the purposes of any trade, manufacture, adventure or concern."

In cases of claim for depreciation, the two last-named Acts may be relied on—viz.: The Customs and Inland Revenue Act, 1878, and the Finance Act, 1907, which both explicitly state that the Commissioners shall allow such deduction as they may think just and reasonable, and that therefore they have only to decide what amount is just and reasonable.

Commercial Sections.—The Council having considered the suggestion of the Commercial Section of the Southern District Association, that steps should be taken for the systematic advertising of the advantages of the use of gas, recommend that this and other questions should be discussed at a conference of all the Commercial Sections to take place in the afternoon of the first day of the Institution's meeting; and arrangements for carrying this into effect have been made accordingly with Mr. S. Meunier as Convener and Mr. H. Kendrick as Hon. Secretary. All members of the Institution are invited to this conference, at which a report of the Joint Commercial Sections of the United Kingdom will be submitted.

Visit of the German Association of Gas and Water Engineers.—Arrangements for a visit of the members of the German Association of Gas and Water Engineers for the week ending the 28th of May, in response to the invitation addressed to them by the Institution, were being made, and were in fact practically completed, when the lamented death of King Edward occurred, in consequence of which, and at the suggestion of the German Association, who sent a kind message of sympathy and condolence, it was decided to postpone the visit until the autumn.

Société Technique de l'Industrie du Gaz en France.—A similar message expressing the deep sympathy and condolence of the Société Technique de l'Industrie du Gaz en France on the death of the King was received from the President of that Society.

THE SPECIAL PURPOSES FUND.

The important work which is being conducted by means of the Special Purposes Fund was continued during the past year; and valuable results were obtained. The Council regret to observe that only 103 undertakings are represented in the list of contributions to the fund. They would ask members connected with those undertakings not subscribing to bring the claims of the fund before their Committees or Boards of Directors, so that their assistance may be given to the work which, carried out for the benefit of the whole industry, should be supported more adequately.

Carbonization.—The Sub-Committee having in hand the investigation of the various methods of carbonization—Messrs. Charles Carpenter (Chairman), Edward Allen, J. Ferguson Bell, A. E. Broadberry, Thomas Glover, W. Langford, John W. Morrison, Alexander Wilson, and S. Y. Shoubridge (Hon. Secretary)—report that they have been disappointed in their endeavours to arrange for a comparative test, made as far as possible under identical conditions, of the three best-known systems of vertical retorts, difficulties having arisen which necessitated the abandonment of the project. One of the members of the Committee has, however, furnished the details of an investigation into the working of horizontal retorts with full charges; and this communication will, it is thought, form a valuable supplement to the paper he contributed last year to the Institution's proceedings. The particulars of this investigation will be presented at the forthcoming meeting of the Institution.

Gas for Heating Purposes.—The investigation into the hygiene and economical application of gas for heating purposes has been continued in the Department of Fuel and Metallurgy of the Leeds University, under the direction of the Sub-Committee, consisting of Messrs. John Bond, J. H. Brearley, and Charles Wood, with whom Professors Smithells, William A. Bone, and Julius B. Cohen have kindly co-operated as representing the University; Mr. E. W. Smith, M.Sc., acting as Chemist to the Committee. The report of the Committee, which is now being completed for presentation at the forthcoming meeting of the Institution, will contain the following sections: (1) Condensing stoves; (2) radiation efficiencies of various types of stoves; (3) variation in radiation efficiencies due to changes in the gas consumption; (4) change in the method of determining radiant heat used during the past year; (5) proposed simplification of the method of determining the radiant heat; (6) increase or decrease of the radiation efficiency due to varying the composition and shape of the fire-clay "fuels" employed in the stove, together with a short report on a few minor

points; (8) general considerations with regard to the hygienic aspects of gas-stoves.

Gas Research Fellowship.—Mr. Arthur Forshaw, M.Sc., the first holder in 1907 of the Institution's Fellowship at Leeds University, and who was appointed for a second year, gave the results of his work carried out under the direction of Professor Bone in the Fuel and Metallurgical Laboratory, in the form of a paper entitled "Illuminating Efficiencies of Carbon Monoxide and Hydrogen Used in Conjunction with Incandescent Mantles," which was read and discussed at the Institution's meeting last year. The University Senate, on the recommendation of the Board of Science and Technology, have appointed Mr. Harold Hartley, M.Sc., to the Fellowship for the year 1909-10; and he is now engaged, under Professor Bone, on an investigation relating to surface combustion, and especially to the supposed connection between the electrical condition of a hot surface and its power of inducing gaseous combustion.

Refractory Materials.—The Refractory Materials Committee, consisting of Messrs. James W. Helps (President), E. Allen, John Bond, A. E. Broadberry, H. G. Colman, W. Doig Gibb, Thomas Glover, Thomas Goulden, D. H. Helps, W. R. Herring, Edward Jones, James Paterson, S. Y. Shoubridge, Alex. Wilson, Harold W. Woodall, and F. J. Bywater (Hon. Secretary), report as follows:—

For the purpose of obtaining definite information with regard to the life of the material now used, and the temperatures at which it is employed, inquiry forms have been sent to a number of representative works. The opinion of engineers has also been invited as to the desirability of drawing up standard specifications for different kinds of refractory material, on the question of an independent testing laboratory, &c. Very useful information has been obtained as a result of the inquiry, and conferences are now being held with representatives of the retort and fire-brick manufacturers through the Society of British Gas Industries, to see how far the requirements of the industry can be met. The Committee hope to be able to present a full report dealing with the whole matter before the time arrives for making contracts for next season's requirements.

Unification of Gas-Threads.—The President and Mr. Thomas Glover represented the Institution at the second session of the International Commission appointed by the Société Technique de l'Industrie du Gaz en France to deal with the "Unification of Pipe-Threads," to which reference was made in the Council's last report. The report of the proceedings of this second session was given by Mr. Helps at the close of the Institution's annual meeting last year.* Mr. Glover desiring to relinquish his position as representative of the Institution, the Council have accepted his resignation with regret, and have pleasure in reporting that Dr. R. T. Glazebrook has kindly consented to act in his place. The third session of the Commission is expected to be held in Paris later in the year.

JAMES W. HELPS, *President.*
WALTER T. DUNN, *Secretary.*

May 27, 1910.

Appended to the report is a list of the additions made to the library during the year, for which the Council express their thanks; also the statement of accounts and balance-sheet for the year ended Dec. 31, 1909, duly certified by the Auditors, Mr. James L. Chapman and Messrs. Wood, Drew, and Co., and a list of contributions to the Special Purposes Fund.]

Report of the Benevolent Fund Committee.

The Committee report that during the year ended Dec. 31, 1909, the amount of £264 14s. 9d. was received. Subscriptions produced £143 2s.; donations, £11 13s.; interest on investments, £105 0s. 1d.; and income-tax refunded, £4 19s. 8d. The expenditure amounted to £284 2s. 10d.; £255 10s. having been granted in the relief of twelve necessitous cases, and £28 12s. 10d. expended for printing and stationery, postages, bank charges, and incidental expenses. There was thus a deficit of £19 8s. 1d., in consequence of which the Committee were unable to deal with all the applications for assistance received at the close of the year. They would therefore again appeal to the members who do not subscribe to the fund, in the hope that they will kindly become contributors, and thereby enable the Committee to grant adequate relief to every applicant whom they consider eligible. With the object of increasing interest in the fund, alterations in the rules have been made, whereby the Honorary Secretaries of the District Associations affiliated with the Institution have been added to the Committee of Management, and providing also for nominations by contributors for service on the Committee.

[The list of contributors for the past year and copy of accounts, duly certified by the appointed Auditors, Mr. James L. Chapman and Messrs. Wood, Drew, and Co., are appended to the report.]

* The Council give the text of the report, which appeared in the "JOURNAL," for June 22, 1909, p. 885.

Masonic.—The installation of Bro. John Mackay as W.M. of the Northern Star Lodge, No. 3053, was duly carried out last Friday at Manchester. It may be remembered that, in consequence of the severe illness of Bro. Mackay, this ceremony, which should have taken place last February, had to be postponed; but as a very material improvement has taken place in his health, he was able to attend last week, and was installed by W. Bro. Surtees, I.P.M.

CAUSES OF DESTRUCTION OF REFRACTORY BLOCKS AND RETORTS.

By ALFRED B. SEARLE, Ph.D.

(Concluded from p. 494.)

RESISTANCE TO BLOWS.

An important characteristic of almost all fire-clay products is their resistance to accidental damage by blows from either material or from the tools used by the workmen. There is not usually much difficulty in selecting goods which are reasonably strong in this respect; and the provision of a special test for the purpose is scarcely needed. If the goods are satisfactory in all other respects, they will scarcely fail in this. It is, however, important to notice that "hardness" is often recommended as a characteristic in favour of retorts and blocks—chiefly with a view to suggesting that they will, for this reason, resist blows of various kinds. This, is, of course, true; but excessive hardness is often synonymous with brittleness, and is almost invariably accompanied by density, and consequently by a low resistance to sudden changes in temperature. Hence, the wise engineer will usually pay less attention to the resistance of these materials to blows than to their other characteristics; for even in the worst cases, fire-clay is by no means a weak material as far as abrasion is concerned.

CRUSHING STRENGTH.

What is far more important is the ability of the retorts, and especially blocks and bricks, to resist the pressures to which they are subjected in daily use. Unfortunately, it is very difficult to set any minimum strength in this respect; for the behaviour of a clay at high temperatures is so widely different from what would be assumed from the results of an ordinary crushing test, and the difficulties in the way of carrying out a crushing test at a temperature of 2000° Fahr. are very great. The present writer has, on several occasions, built bars of the same material as the blocks into a special furnace and has heated these in a manner as nearly as possible like that used in heating ordinary gas-retorts; the bars being loaded with fire-bricks placed on their centres until the breaking point was reached. Owing to the great loads required where the material is suitable, this test can only be regarded as of value when sorting out undesirable materials, and then only those of the weakest kind. Rough as it is, however, the test has served to demonstrate the great loss in strength which occurs when fire-clay products are heated to redness or to still higher temperatures, which are still far below the temperature at which they begin to lose shape. The author has also attempted to test the strength of various retort and block mixtures by placing them in a retort-setting and firing them in the absence of a retort, but with a vertical bar (properly protected with fire-clay) resting on them—pressure being applied to this bar by means of powerful chains attached to a cross beam resting on the top of it. The tension on the chains was caused by loaded waggons; suitable pulleys being employed, so as to avoid the necessity of a load directly over the furnace. This method is, however, too clumsy for general use, though it served to show why some blocks failed in actual use. The ordinary brick-crushing testing machine is too delicate an appliance to be used in testing the strength of materials at the high temperatures required, and some modification of it which could be used for this purpose would be a blessing to many gas engineers. As at present carried out, the crushing test on fire-bricks and retorts is practically useless, and can never be relied upon to give any indication of their strength in actual service.

At present, the most suitable means of securing that the articles are sufficiently strong is to insist that they shall be fired in the manufacturer's kilns to a temperature of not less than 2500° Fahr. (2600° Fahr. being preferable), and that the same material when heated to the point of incipient fusion shall not be appreciably diminished in porosity until it has begun to lose its shape. The latter test is a very delicate one, and requires considerable skill in its execution, as it is not usually practicable to heat samples of more than 1 oz. in weight to the high temperatures required, and consequently the variations in porosity are always small—only "trifling" errors in measurement causing large errors in the final result.

DESTRUCTIVE AGENCIES IN THE FUEL.

The defects and causes of failure hitherto mentioned have been chiefly concerned with the fire-clay products themselves. It is, however, often found that the damage or shortness of "life" is due to adventitious materials in the fuel used for heating the furnace or for making gas. Thus the contact of ashes with fire-clay at a high temperature will always cause a certain amount of fluxing, and will therefore weaken the work wherever such contact takes place. It is most marked in the flues where the fine dust, rich in alkalis, is blown with some force against the hot work and corrodes it partly by its own natural cutting action (abrasion), and partly by its chemical combination with the silica of the clay. Where such action is at all violent, bricks rich in alumina should be used, or those which are particularly hard-fired may be employed if the action of the dust is more abrasive than chemical.

Sulphur in the fuel burns to sulphur dioxide; and in the presence of air and steam this is converted into sulphuric acid,

which has a highly corrosive action upon clay goods. To some extent, the sulphur may be prevented from volatilizing by mixing slaked lime with the coal; but this, for obvious reasons, is seldom practised. It is extremely unwise to generalize on the results of a limited number of experiments—the more so as both pure clay and silica are, when treated separately in a burned state, unaffected by sulphuric acid to any appreciable extent. At the same time, the results of many of the present writer's observations tend to show that the richer a fire-clay is in alumina, the greater will be its resistance to the products of the sulphur in the fuel. The presence of sulphur inside the retorts is of less importance than in the furnace, as in the retorts the lower temperature reached and the absence of air prevent any serious quantity of sulphuric acid being formed in a free state.

Wet fuel is far more serious than sulphur, as superheated steam has a strong softening effect on fire-clay work, especially when the latter is porous. The proportion of moisture in ordinary coal is not sufficient to do much harm, so far as the furnace is concerned; and the carbonaceous lining of the retort after a short time of use protects the latter from serious damage. So that, unless the fuel is abnormally damp, no special precautions need be taken. A careful study of the fire-bricks used in boilers having a steam jet in the fire-box to increase the draught, will soon show the effect of heating fire-clay in presence of an excess of steam. This effect is so seldom noticed in the manufacture of gas as to be scarcely worth the attention of the gas engineer; though the fact that, under certain conditions, steam may seriously affect the durability of the retorts and brickwork should be kept in mind.

The internal strains set up in retorts when used for gas-making, and in other cases where carbon is absorbed within the pores of the material, have not been sufficiently studied to render any publication of definite results satisfactory. It is, however, well known that when heavy hydrocarbons are decomposed in fire-clay, leaving much of their carbon behind, some very noticeable changes in the strength of the fire-clay body take place, though the exact nature of the reactions remains unknown. In some ways, the action appears to be catalytic, and to be due to the fire-clay itself, as the same hydrocarbons when heated under precisely similar conditions in the absence of fire-clay require a higher temperature for the formation of free carbon, though the experiments hitherto made are by no means conclusive on the point.

The action of this deposited carbon is seldom seriously detrimental, and is often advantageous, as it fills up small cracks in the retorts, and so enables them to be used for a much longer time than would otherwise be the case. If the deposit is so thick as to be a serious hindrance to the heating of the retort (carbon being a bad conductor of heat), it may be scraped off periodically, or the retorts may be made very smooth inside by the manufacturer. In some cases, they are even covered with a thin layer of glaze; the claim being made that this facilitates the drawing and heating. Whatever action such glaze may have must be very small; and the repeated heating and cooling of the retort will soon make it break up. Its value will thus rapidly diminish. It is, therefore, questionable whether it is worth the extra expense, even though this is only small.

CRYSTALLIZATION.

Much attention has recently been paid to the crystallization which occurs when clays are repeatedly heated and are cooled slowly. Mr. J. W. Mellor has studied this matter as fully as anyone in this country, and his work has been confirmed in many directions by other observers—notably by a lengthy investigation on china clay by a Continental worker. It is essential that the heating shall be prolonged or frequently repeated and that the cooling during the earlier stages shall be sufficiently slow for crystals of appreciable size to be formed. This phenomenon is not often observed in the case of gas-retorts, though it may be readily seen if microscope slides are prepared from suitable parts of old retorts—particularly the thicker portions, where the cooling is slower. In some instances, however, it has proved important as an explanation of failure; and on this account it should not be overlooked when investigating the causes of destruction. The amount of crystallized matter is naturally greatest when the clay is rich in fluxes, though this is not invariably the case, as some of the alkaline ingredients of a clay are always volatilized at high temperatures.

CONCLUSION.

In conclusion, the present writer has avoided what may be considered as the mechanical causes of destruction apart from those of a more strictly chemical or physico-chemical nature; and for this reason he has made no reference to the right construction of settings, the best shapes of retorts, the objections to certain patterns of retort now in use, the method of firing, the rate of heating, and the mode of drawing the coke. These are all matters which have received much attention from gas engineers, and though the problems in connection with them are by no means solved, what is of greater moment at the present time is that attention should be paid to the actual texture and structure of retorts and blocks used, as these are of far greater importance than many gas engineers and fire-clay workers are aware, it is safe to assume.

The Gas Institution's action in endeavouring to work co-operatively with the manufacturers is a step in the right direction; but far more thorough work will have to be done in investigating

the problems if the truth is to be reached. At present, there is too much reliance placed on rule-of-thumb specifications; and the records of many "tests" made by gas engineers are too scanty to be of much service.

Continental manufacturers, subsidized by their Governments in various ways, have done so much in the way of preliminary investigations, and several firms in this country have, on their own initiative, done so much more, that the main lines of work in improving the quality of British retorts and blocks may be considered as definitely known. In this country, however, much of these improvements are regarded as "trade secrets," and there is still a large amount of indifference on the part of even well-known firms to enter upon any general or co-operative scheme for the improvement of their products, though they refrain from undertaking this work individually because of the probable cost. Yet everyone admits that any improvements would be a great benefit to all the industries concerned, and that by making them much of the present anxiety with regard to the importation of foreign retorts could be stopped.

When manufacturers and gas engineers unite in declaring that improvements are both desirable and possible, only one comment is possible—they must endeavour to obtain them separately as individuals or they must press for more vigorous efforts on the part of the joint body appointed for this purpose.

PURCHASING LIGHT.

DURING the past few years, endeavours have been made to educate the public up to an appreciation of the advisability of keeping before them the idea of purchasing light rather than the agent for its production; and the following remarks bearing on the subject appeared in a recent number of the "Illuminating Engineer" of New York.

The substitution of the magnetite arc for the enclosed carbon arc is one of the factors in this education. The increase in illumination is so material and evident to the ordinary observer that the public are quite willing to pay a larger price for current when used with this light source. After all is said and done, it is illumination that is wanted; and the only safe course for the central station to take is to educate the public along these lines as rapidly as can be done without encountering an undue amount of prejudice and opposition.

The most efficient electric lamps of to-day are great improvements, in point of economy of current, over those which they are supplanting; but they are a long way from being the limit of perfection in this respect. There is no telling when another lamp may make its appearance representing an equal advantage in economy. It is a self-evident proposition that another improvement over the best modern lamps equivalent to that of these lamps over their predecessors would bring about the positive necessity for central stations receiving a higher rate per kilowatt for current for lighting purposes. There is no need of expatiating upon the difficulties of raising prices; the present howl about the increased cost of living is sufficient proof. No matter what the conditions or circumstances may be that bring about an increase of price, those who must pay will object. The only sure way to avoid such objections in the case of light is for the public to get accustomed to paying for the thing which they really buy—viz., light. Then when any further improvement in its production is made, the cost can be reduced to a certain extent, and still leave a portion of the benefits to the producers.

Means of measuring illumination have been brought to a sufficient state of perfection to form a basis for cost; and it only remains for the users of light to be made familiar with the fundamental principles of illuminating engineering. Such a condition would not only obviate the serious question of the reduction in current occasioned by improvements in lamps, but would ensure a much better understanding between consumer and producer, and in the end conduce to equity and justice to both.

A Spacious Gas-Lighted Armoury.

The last number of the "American Gaslight Journal" to hand contains an illustration of the spacious armoury at Scranton (Pa.), which has been entirely fitted up for gas lighting by the Hyde Park Gas Company of that city. The drill hall, which is 120 ft. by 240 ft., is provided with sixty gas-lamps, each containing four mantles, and fitted with light opalescent globes. They are 15 feet above the floor and about 22 feet apart. The galleries, halls, and various quarters are lighted with either gas "arcs" or inverted mantle burners. According to some particulars furnished to our contemporary by Mr. E. M. Stack, of the Scranton Gas and Electric Company, the entire armoury is equipped to the extent of 60,000-candle power; and though electric current is supplied at from 2 c. to 10 c. per kilowatt in Scranton, the officials find that they get 60 per cent. more light from gas at 40 c. per 1000 cubic feet, and, moreover, have an uninterrupted and uniform service. The fittings have been designed to harmonize with the elegant and artistic decorations and furniture of the building; and the result is that the drill hall, in which many of the leading social functions of the city are held, is the most effectively lighted room in any large edifice in the State.

NEW COKE PLANT AT CROYDON GAS-WORKS.

The "Marcus" Screening-Conveyor.

WHEN the members of the Institution of Gas Engineers visit the Croydon Gas Company's works on the Friday of the week of their annual meeting, they will find much there to arrest their interest. During the past few years, to meet the ever-increasing requirements of Croydon and the neighbouring districts, to supersede that which was uneconomical by that which is economical, and to realize other advantages, reconstruction and extension work has been, almost unceasingly, in progress, until now a point has been reached at which there may be a pause for a space. It will be seen that the President of the Institution (Mr. James W. Helps) has, with his



The "Marcus" Coke-Screening Conveyor.

engineering staff, had a busy, but interesting, period during the execution of all this necessary change; and it will likewise be found that, into what has been done, there has been original introduction in design and system. The latest addition to the works is a new coke-handling plant in connection with one of the retort-houses, in which plant there has been incorporated (we believe for the first time in gas-works) the Marcus screening-conveyor of Messrs. Head, Wrightson, and Co., of Thornaby-on-Tees; the other important members of the installation being the work of West's Gas Improvement Company. The whole installation was carried out to the designs of Mr. Helps, and under his supervision.

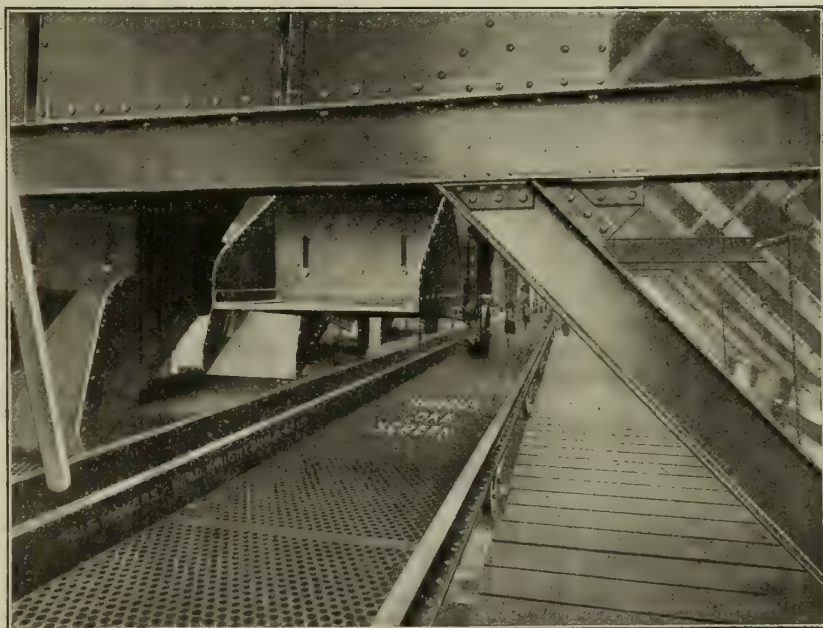
We will briefly describe the plant in the order of its operation. The coke is taken from one side of the retort-house by a West hot-coke conveyor, 206 ft. long by 2 ft. 9 in. wide, driven by a 9 brake horse power motor. Quenching the hot coke is done by means of jets of water delivered at a pressure of 60 lbs. per square inch, supplied by a two-stage centrifugal Tan-Gyro 17 brake horse power motor driven pump. The water and the fine breeze find their way through the screen over which the coke passes on its journey to the shoots by which the coke-skips are filled. The water and fine breeze fall into underground settling-tanks, where the breeze settles out—the water overflowing into another compartment, whence it is again pumped for further use. The coke-conveyor motor, and also the motor-driven pumps, are housed in a small building over the underground settling-tanks.

Turning now to the coke storage, screening, and loading plant. Over this is constructed a crane-gantry, with an extension on either side, carried upon which is a high-speed electric crane made by Messrs. Stothert and Pitt of the free-barrel three-motor type, with a 30 brake horse power lifting motor, 11 brake horse power travelling motor, and 4 brake horse power slewing motor—the respective speeds being: Lifting, 160 feet per minute; travelling, 160 feet; and slewing, 340 feet. The crane will deal with a skip of coke from three retorts, holding approximately 1 ton. While one skip is being dealt with by the crane the other skip is being filled by the conveyor and automatic shoot. The range of capability is excellent. The crane can deposit the coke in any part of the hopper; or, by travelling across the top, it can put the coke into the yard on the far side. The coke-hopper has a length of 58 ft. by 40 ft. wide, is 41 ft. to the top, and has a

storage capacity of approximately 500 tons of unscreened coke. At one end of the hopper, are small hoppers for broken coke and breeze. The whole of the broken coke required is made by passing through two "Cort's" coke-cutting machines, each with a capacity of 8 tons per hour, and driven by an 11 brake horse power motor—the small coke passing over fixed round bar screens to the hopper on either side, and the breeze into the hopper between the two. Shoots are arranged to deliver the small coke, &c., into railway trucks or carts as required. Small hoppers are fixed above the breakers, and are capable of holding one skip of coke each.

This brings us to what will be regarded as the chief feature of novelty in the installation—the two Marcus screening-conveyors (63 ft. long by 3 ft. 6 in. wide) by Messrs. Head, Wrightson, and Co., which conveyors deal with the coke deposited in the main hopper. The coke is fed on to the conveyors by a series of balanced hinged shoots along the bottom of the hopper, the angle of which can be altered to adjust the flow. The purpose of these conveyors is to load the railway trucks with screened coke direct, and they have a capacity of 30 tons per hour each. The coke as it travels along the conveyors passes over perforated bottom plates, about 10 ft. long, fixed in each conveyor, which separates out the breeze. The conveyors are driven by the patent Marcus gear, which imparts a uniform acceleration to the forward movement, and a uniform retardation to the return movement. The speed is between 72 and 80 strokes per minute. The conveyors are mounted on spring-controlled rollers, and the driving gear upon a solid concrete foundation. The motive power is supplied by a 12 brake horse power motor. On the yard side of the hoppers are a series of fixed round bar screens, with baffles, down which the coke falls for loading into carts direct; the breeze passing through the screen into the space under the hoppers.

Here we have described the whole plant in outline in the order of consecutive operation. But before concluding, it may be added that the construction of the Marcus conveyor is very simple. The trough may be made to any section, and can be fitted with perforated bottom or otherwise according to the purpose to which it is proposed to put it. The trough is supported on line rollers,



and receives a peculiar to-and-fro motion from the patent driving mechanism. The material is rapidly conveyed along the trough only on the forward motion. The propulsion gear is so constructed that, by means of cranks and a connecting link, a variable speed is produced. As the trough increases in speed, it gradually imparts sufficient impetus to overcome the frictional contact between the material and the trough on its backward stroke. The advantage of this in the case of coke will be obvious. There is nothing about the travel of the coke in this conveyor that is comparable to the jiggling-conveyor. In the Marcus form, there is not the same oscillatory movement as in the case of the latter; the travel, while rapid, being forward only, and remarkably free from vibration.

The prospectus of the Smoke Abatement Exhibition which is being organized by the Glasgow Corporation for three weeks in September and October next has been issued. It will be held in the Victoria Skating Rink.

HORIZONTAL CHAMBER SETTINGS.

IN preceding numbers of the "JOURNAL," reference was made to two articles by M. Grebel, in recent issues of "Le Génie Civil," on the evolution of furnaces, for the production of illuminating gas, with special reference to the utilization of horizontal carbonizing chambers for the purpose. In the second article he deals specially with the economics of the question.

M. Grebel points out that the horizontal chamber setting possesses naturally the advantages which are common to all similar furnaces—viz., economy of labour and high yield of gas. These and other characteristics he proceeds to consider in succession. Dealing first with labour, he gives the following as the number of working hours or "men-days" necessary in a retort-house with different systems of furnaces: Ordinary horizontal retorts, 12; ditto with mechanical stoking, 6; inclined retorts (30°), 5.5; vertical retorts, 2; chamber settings, 1. He acknowledges, however, that it is difficult to make exact comparisons, as the percentage of labour may vary with the organization of the works, the size of the gangs, and the greater or less efficiency of the arrangements for the supply of coal and the removal of coke. He thinks that the 30 tons of coal per eight hours per man, which has been talked about, is a limit that could scarcely be reached, even with very large 7-ton installations of chamber settings. At Padua, to serve four of these settings, 20 feet in length, nine men are employed in three gangs—one of five and two of two each to supervise (though one would have been amply sufficient)—instead of the 65 men who were engaged on the former furnaces. With regard to the "life" of the setting, M. Grebel considers that this must necessarily be longer than with ordinary retorts, on account of the slight wear and tear owing to the large space available for discharging. He points out that the Rotterdam chambers have been working uninterruptedly for nearly two years without showing signs of deformation or wear. A constructor who guarantees his horizontal chambers of simple and strong construction for 600 to 800 days, will not give his inclined chambers more than 400 to 600 days. These minimum figures will, however, apparently soon be surpassed in practice, and the actual life of these settings approximate that of coke-ovens—at all events, be much longer than that of ordinary retort-settings. In regard to yield of gas, Herr Klönne's firm guarantees 1200 cubic feet per 220 lbs. of good dry gas coal containing not more than 10 per cent. of ash. If brought to the basis of chamber length, the daily production per metre (3.28 feet) run is at least 7400 cubic feet. The guaranteed illuminating power of the gas is 13 Hefner units, or close upon 12 English candles; the gas being tested with a "Metropolitan" burner No. 2 at standard temperature and pressure. The yield of gas per metric ton during a trial was 12,116 cubic feet; the heating power being 1,901,857 calories; whereas with ordinary retort-settings similar coal only produced 1,738,205 calories per ton in the same time. This difference was maintained in trials extending from August, 1908, to February, 1909. The quality of the gas decreases as the coking process advances; the gas given off in the last six hours being inferior to the other. But, as pointed out by M. Sissingh, at the meeting of Dutch gas managers early last year, all that is necessary is to mix with this gas the rich gas produced in the first six hours' carbonization in another chamber to obtain a product of suitable quality.

Coming to residuals, M. Grebel shows that the coke from chamber settings has the appearance and density of metallurgic coke, and that it is produced at the rate of about 76.7 kilos. per 100 kilos. of coal, or 72.6 kilos. in its dry condition. The yield of tar at Rotterdam is about 5.8 litres per 100 kilos. of coal, or 13 gallons to the metric ton. Its specific gravity is 1.09. It contains little naphthalene, and 2.54 per cent. of free carbon, compared with 14 per cent. in the tar from the ordinary retorts on the works. The yield of sulphate of ammonia is 11 kilos. per metric ton, compared with 8 kilos. from ordinary retorts, or an increase of 35 per cent.; indeed, during the trials, as much as 13.36 kilos. of sulphate per ton of coal were produced.*

M. Grebel thinks it would be a great mistake to suppose, as people have tried to make out, that the new systems of gas-furnaces permit the realization of considerable economy in the total working expenses. The most that can be hoped for, in his opinion, is that the sinking fund payments, the interest on the money spent on the installation, and the expenses of maintenance and for motive power, may be largely compensated for by the reduction in the cost of labour, which is the real advantage attending these new settings. At the same time it must be borne in mind that they occupy less space than an ordinary setting of retorts. Reckoned on the basis of daily carbonizing capacity, the area occupied by a setting 6 metres long is only 1.8 square metres per ton; but with the 9.5 metre type this figure is reduced to 1.6 square metres. The space before the setting to allow for discharging is practically the same as that reserved in front of 20-feet through retorts for the charging and drawing machines. Consequently, horizontal chamber settings may often be installed in existing retort-houses.

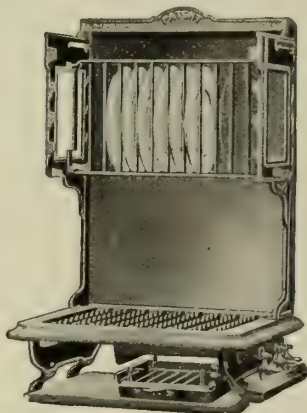
The author next offers some observations on the experiments carried out with horizontal chamber settings at Padua. They continued from Jan. 26 to Feb. 2 last, with fourteen four-ton

chambers; and the results are tabulated. The total production of gas (corrected) was 129,848 cubic metres, or rather more than 4½ million cubic feet, of gas, or at the rate of 1325 cubic metres (46,770 cubic feet) per chamber per 24 hours. Of the coke used for heating purposes, allowance has to be made for that required for evaporating the moisture in the coal. On this being done, the quantity works out to about 14 per cent. of the total weight of coal.

M. Grebel concludes his long and interesting articles by remarking that just as, notwithstanding all that has happened, there remain independent electricity stations, so there will subsist a number of small and of medium-sized gas-works using the old system of retort-settings. Nor will recuperative coke-ovens, heated by gas, altogether disappear. But he appears to regard it as possible that we shall some day see coke-ovens in operation without recovery of their bye-products.

COOKER PLATE-RACKS.

THESE are good times for the numberless people who are wise enough to adopt the use of gas for cooking purposes; for their comfort and their convenience are ever being studied by the manufacturers of culinary appliances. Well to the fore in this respect, it need hardly be remarked, are the Parkinson Stove Company, Limited, whose latest list of gas-cooking apparatus indicates that they have been devoting attention to an important point in the serving of a hot meal—namely, the warming of the plates and dishes. The accompanying illustration shows their



Parkinson's Improved Plate-Rack and Back Plate.

enamelled back plate with an improved patent plate-rack introduced by the firm. The back plate, which is enamelled white, and can be easily cleaned, prevents the kitchen walls being splashed during cooking operations. The rack on which the plates and dishes are placed for warming can be used in five positions in height, as necessity requires; and it can be drawn out (in a manner similar to the self-locking grid-shelves which are a well-known feature of the Company's ovens) without fear of the crockery being upset. Provision is further made to enable the rack to be used in a perpendicular position, which allows of the more even and thorough warming of plates, &c. It can

be fitted, of course, to different sized stoves.

A similar back plate can be had with a more simple and inexpensive plate-rack fitted at the top, so arranged that, when not required, it can be readily lowered out of position against the back plate. Those desiring something unlike either of these arrangements, can be furnished with a cast-iron hot closet (provided with a fall door) attached to a back plate, and standing at a suitable distance above the cooker top. This closet is warmed by means of the waste heat from the oven, so that when a joint is cooked a warm dish and plates are waiting for it without any additional cost in gas consumption having been incurred.

The New Building of the Institution of Civil Engineers.

The Secretary of the Institution of Civil Engineers (Dr. J. H. T. Tudsbery) has recently circulated among members a pamphlet relating to the new building in course of erection, at the corner of Great George Street and Prince's Street, Westminster, which upon completion will be the home of the Institution. It has been designed by Mr. James Miller, F.R.I.B.A., in the style of a modern rendering of the later Renaissance. On the ground floor will be the general offices, reading-rooms, and Council and Committee rooms; a handsome vestibule and hall giving the main access to these. Upon the first floor will be found the great hall, which will be a distinguishing feature of the new building, the lecture theatre, and the chief library. Further library and other accommodation, such as writing and smoking rooms, will be provided on the second floor. An interesting point of construction will be the use of timber and other products selected from all parts of the British Empire, which may be taken to symbolize the wide character and relationship of British engineers the world over.

The Federated Gas-Works in the Potteries.—At the meeting of Potteries Federated Council at Tunstall last Thursday, the Gas Committee reported that they had requested each of the Managers of the several gas undertakings to submit to the Committee a report on the whole of the gas-works in the borough, giving his views as to the most economical method of working, either separately or by coupling-up two or more of the undertakings, and to state in the report his opinion as to the best method of conducting such works, either separately or jointly. The report was adopted.

* A full account of the trial referred to was given in the "JOURNAL" for Dec. 29, 1908 (p. 902).—ED. J.G.L.

ILLUMINATING ENGINEERING SOCIETY.

Annual General Meeting.

The Annual General Meeting of the Society was held on Monday evening last week, at the Royal Society of Arts. Professor SILVANUS P. THOMPSON, D.Sc., F.R.S., the President, occupied the chair, and at the outset of the proceedings made reference to the loss the country has sustained by the death of King Edward VII.

The HON. SECRETARY (Mr. Leon Gaster) then read the report of the Council, which marked the termination of the work of the first session of the Society. An abstract of the report appeared in last week's issue of the "JOURNAL" (p. 502). In addition to the particulars then given, the following statement of the Council with regard to the character of the membership of the Society may be quoted: "The distribution of members is proportionally as follows, though naturally this can only be regarded as a very approximate classification: Electrical engineers and members concerned mainly with electric lighting, 39 per cent.; gas engineers, manufacturers of gas appliances, &c., 18 per cent.; professors of physics, experts in photometry, &c., 10 per cent.; representatives of oil, acetylene, petrol air gas lighting, &c., 8 per cent.; physicians, oculists, opticians, &c., 8 per cent.; architects, surveyors, &c., 3 per cent.; and miscellaneous, including makers of shades and reflectors, mechanical engineers, and others not exclusively connected with any one system of lighting, 14 per cent."

The PRESIDENT said they had listened to the report of the Council summarizing the work of the year. It was unnecessary to labour the points set forth; but there were two matters on which he thought it might be worth while to lay a little emphasis. The first was the extraordinary degree in which they had succeeded in enlisting the co-operation of foreign correspondents. Contributions to their various discussions had been received from both Europe and America. It was clear that they did not stand alone in this country, but received the support of those in other countries who were best qualified to speak upon the matters within the ken of the Society. He understood that their Honorary Secretary had been seeing some of those people who might have been able, had they been minded, to form another Association in Paris; but they were of opinion that they could not do better than join the English Society, and so they would continue to receive contributions to their discussions from their French friends. He thought the same might be said of Germany, Belgium, and elsewhere. The Americans, of course, had their own Illuminating Engineering Society; but they were taking a keen interest in what was being done here. The second matter to which he wished to refer was the statement in the report that the Editing and Papers Committee were now "arranging for the regular contribution of papers by individual readers upon selected topics." They were going to follow up the policy in the forthcoming session of devoting the monthly meetings to subjects which they thought would be of value to the wider circle of members who were not limited in interest to purely technical matters. It was contemplated that papers on such questions as the lighting of streets, shops, libraries, schools, &c., would be presented; and in this way the Council hoped they would succeed in enlisting the co-operation of some who had not as yet recognized the importance of the Society. He referred specially to surveyors and architects, who were an extremely important technical class. It was, he feared, because they had not realized how much they had to learn on this subject, that they had not come forward in large numbers to see what could be learnt. Those who had been working on the question for some years had been finding out all the winter how little they knew; and it was to be hoped that those who had not discovered how much knowledge there was to be gained would give the Society their support.

Mr. J. G. CLARK remarked that he did not think anyone would say, after hearing the report, that there was not a great work before the Society, both in importance and extent. Personally, he entertained the highest hopes with regard to the future; and he had pleasure in moving the adoption of the report.

Dr. R. LESSING seconded the proposition, which was at once unanimously agreed to.

The PRESIDENT pointed out that the Council elected last session were, by the rules, to remain in office for three years—it being the commencement of a new Society. When this period had elapsed, a new Council or fresh members would be appointed each year. But even during the first three years, the rules provided that there should be each year certain new members chosen by the Council. The following had been so selected, and had accepted office: Dr. W. Eccles, Mr. A. Stokes, the Chief Outdoor Inspector of the South Metropolitan Gas Company, and Mr. A. H. Seabrook. These three gentlemen represented three entirely different branches of the Society's membership—the medical and surgical profession, the gas interests, and the electrical supply industry. Then Mr. Denman Jones and Mr. V. H. Mackinney had consented to act as Hon. Auditors, though, of course, there were as yet no accounts to present.

On the motion of Mr. R. J. WALLIS-JONES, seconded by Dr. W. LEVY, it was agreed—"That the first sentence of Article 8 in the constitution of the Society, which at present reads: 'The President shall hold office for one year only, but shall, after the lapse of a year, be eligible for re-election,' shall be modified as

follows: 'The President shall hold office for one year, and shall then be eligible for re-election; but his period of office shall not exceed three successive years.'"

Proposed by Mr. T. HAYDN HARRISON, and seconded by Mr. W. OKEY, it was also decided—"That Article 25 in the constitution of the Society, relating to the payment of subscriptions, should be modified as follows: 'Subscriptions shall be dated quarterly, becoming due in the quarter of the year in which the member joined the Society.'"

Mr. WALLIS-JONES, in proposing a hearty vote of thanks to Professor Silvanus Thompson, remarked that the success which had attended the first session of the Society was very largely due to the fact that they had had such an excellent President. It was to his international reputation that they were indebted for having secured so great a measure of support from scientific men abroad. The Council had acted wisely in suggesting the alteration of the constitution, as it would enable them to retain the benefit of Professor Thompson's services as President for a further period of twelve months.

The vote having been seconded by Mr. F. J. Cox, and heartily accorded,

The PRESIDENT, in acknowledgment, said that in occupying the chair another year, he could not undertake to give the same amount of time or thought as he did last autumn to the preparation of a Presidential Address; but the Council had assured him that it would not be necessary to produce another work of such elaboration.

The other officers were also heartily thanked for their services; a compliment which was acknowledged by Mr. GASTER.

This concluded the formal business of the meeting; and the members then had introduced to them some new photometrical apparatus. There were two instruments; and both were of portable type. The first, designed by Mr. Haydn Harrison, was in the form of a long narrow box, with a scaled screen on which the readings are taken by merely placing the appliance in the light. The second, introduced by Mr. J. S. Dow, was quite a pocket apparatus, fitted with an eye-piece through which the observations are made.

Mr. HAYDN HARRISON said he had been trying to think of something that would be the acme of simplicity in the shape of a photometer; and the result was the instrument now submitted to the members—which he did not call a photometer, but an "illuminometer." With it one could walk right round a room or picture gallery, or down a street; and it was not necessary even to stand still before the observer could see what was the illumination at a particular point. Its accuracy would probably be quite as great as was requisite for this kind of work. In the hands of a man used to photometry, it would have the same accuracy as an ordinary photometer; but in those of the people he hoped would, on account of its simplicity, use it—such as architects and surveyors, who had not time to take actual measurements, but to whom a general knowledge of what was going on in buildings or streets was always helpful—it would come within 10 or 15 per cent. It had probably got the longest scale in the smallest space of any photometer; for, though only 14 inches long, it would measure from 100 candle-feet to 0.2 candle-foot. All that was necessary was to look at the instrument.

The PRESIDENT: You have certainly attained great simplicity.

Mr. Dow said his was rather a different idea—namely, to measure, by looking through the eye-piece, the intrinsic brilliancy of the surface on which was pointing the instrument at. Taking the apparatus into a school-room, for instance, the observer could get an idea of the actual conditions under which a pupil was working. It was intended for use rather by the man who knew what he was doing, than by one who had no knowledge of such work. One respect in which it was convenient was that very often when an observer might desire to study something, it was impossible to find a place to put a photometer. With his apparatus, one was not much limited by distance. So far as he had tried it, he thought that, within reasonable limits—up to about 10 feet or so—no very material difference would be found. He mentioned that Mr. Mackinney had worked with him throughout in the production of the instrument.

The PRESIDENT said this also was a simple appliance. The two instruments did not solve exactly the same problem; and he thought they would satisfy different requirements.

Mr. JOHN DARCH expressed the opinion that in time to come they would have to rely more and more on reflected light for illumination. He would even, he said, like to see the streets lit in this way. With light walls, they did not want such strong light sources. Therefore they wanted an instrument to give the reflecting power of a wall. In his opinion, this would be the only really useful instrument to an architect.

Mr. F. EDGECOME remarked that this was exactly what Mr. Haydn Harrison's instrument would do.

In the course of the report of the half-yearly meeting of the Portsmouth Water Company which appeared in the "JOURNAL" last week, reference was made to the practical completion of the new filtration works, and to the litigation between the Company and the London, Brighton, and South Coast Railway Company, in which the former were successful. These matters imposed considerable additional work upon the Engineer (Mr. Herbert Ashley, M.Inst.C.E.); and in consideration of this he has been awarded a gratuity of 200 guineas.

CONTROL OF UNIFORM CANDLE POWER.

At the Second Annual Meeting of the Pennsylvania Gas Association, a paper on the above-named subject was submitted by Mr. C. R. STULL. It was based upon communications presented at various times during the past few years—notably by Messrs. Forstall, Gartley, and Blauvelt. The following are the principal portions of the paper.

To thoroughly cover the subject, I believe it is necessary to start on the first step in the manufacture of the gas—viz., the control of the retorts or generator sets. The proper or improper working of these is a decided determining factor on the quality of gas put into the holder for distribution. In this respect, conditions vary with each individual case, as no set rule can be formulated or laid down as regards the proper heat to be employed for the most efficient operation of the retorts or generators. High heats might be desirable with certain coals and oils, which with other kinds would produce most disastrous results. It is the general result, however, that the gas undergoes a greater drop in candle power when produced with low heats. When the heats are higher, there can be obtained a harder or better fixed gas, which can usually be transmitted to greater advantage under both high and low pressure distribution.

The desirable contents in illuminating gas are the high-tension vapours, chief among which is benzene. Along with this we have certain fixed gases, by which I mean those that are stable at ordinary temperatures. A vapour at ordinary temperature exists as such below its critical temperature, and a gas at ordinary temperature exists as such above it. The general composition of the illuminants in the gas depends, in the case of coal gas, on the composition of the coal carbonized and the enriching oil, if this is used. In the case of water gas—it is dependent to a great extent on the oil employed for carburetting. The illuminants which are conserved to the finished gas are now dependent upon the heats to which this raw gas is subjected, and on the method of condensation. Oils containing more members of the paraffin and olefine series require different heats for proper fixing than oils with a benzene base. The more complex members of the paraffin series are broken-down into the lower members, which go to make up the illuminants.

In the case of water-gas practice, I believe the control of the heats should be left partially to the judgment of the gas maker. It is a very common occurrence, particularly in a small works, to find conditions varying to a greater or less extent. For instance, the fire may be in such condition to-day that it turns out more blue gas per run than it did yesterday. Assuming the same length of run, then the carburettor and superheater heats can be higher, as the volume of gas, and hence the speed of travel through the machine, is greater. If, on the contrary, the fire is not working as well, the heats could be lower, as the gas is longer in contact with the chequer bricks, and consequently has more chance of approximating the desired temperature. In speaking of high heats, I mean heats above the average practice. We are now using higher heats than were employed several years ago; and this has been the means of producing increased yields—a very desirable result. With these high heats, however, we have a "cracking process" of the hydrocarbons in the gas, by which some valuable illuminants are formed, and also some undesirable constituents. This, I believe, is the point of formation of most of the naphthalene present—two benzene rings being broken into one naphthalene and one ethylene.

Now, we will assume that the gas has come through the scrubbers and condensers with the maximum amount of desirable gases and vapours in it. Quoting from Mr. Forstall's paper:

Condensation is perfect only when the gas leaves the apparatus carrying such an amount of the most valuable hydrocarbons originally present in it, as it passes out of the retort, as will just fall short of saturating it at the minimum of temperature and maximum of pressure to which it will be subjected during its journey to the burner. The attainment of this perfection of condensation is rendered difficult by the fact that the various hydrocarbons have a solvent action upon each other, which makes it almost impossible to condense out the vapour of any of these, even though its boiling-point be high and its vapour tension low, without at the same time bringing down more or less of these vapours with low boiling-points and high tension, that, if diffused in the gas after the heavy vapours have been removed, would be retained under all conditions of temperature and pressure met with during distribution; while, on the other hand, the lighter vapours hold up at low temperature some of the heavy vapours that but for this mutual action would be condensed out at high temperatures.

Keeping in mind the effect of this solvent action, we can readily understand why it is desirable to remove the condensate from intimate contact with the gas at about the temperature at which it was deposited. One step in the attainment of this result is gradual condensation. When a gas is "shocked," the condensate first forms as a mist; thereby allowing an intimate contact between the full body of gas and its condensate. This will cause a quicker readjustment of the vapour tension still valid, with the result that the condensate will carry down a quantity of desirable high-tension vapours.

As the process of condensation is carried on, the ratio of the high-tension to the low-tension vapours is increasing; but the vapour tension of the composite mixture is gradually decreasing. This statement merely repeats the well-known law that the pres-

sure exerted by a mixture of a gas and a vapour, or of two gases, is equal to the sum of the pressures which each would exert if it occupied the same space alone. A mixture of 50 per cent. of benzene and 50 per cent. of water would exert a pressure equal to the sum of the vapour pressure of the two separate substances at the temperature of the observation. With liquids which mix readily, the pressure of the mixture is approximately the mean of the two individual pressures.

The ideal method of condensation would be one in which the base temperature was such that only the least trace of high-tension vapours could stay in the condensate, while the outlet should be the minimum which the gas would reach at any point in the distribution system. In order to determine this minimum temperature, recourse must be had to the hygrometer, which will quite accurately show the minimum to which the gas has been exposed, provided that between the point of minimum temperature and the hygrometer the gas has not come in contact with any other vapour condensate.

If at some point beyond our photometrical testing-room we can procure gas which has been chilled to a point equal to, or slightly lower than, that which it will reach at any other point in the mains, and can have the candle power at this point up to the standard, we can feel reasonably certain that it will carry to the burners. No further condensation assures no additional loss in candle power. Continuing farther along this line the experimental work with the freezing-coil and hygrometer, the candle power necessary to be carried, in order to pass this point at a predetermined minimum, may be readily ascertained. With uniformity in retort and generator house practice, this rule should hold for all cases in any individual plant.

With regard to benzol enrichment when employed with the view of equalizing variations in illuminating power, a good deal might be said. Practice strongly supports the theory that, in order to secure enrichment, the vapour tension of the enriching liquid must be above the tension of vapours already present in the gas. This was forcibly demonstrated when we endeavoured to enrich carburetted water gas with benzol. With a benzol of 78 per cent. quality, we were unable to obtain any enrichment; in some cases it proved negative. This oil gave satisfactory results on coke-oven gas of low candle power; carrying well throughout both the low and the high pressure districts. During the colder months, the quality of benzol used was above 86 per cent.; it being found that this was necessary in order to deliver a gas of standard candle power. Along with proper condensation, better carrying properties could be obtained if the gas were washed before enrichment with an oil capable of absorbing the low-tension vapours, leaving behind only the high-tension vapours.

During the past two years, my own experience has been almost entirely with benzol enrichment. It has been on varying ratios of water gas and coke-oven gas, which, coupled with variable weather conditions, at times presented some peculiar problems. In the early spring, we experienced a condition, for weeks at a time, when it was not necessary to introduce any enriching oil into the coke-oven gas. This gas reaches our station at about 5-candle power, and will pick up light oils enough from the holder to enrich it to 17.5-candle power, above which it will not go, but will repeat the operation for a considerable period of time. Of course, the reverse operation is experienced later in the year. This gas carries well on low-pressure, but not so well on high-pressure, distribution; re-enrichment being necessary. By comparing the enriching values and drip-oil tests in the following table, it can easily be seen that the candle power was due almost wholly to condensable vapours:

| Month. | Temperature. Candle Power of Gas. | | | | Candle-Feet. | Darby. C.P. | Drop. |
|----------|-----------------------------------|------------|------------|--------|--------------|-------------|-------|
| | Air. | Water Gas. | Coke-Oven. | Fixed. | | | |
| February | 38 | 20.0 | 7.6 | 17.3 | 18,900 | 11.7 | 5.6 |
| March | 38 | 20.2 | 8.1 | 16.9 | 18,900 | 15.2 | 1.7* |
| April | 50 | 19.0 | 7.0 | 16.8 | 34,100 | 16.1 | 0.7† |
| May | 61 | 20.1 | 8.0 | 16.8 | 52,500 | 16.1 | 0.7 |
| June | 71 | 20.8 | 6.5 | 19.0 | 27,600 | 15.2 | 3.8‡ |
| July | 74 | 19.8 | 6.5 | 19.0 | 30,100 | 17.1 | 1.9 |

* Less water gas than in February; better grade of light oil.

† Less water gas than in March. Note increase in air temperature.

‡ Excess of water gas over coke-oven gas.

High-Pressure Drip Oil Test.

| | | February. | August. |
|--------------|----|----------------|---------------|
| Up to 202° | .. | 36.5 per cent. | 0.6 per cent. |
| 202° to 212° | .. | 60.0 | 4.0 |
| 212° to 260° | .. | 93.0 | 41.5 |
| 260° to 302° | .. | 97.0 | 70.0 |

The heating values were as follows: Water gas, 619 B.Th.U.; coke-oven gas, 575 B.Th.U.; mixed gas, 603 B.Th.U.

The Midland Association of Gas Managers will hold their spring general meeting on Thursday of this week at Smethwick, on the invitation of the Corporation Gas Committee. After being received at the Council House by the Mayor (Alderman W. H. Goodyear, J.P.), the Chairman and members of the Gas Committee, and the President of the Association (Mr. Vincent Hughes, the Gas Engineer to the Corporation), vehicles will convey the visitors to the gas-works, which will be inspected under the guidance of the President and his assistants. Lunch at the invitation of the Mayor will be followed by a drive to Warley Park and Abbey and a visit to the works of Messrs. W. & T. Avery. The Chairman of the Gas Committee (Alderman C. W. Pinkney, J.P.) will afterwards entertain the members at tea.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at Burnley.

The One Hundred and Fifty-Seventh Quarterly Meeting of the Manchester District Institution of Gas Engineers was held at Burnley on Saturday. The programme included a visit to the gas-works of the Burnley Corporation, chiefly for an inspection of the Woodall-Duckham system of vertical retorts which have been installed there, and are now at work. The party numbered about ninety.

On arriving at the gas-works, the party assembled in the laboratory, and were welcomed by Alderman H. Emmott, J.P., the Chairman of the Gas Committee of the Corporation, Mr. J. W. Clough, the Vice-Chairman, and Mr. J. Petty Leather, the Engineer and Manager. Then a move was made to the retort-house for an inspection of the installation of vertical retorts; most of the time being spent in this part of the works. Mr. Duckham and Mr. Leather, with their assistants, explained the working of the plant to those seeking information in regard to it. Opportunity was also taken by many to view the new coal-stores and the coal-handling plant installed there by the West Gas Improvement Company; also the inclined retorts, the carburetted water-gas plant, the exhausters, and the sulphate of ammonia plant. Subsequently the party assembled at Brunswick Schools, opposite the Town Hall, where luncheon was partaken of, on the invitation of Alderman Emmott and Mr. Clough.

The Business Meeting.

The Business Meeting was held in the same building—Mr. H. KENDRICK (Stretford) presiding.

THE DEATH OF THE KING.

Before the business was proceeded with, the PRESIDENT said it was impossible for a body of Englishmen to meet under any circumstances just now without reference being made to the cloud which rests upon the country by reason of the death of the King. It was not his intention to enter into a panegyric of his late Majesty, even if he were capable of it; but this he would say—that the name of Edward the Peacemaker would be remembered and revered as long as British history lasted. The Committee, anticipating the wish of the members, sent the following resolution to King George V.: "His Majesty the King, Buckingham Palace—The Manchester Institution of Gas Engineers, gratefully recognizing the advantages enjoyed under the glorious rule of King Edward VII. of glorious memory, humbly tender through me, the President, to your Most Excellent Majesty, our profound sympathy with you and the Royal Family; and our earnest hope is that you may happily be long spared to your people to carry on the rule so wisely exercised by your revered predecessor.—H. Kendrick." To this message they had received a reply as follows: "H. Kendrick, Gas-Works, Stretford—The King thanks the Manchester Institution of Gas Engineers for kind message of sympathy and their loyal assurances."

SYMPATHY WITH THE HON. SECRETARY.

The PRESIDENT said there was another matter he desired to refer to before they proceeded. Their Secretary, as some of them knew, had, owing to illness, been away from home for a long time. They were glad to see him back among them again. He (Mr. Kendrick) was certain he was expressing the wish of them all when he said they hoped Mr. Whatmough would have a happy and speedy recovery to health. (Applause.)

Mr. WHATMOUGH thanked the President and the members for their kindly interest, sympathy, and wishes on his return to the secretaryship.

THE OCTOBER MEETING.—STRETTFORD'S INVITATION.

After the minutes of the previous meeting had been confirmed and letters of apology read from gentlemen unable to attend that day,

The PRESIDENT announced that he had been empowered by his Directors to extend an invitation to the members of the Institution to visit Stretford on the occasion of their next meeting, which would be in October. He assured them that if the Committee thought fit to accept the invitation, they would receive a hearty welcome from his Directors.

PROGRESSIVE BURNLEY.

Mr. J. W. MORRISON (Sheffield), in moving a vote of thanks to the Chairman and members of the Burnley Gas Committee for having invited the Institution to hold their meeting in Burnley that day, said Mr. Leather must feel highly honoured in having a Chairman and Committee who took such an interest in the progress of the gas undertaking and put down the installation of vertical retorts they had inspected that day. The visit had been a most instructive one to many of them. The installation they had seen certainly did credit to the firm who had erected the retorts. They all sincerely hoped that the installation would turn out a success, and that the Gas Committee and Mr. Leather would reap a full reward for their progressive enterprise.

Mr. T. BANBURY BALL (Rochdale), in seconding the vote, said the visit to Burnley was of peculiar interest to him, because of the

decision arrived at by the Rochdale Corporation with regard to the erection of vertical retorts. Mr. Leather and himself were, he believed, early competitors in the race for the installation of inclined retorts. This time Mr. Leather had the start of him in the matter of verticals, and had adopted the Woodall-Duckham system; while they in Rochdale had decided upon the Glover-West system. Therefore Mr. Leather and he would be able before long to compare notes; and it would be interesting to see which of them was best satisfied with his bargain. He was sure they all hoped and trusted that the installation which the Burnley Gas Committee had been so enterprising to first start would turn out everything they desired. It had been of considerable interest to members of the Institution to see an installation of such size in actual work and producing the bulk of the gas required by the town; and he was sure they would all be gratified to hear that the hopes of the Gas Committee and of Mr. Leather had been realized to the full.

The PRESIDENT, in putting the resolution to the meeting, said the Institution was deeply grateful to the Chairman of the Burnley Gas Committee and his colleagues for the opportunity afforded the members of visiting the works to see their fine installation.

The motion having been carried with applause,

Alderman EMMOTT, in responding, said it was a pleasure to him and the members of his Committee to have the opportunity of welcoming to Burnley the members of the Institution. They considered the visit an honour to their Engineer and Manager (Mr. Leather), and also to the town of Burnley, particularly at the present time. The members of the Gas Committee, he frankly admitted, were not experts in gas making; but he did say they were a Committee of business men. They had Mr. Leather as the expert—a gentleman in whom the Committee had every confidence. They had also Mr. Raymond Ross, the Works Chemist and Borough Analyst; and the two were working together in such a way that the Gas Committee had every reason to be satisfied with what was being done. With regard to Burnley being one of the first towns to put down an installation of vertical retorts, Alderman Emmott reminded his hearers that Burnley was also one of the first to go in for the inclined system; and they were put down at a time when there was some doubt about their working satisfactorily. Burnley had no reason to regret their action in installing the inclined retorts, for they had worked very satisfactorily; and they expected the verticals would do the same. When Messrs. Woodall and Duckham had finished their work, the Gas Committee had every confidence that, with Mr. Leather at the head, they would make the new installation a thorough success. Alderman Emmott went on to say that when the question of putting down this installation of vertical retorts was first of all brought before the Town Council of Burnley, it met with some opposition. Members of the Gas Committee pointed out to the Council the advantages of these retorts, and Mr. Leather put the matter in such a way as to convince them as business men that it was the right thing to do. Now they had had the verticals at work for a month or two; but he did not think they were quite up to perfection just yet. Still, he was satisfied that before long every corporation and gas company in the country would go in for verticals. The Burnley installation was expected to be of benefit to the men and to the ratepayers. There was one thing they expected from the system—an improvement in regard to smoke, steam, and draught. The difficulty his Committee had in the Council was that, by putting down these retorts, they would do away with a certain amount of labour at the works—a point that the Labour members on the Council made a great deal of. Having got over this opposition, they expected, as a Gas Committee, being able to show before long that what they had done was justified. He (Alderman Emmott) hoped the members of the Institution had benefited by their visit to Burnley, which, he incidentally mentioned, was the largest cotton manufacturing centre in the world, and also had the largest loom-making industry in the world. The gas undertaking of the town, he added, had been a thorough success since it was taken over by the Local Authority some sixty years ago. They had handed over in relief of rates out of the profits more than their debt stood at the present time; and they had gas at 2s. 3d. per 1000 cubic feet, less 5 per cent. Another thing Burnley prided itself upon in its gas undertaking was that they worked as cheaply as any gas-works in the country, which was a matter of great satisfaction to him and his Committee.

APPEAL FOR THE GAS INSTITUTION BENEVOLENT FUND.

The PRESIDENT, in calling attention to a circular which members had received as to the Benevolent Fund of the Institution of Gas Engineers, said an appeal was made to them about three years ago, and the suggestion put forward that an effort be made to obtain 100 subscribers to the fund from the Manchester Institution. They actually succeeded in obtaining 61 subscribers to the fund, which was doing a really useful work—one that was capable of extension, and the need for which he thought was admitted by all. It was impossible to carry on the work of the Benevolent Fund Committee as it ought to be without money; and an appeal was now made for more subscribers. He was sure all would agree that the great work done in helping the widows

and families of gas engineers left in needy circumstances was worthy of their generous support. The report which members had received that day showed that the amount of cash subscribed during last year (1909) was £143, and that the payments totalled £255. When they considered that they had only about 160 subscribers out of a total of 862 members of the Gas Institution, he thought they would agree it was a condition of affairs which did not reflect to the credit of the Associations, and a condition which they ought to do their utmost to amend. Mr. Kendrick added that the Manchester Institution had 61 subscribers in 1907, 46 in 1908, and 42 in 1909. The figures for the past year were really better than they looked, because he found that 16 members who subscribed in 1908 did not do so in 1909; while there were 10 new subscribers. Therefore had they retained the old subscribers they would have been about level with the year 1907. The Committee of the Manchester Institution, and Mr. James W. Helps, President of the Institution of Gas Engineers, hoped that every member would do his utmost to place this deserving fund on a much stronger financial basis. "Your Committee," added Mr. Kendrick, "decided that, as we had some £70 surplus funds in hand, we could not do better than make a donation of £10 10s. to the Benevolent Fund, in order to assist in wiping off the deficit. This money has been paid, as it was wanted in London; and I think in doing this we anticipated your wishes in the matter." He moved that the Committee's action in subscribing £10 10s. be approved.

Mr. E. A. HARMAN (Huddersfield) seconded.

Mr. T. DUXBURY (Oldham), supporting, said he was satisfied that if members only knew how the money was distributed and the circumstances of the cases dealt with, they would subscribe more generously to the Benevolent Fund. Every case that came before the Committee was thoroughly investigated by someone in the district from which it came; and he could assure the members that most of the cases dealt with were such as to call for even greater assistance than could be given. The Committee did not ask for large subscriptions; and amounts of 5s. or 10s. would be welcome. He thought the Manchester Institution ought to have 100 subscribers to the fund.

The resolution was then put, and carried *nem. con.*

UNIVERSITY EXTENSION LECTURE SCHEME.

The next item on the agenda was the consideration of the position of the Seniors to the Manchester Junior Gas Association and a University Lecture Extension Scheme.

The PRESIDENT explained that there had been several meetings with the Juniors on the subject; and so that the matter might be clearly laid before the present meeting, the Committee had prepared the following report.

Lectures on Gas-Works Subjects at Manchester University.

Your Committee have for some time past been in communication with the Manchester Junior Gas Association, with reference to their proposal to enter into arrangements with the authorities of the Manchester University to establish a course of lectures for the benefit of the gas-works juniors, and all interested in the gas engineering profession.

It is felt that the expense and distance from Leeds precludes the Lancashire juniors from attending the special lectures given there; and if the proposed course be instituted at Manchester, it would be greatly to the advantage of the gas profession in this part of the country. There is no question of rivalry with Leeds in the matter, as it is practically impossible for the vast majority of Lancashire assistants to be absent from their duties for about a day-and-a-half per week in the heart of the busy season, for the purpose of attending the courses that have been arranged during the past few years. A suggestion will be made that it would be advantageous if these special lecture courses (even at Leeds) were held in the late spring or early summer, as it is much more likely that leave of absence could then be obtained for the purpose.

Your Committee have communicated with the Institution of Gas Engineers, before giving a definite offer of help, as they do not desire to seem to be interfering in any way with the Institution's arrangements with the Leeds University. Your Committee have received the approval of the Council to the proposal, couched in very cordial terms, and stating that they wish the movement every success—with the proviso that before taking definite steps to give effect to any scheme, the whole matter shall be submitted to the Institution Council.

The main reasons for the proposed step, in addition to those already stated, are: (1) The need for higher education than at present supplied by the classes at the Technical Schools. (2) The advisability of raising the status of the gas engineer, by providing the possibility of at least a partial University training, and the direct advantage that would accrue to the industry by establishing a direct connection and interests between the Gas Associations and the Universities generally.

The Manchester University professors are willing and anxious to assist, and are prepared to advise the Synod to help financially and provide accommodation and lecturers for any approved scheme.

The general trend of the University authorities, at the present moment, is to collaborate with industry in general. At present the gas industry has connections with only one University, while other industries have special training courses in every modern University in the kingdom.

It has been arranged between the two Associations that there shall be a permanent Lecture Sub-Committee, consisting of three representatives from the Senior and Junior Associations, together with Professors Dixon and Carpenter of the Manchester University; and all lecture courses and names of proposed lecturers will be submitted to, and approved by, the Sub-Committee before being finally arranged.

The proposals are at present the establishment of two courses of lectures—one to be highly technical in character on special subjects of

great interest to the gas industry. It is suggested that this course should consist of six lectures on the following subjects: (1) Combustion of gases; (2) theory of the gas-engine; (3) photometry or light standards; (4) carbonization theories; (5) constructional engineering as applied to gas-works; (6) applied chemistry in the gas-works. The lecturers are to be three professors and three from the gas engineering profession. The probable dates will be the first Saturday in the months October to March inclusive. They are to be entirely free and open to all interested in gas engineering matters. The cost, it is anticipated, will be somewhere about £50, which, it is suggested, shall be met by contributions from the University and the Manchester Senior and Junior Associations.

The second series of lectures, which have still to be elaborated, will not entail any expense on the Gas Associations, as it is proposed to make them part of the ordinary University course. The course to consist of sixteen to twenty lectures, given in the evening from 5.30 to 7.30—being partly lectures and partly demonstrative and experimental. The lecturers and subject-matter (which would be both physical and chemical) would be under the control of the Special Joint Committee, and delivered partly by Professors Dixon and Carpenter, and partly by other fully qualified men. The suggested fee for the course is £2 2s.—this to include the provision of all apparatus required.

Your Committee desire your approval of the action they have taken in the matter, and your permission to assist further, both by their influence as your representatives and financially as our funds will allow—provided that all schemes are first submitted to, and approved by, them.

The PRESIDENT added that one other suggestion had been made which did not altogether meet with approval on the part of the Juniors. This suggestion, which came from Professor Dixon himself, was that it should be a qualification for admission to the classes that members hold a full class certificate in gas engineering or a full technological certificate. He thought it was likely the Juniors' Sub-Committee would view such a proposition with favour, but that the others would not. At any rate, this was a question which had not yet been settled—whether such a proposition should be included or eliminated from the scheme.

Mr. T. B. BALL (Rochdale) asked why it was proposed to have one set of lectures free and charge £2 2s. for the other course.

The PRESIDENT said the second part was practically a University course, and there would be some cost for apparatus.

Mr. BALL said his experience was that if one gave something for nothing it was not appreciated very much. He noticed that the first six lectures were to be entirely free, and open to all interested in gas engineering matters. This no doubt was about as wide as they could make it.

The PRESIDENT replied that the representatives of the Seniors had insisted upon it being made as wide as possible. He moved that the action of the Committee in the matter be approved, and that they be empowered to go on with the scheme which would be matured later. As to the second part of the scheme, in regard to the sixteen lectures for a fee of £2 2s., this had not been elaborated yet; and before it could be put into force, it would have to meet with the approval of the Committee of the Institution. Practically, the only thing decided up to the present moment was with reference to the six lectures. He was not able to give them the names of the lecturers, because the sanction of the gentlemen had to be obtained before publication.

Mr. J. C. BELTON (Chester) asked what the cost was to be to the Institution.

The PRESIDENT said the amount would be somewhere near £15. The Juniors were to provide about a like sum, and the University would contribute £20 or more. The University's contribution would, however, have to receive the sanction of the Synod.

Mr. J. H. CROWTHER (Wallasey) asked if it was not a fact that there were now in connection with the technical classes in Manchester sufficient facilities for young men in the neighbourhood getting the education they required in this direction. He did not anticipate they would get much more by the proposed scheme than by the technical schools through the City and Guilds of London Institute. If it was intended to go beyond this, they would be giving an advantage to the few men in the immediate neighbourhood of Manchester which would not be shared by those in other districts who could not come to the lectures.

Mr. GEORGE NIVEN (Cleckheaton) considered it would be rather costly if they had to subscribe to the Manchester University lectures as well as those at Leeds.

The PRESIDENT said the lectures at Leeds had been arranged entirely by the University authorities there in connection with the Chair of Gas Engineering; and most of them had been held in the winter session. As an example of the difficulties which men on the Manchester side had to contend with in attending the lectures at the Leeds University, involving being present on the evening of one day and next morning, he cited the case of one of his assistants who was anxious to avail himself of the facilities offered. The question was how much time it would take; and it was found that it meant a day-and-a-half per week. His Directors, though willing to grant the assistant time to attend the lectures, felt compelled to come to the decision that they would not be justified in letting him go for one-and-a-half days per week in the busy season. If the lectures had been given in the quieter seasons of the year, no doubt the case would have been different. This was the experience of one of his assistants; and very likely it was that of many more in the Manchester district. Then there was the expense in travelling from the Manchester district to Leeds and staying the night in the latter city. He ventured to

say there were not many juniors or assistants in the Manchester district in a position and prepared out of their small salaries to pay these expenses to attend the lectures at Leeds University. The Juniors of Manchester thought it possible, without in any way interfering with the Leeds University, which served certain Yorkshire towns of which Leeds was the centre, to have a similar course of lectures at the Manchester University, which would serve the needs of the districts of which Manchester was the natural centre. The Committee of the Senior Association evinced a considerable amount of sympathy with the idea; and he thought the members of the Institution might very well give the Committee the power they asked for.

Mr. J. H. BREARLEY (Longwood) thought there was some misapprehension as to the lectures at the Leeds University. Those who had taken part in the discussion seemed to think these lectures arose out of the establishment of the Chair of Gas Engineering at the University. He believed this was not the case; the lectures having been previously arranged entirely by the University of Leeds. He was under the impression that the Committee had not given the mature consideration to the matter they might have done. While being entirely in sympathy with the Manchester Juniors in their desire for education, he would like to ask whether the Committee had thought of the possibility of getting the Gas Committees in Lancashire to pay towards the education of their juniors.

Mr. J. WILKINSON (Halifax) was prepared to support the Committee in what had been done, if they would agree to the insertion of words to the effect that the cost to the Institution should not exceed £15 or £15 15s. He thought it better to have the sum fixed.

The PRESIDENT said the Committee would take care that the funds of the Institution were not unduly interfered with. In reference to the remarks of Mr. Belton, he desired to point out that the lectures arranged for would go far beyond the ordinary course of the technical school in connection with the City and Guilds of London Institute. In reply to Mr. Brearley's remark, he might say the Committee had taken into consideration the question of applying to Gas Committees in the Manchester district, and also to the Gas Companies, for financial assistance. Unfortunately, however, in Manchester and the district the ruling authority in nearly all the gas undertakings were corporations; and while the gas committees might finance such a scheme as the one before them, there were other people behind who were not so broad-minded—he referred more particularly to Elective Auditors and the Labour members. Therefore it seemed to him that gas committees would find considerable difficulty in getting a subscription to such a scheme sanctioned. Then, again, the number of gas companies in the Manchester district was few, and to ask them to contribute what was required would, in his opinion, be asking a little too much. He had no doubt that the Directors of his Company would be prepared to contribute their share, as would others, if the corporations would contribute.

Mr. T. DUXBURY (Oldham) took it that the Committee were asking the members to sanction what had been done up to the present time. He thought they might approve of what had been done with regard to the six lectures, and leave out for the present the remaining sixteen. The fact of the six lectures arranged for being given on Saturdays was, in his opinion, a great advantage. They were to be delivered by well-known men in the gas engineering world, and he believed the services of these gentlemen were to be free. He did not think it was the intention that these gentlemen should receive a fee for the lectures; but there would, of course, be their travelling expenses. As probably some of them would come from London, there would be expenditure in this direction; and he believed the University authorities were prepared to pay their share, while the Juniors were willing to pay £10 or 15. He thought, as the Juniors were showing a desire to improve their knowledge in gas engineering, they as Seniors ought to go some little way to assist them. He was prepared to second an amendment that the amount should not exceed, say, 15 or 20 guineas. The lectures would be of benefit not only to the Juniors but to the Seniors as well; and being held on Saturday afternoons, men living at a distance could very well attend.

Mr. WILKINSON moved, as an amendment, that the report be received, and that the subscription from the Institution should not exceed £20.

Mr. J. W. MORRISON (Sheffield) seconded the amendment without comment.

Mr. CROWTHER moved, as a further amendment, that the matter be referred back to the Committee for them to prepare a complete statement. He remarked that something had been said about the difficulty assistants in the Manchester district had in attending the lectures at the Leeds University, and also about the expense. This might apply, in regard to the proposed scheme for the Manchester University, to assistants who lived at a distance from that centre. He thought he was entitled to ask if something might not be done for those in the Liverpool district, who were just as badly placed in travelling to Manchester as Manchester men were in getting to Leeds.

Mr. J. E. HALL (Prescot) seconded Mr. Crowther's amendment.

Mr. T. DUXBURY remarked that as the Leeds lectures were held at a very inopportune time, and meant a day-and-a-half for those attending them, it was impossible for students in the Manchester area to take advantage of them. The lectures at the Manchester University would be given on Saturday afternoons; and therefore those desirous of attending would have no difficulty at all.

What the Committee asked for now was sanction to the arrangements made for the six lectures, which would be free. As to the other sixteen, and the question of a two-guinea fee, this would come before members again before anything definite was done.

Mr. BREARLEY said he was prepared to agree to what had been done with regard to the six lectures, and suggested that the report should be referred back to the Committee, with the exception of the part relating to the six lectures arranged for.

The PRESIDENT pointed out that the proposal of the Committee really was that the meeting should approve of the arrangements made for the six lectures, and authorize them to assist financially. Mr. Wilkinson's amendment was that the arrangements should be approved, and that the Institution should contribute a sum not exceeding £20; and Mr. Crowther's proposal was that the whole matter should be referred back to the Committee for them to bring forward what he called a complete scheme.

Mr. J. TAYLOR (Mossley) pointed out that the lectures so far at the Manchester University had always been delivered on Saturday afternoons, and had been well attended by members from the Liverpool side. He believed the Liverpool men would attend in larger numbers when these extended facilities for education were open to them.

On a vote being taken, 10 members were declared to be in favour of Mr. Crowther's amendment, and 21 in favour of that submitted by Mr. Wilkinson; while for the Committee's proposal there was no show of hands.

The PRESIDENT humorously remarked that he must vote for it himself, even if he stood alone. He then put Mr. Wilkinson's amendment as a substantive motion; and it was carried *nem. con.*

THE EDUCATION AND AUTHORIZATION OF GAS-FITTERS.

The PRESIDENT next moved the adoption of the following report on the education and authorization of gas-fitters.

Education and Authorization of the Gas-Fitter.

Your Committee have at their last few meetings discussed the vexed question of the relationship of the plumber and gas-fitter with the gas undertakings, and the general neglect of modern gas appliances by the gas-fitters generally. So serious is the position in their opinion, that they think the time has now arrived when there should be some co-operation between the Technical Schools, the Plumbers' Associations, and the various Gas Associations; and, in order to put this on a working footing, they suggest the establishment of special classes at the various Technical Schools throughout the country, where gas fitting and gas appliances, their use, fixing, adjustment, maintenance, and repair can be fully explained to all interested, and instruction given, both theoretical and practical.

To give effect to this, it is desirable that the various Plumbers' and Ironmongers' Associations throughout the country should support the proposal, and call their members' attention to the question, and suggest attendance at the classes—not only of apprentices, but their workmen as well. An examination should be held at the end of the session, and certificates of proficiency granted by the Technical School Committees and the Plumbers' Associations. It has also been suggested that the gas undertakings should in future agree not to authorize any gas-fitter who did not possess such a certificate from the Plumbers' or Ironmongers' Associations, or from the Technical School, as is the practice in plumbing to-day.

If arrangements of this kind can be made between the various authorities, it will raise the status of the gas-fitter, and give him a standing that the present-day tradesman has not. It will be generally admitted that a certificate of authorization from a gas undertaking is a considerable asset to every tradesman it is granted to, and a hall-mark of ability to the general body of consumers; and one granted under such conditions as suggested—backed up by both the Plumbers' and Ironmongers' Associations and the gas undertakings—would be a sure testimonial of fitness and ability, and be valuable not only to the gas-fitter, but to the gas undertaking as well in whose district he carried on his business.

Your Committee finally arranged for the Principals of the Technical Schools at Manchester and Salford to be interviewed, to ascertain if their Committees were willing to establish classes for gas-fitters and others, either separately or as supplementary to the already established classes in plumbing. At the same time, a full statement of our ideas and suggestions were to be forwarded to the Plumbers' and Ironmongers' Association and their co-operation enlisted.

A suggested syllabus was drafted, embodying all the matters and apparatus that an ordinary gas-fitter would be called upon to deal with, and placed before the various authorities as instructed. The deputation was most cordially and sympathetically received at Manchester and Salford, and given every encouragement to push forward with the scheme; and your Committee are pleased to report that there is no doubt that a class under a competent teacher will be started in the autumn at Manchester, while Salford have given a definite pledge and authorized the Principal to make the necessary announcements and arrangements for the proposed course of lectures, and have appointed a Manchester district gas engineer as their first lecturer.

The Executive of the Institute of Plumbers have considered your Committee's communication and referred the matter to the Advisory Committee on Plumbing to the City and Guilds Institute, London. The statement has also been forwarded to the Clerk to the Worshipful Company of Plumbers by the kindness of one of our southern friends, who undertook personally to lay it before him.

Your Committee have considerable hope that all our members will, as far as possible, interest themselves in the question, and assist them in their endeavour to retain and even strengthen our present position by inducing, not only their own maintenance men and fitters to attend the classes, but also (what is much more important) will see the plumbers and gas-fitters in their various areas of supply and impress upon them the absolute necessity of their men attending. It is only by missionary work of this description that we can hope to succeed.

Your Committee considered the advisability of remitting the arrangements and negotiations to the Institution of Gas Engineers, but finally decided that it would be better to try the experiment on a small scale in a confined area first, as it is possible there may be opposition on the part of the plumbers and ironmongers, or an attempt to impose such conditions as would make the scheme valueless. If, as we hope and trust, the venture is a pronounced success, and negotiations ensue with the various Associations already mentioned, your Committee propose to ask the Institution of Gas Engineers and the City and Guilds of London Institute to take up the question, and make the necessary arrangements to establish classes in every large centre. The President of the Institution of Gas Engineers has been kept informed of all that has transpired, and will probably himself make considerable reference to the question at the annual meeting in London next month.

The practice of a few gas undertakings of sending their apprentices to Technical Schools and paying their fees, time, and expenses, can be commended to all for their own and their Committees' consideration. Instead of offering rewards for proficiency, it has been suggested that a small increase in wages for those availing themselves of the privilege, attending the classes regularly, and showing marked ability, would be a great inducement to these young men to gain the necessary knowledge. Such men brought up on the gas-works, if they left the undertaking's employ and commenced business as gas-fitters on their own account, would be an asset to the undertaking in whose district they settled.

Your Committee desire your approval of what has already been done, and your instructions to undertake any negotiations that may be necessary—reporting the result to you at the general meetings from time to time.

Mr. R. WATSON (Doncaster), in seconding, observed that they were all very much indebted to Mr. Kendrick for having brought this matter forward in his Presidential Address. They knew the trouble caused by the gas-fitter (so-called), and they recognized the need for some such scheme as that now brought forward for their approval. He was quite certain that if this scheme was carried forward, a very considerable benefit to those who had to do with the distribution of gas from the works would result.

Mr. CROWTHER asked if a corporation or gas committee would be in a position to stop a gas-fitter if he worked in accordance with their bye-laws.

The PRESIDENT said it would mean that the "authorized" gas-fitter would get most of the business.

Mr. CROWTHER: But you will have no power over a man if he works in accordance with the bye-laws.

Mr. BELTON expressed the opinion that this was a matter that ought to be taken up by the Gas Institution, and an Act of Parliament obtained.

The resolution was then put and carried.

COMMERCIAL SECTIONS RECOGNITION.

The PRESIDENT said he was happy to congratulate the members upon the fact that the work of the Commercial Sections would in future have the sanction of the Institution of Gas Engineers. For confirmation of this remark he referred to the following paragraph of the Council's report, the principal portions of which will be found elsewhere in to-day's "JOURNAL."

The Council having considered the suggestion of the Commercial Section of the Southern District Association, that steps should be taken for the systematic advertising of the advantages of the use of gas, recommend that this and other questions should be discussed at a conference of all the Commercial Sections to take place in the afternoon of the first day of the Institution's meeting, and arrangements for carrying this into effect have been made accordingly with Mr. S. Meunier as Convener and Mr. H. Kendrick as Hon. Secretary. All members of the Institution are invited to this conference, at which a report of the Joint Commercial Sections of the United Kingdom will be submitted.

THE WOODALL-DUCKHAM VERTICAL RETORTS AT BURNLEY.

Mr. J. P. LEATHER (Burnley) then read a paper on the above subject, which is given in the second column of this page.

VENTURI METERS FOR MEASURING GAS.

Mr. J. L. HODGSON read a paper on "Venturi Meters for Measuring Large Volumes of Gases." It will be found on p. 562.

There was really no discussion on Mr. Hodgson's paper, principally on account of the late hour consequent upon the long agenda that had to be got through.

VOTES OF THANKS.

Mr. J. H. BREARLEY (Longwood) moved a vote of thanks to the readers of the papers; saying that the technical fare of the day had been quite up to the high standard of the Manchester Institution of Gas Engineers.

Mr. J. W. TURNER (Mirfield) seconded the motion; expressing regret that, owing to the lengthy nature of the business, the discussion on the last paper had had to be hurried.

The resolution having been carried and responded to, the meeting concluded.

Subsequently the members were entertained at "High Tea" by Alderman Emmott and Councillor Clough in the same building. At the conclusion of the repast,

The PRESIDENT moved a vote of thanks to the hosts. They much appreciated, he said, the excellent arrangements made for the meeting, and the hospitality of Alderman Emmott and the Gas Committee.

The resolution having been carried with acclamation, Alderman EMMOTT responded. In the course of his remarks, he said he had been a member of the Gas Committee for fifteen

years, and Chairman for twelve years. When he and his Vice Chairman were told that the Manchester Institution of Gas Engineers were to hold their quarterly conference in Burnley, both determined to do what they could to make the visit a success; and he was pleased to find their efforts appreciated.

Councillor CLOUGH also responded, and expressed the hope that the members would go away feeling that the visit to Burnley had been both pleasant and instructive.

Thus ended a very busy day for the Manchester Institution.

BURNLEY GAS-WORKS AND VERTICAL RETORTS.

By J. P. LEATHER.

[A Paper read before the Manchester District Institution of Gas Engineers, May 28.]

There never was a time of greater unrest in the gas industry. Revolutionary ideas are being promulgated and put into practice in connection with every branch of our work—from the handling of our raw material to the oversight of the finished product at the burner. The engineering, chemical, and commercial sides of gas undertakings each has its importance emphasized. This tendency to revolutionary ideas is especially evident in the very foundation of gas manufacture—the department of carbonizing; and in presenting a few notes on the Burnley Gas-Works, it is of this department I propose chiefly to speak. Other parts of the works do not present very striking features of interest.

The manufacture of gas in Burnley dates back very early in the Nineteenth Century; but the Burnley Gaslight Company was not established until 1823. In that year works were erected on the present site. The first gasholder tank is still in use for the storage of tar, and the stone pillars with girders for supporting the counterbalance weights remain in their original position with the inscription "Burnley Gas Company, 1823."

When the Company first commenced, the gas was supplied at a fixed charge per burner; and at the time the undertaking was transferred to the Burnley Improvement Commissioners (in 1855), there were still two contracts running, one at 25s. and the other at 50s. per burner per annum. The make of gas at that time was 25,915,000 cubic feet per annum. Last year the make was 692,578,000 cubic feet. In 1855, the tar and ammonia were sold for £90; last year these products realized over £7000.

Some idea of the character of the site and the nature of its growth may be gleaned from the fact that, although the present area of the works is only about 7 acres, the ground has been acquired by as many as fifteen different conveyances. This piecemeal acquisition of the land has not tended to simplicity in the arrangement of the plant; and the direction of the flow of gas on the works is a very tortuous one.

About one-third of the gas manufactured is carburetted water gas; and the plant for this purpose is of the Merrifield-Westcott-Pearson type. The distinctive feature of this plant is that the blue-water gas from the generator is conducted through a super-heating chamber filled with brick chequer-work before reaching the point where the oil is introduced. The reserve of heat in this chamber enables the gas to be brought into contact with the oil at a determined temperature—thus producing certain and consistent results. In plants in which the oil is introduced to the gas immediately it has left the generator, it is evident that the temperature will be dependent on the condition of the coke in the generator. A further feature of this arrangement is that the gas is ascending and thus counteracts the natural tendency of the oil to descend—making more sure the carrying forward of the whole of the oil. The plant is in duplicate; each section being capable of making one million cubic feet per day. The gas is usually made of a quality of about 21 candles, using a little under 2½ gallons of oil per 1000 cubic feet. In this way, the quality of the gas supplied to the town is brought up to about 17½ candles. The carburetted water gas is mixed with the coal gas at the inlet of the exhausters.

Before passing to the manufacture of coal gas, it may here be mentioned that the only holder at the Lane Bridge works is that used as a relief holder for the carburetted water-gas plant. The mixed gases from the exhausters pass successively through a Livesey washer for the removal of tar, a tower scrubber for the removal of naphthalene, a Holmes washer, lime purifiers, and oxide purifiers. They then, after measurement, are conducted by two mains, one 18 inches and the other 30 inches in diameter, across the town to the storage station. The gasholders consist of one five-lift and three three-lift holders, having an aggregate capacity of 2½ million cubic feet, or about 70 per cent. of our maximum daily output. This low proportion of holder capacity is rendered possible without inconvenience by the readiness with which the make of carburetted water gas can be altered to suit the exigencies of the demand.

To return to the gas-making plant, the old retort-houses which contained direct-fired horizontal retorts have been dispensed with, and there are now only two retort-houses, which are both situated close to the embankment of the Leeds and Liverpool Canal. The canal towing-path being at an elevation of about 40 feet above the general level of the works, the coal from the barges is easily introduced into the stores with a minimum of labour.

One of the retort-houses (erected in 1890) is fitted with two benches of inclined retorts, back to back, with a charging stage

15 feet wide between them. This arrangement, which dates from the early days of inclined retorts, has the disadvantage that men working on the charging stage are exposed to excessive heat. Each bench contains thirteen settings of six retorts. The retorts are 15 feet long by 24½ inches by 16 inches. The house is 141 feet in length and 75 feet wide. The walls are 32 ft. 6 in. high to the eaves; the roof being designed so as to accommodate the hoppers and coal-conveyors above the main tie-rods. In common with all installations of inclined retorts, the first settings were erected with ascension-pipes arranged to take off the gas from the lower mouthpieces. This led to considerable trouble in the early days of working; and all the retorts now have the ascension-pipes at the upper end, which the author conceives to be not only the natural position but the best in working and the simplest in construction. Although fairly high temperatures are employed and a considerable quantity of coal-dust is carbonized, a stopped pipe is a rare occurrence.

The other retort-house (recently erected) is 208 feet in length by 55 feet wide. The wall at the south side is 32 ft. 6 in. in height; but on the north side, which is adjacent to a coal-store, a roof truss 36 feet in span is carried on stanchions—the height of this part of the roof being 47 ft. 6 in. at the eaves. A lean-to roof, sloping down to the wall, completes the covering on the south side. In this way, sufficient height is obtained for the retort-bench, coal-hoppers, and conveyor, while the walls are kept down where the height is not required. This construction was adopted before it was decided to instal vertical retorts—being designed to accommodate inclined retorts; but it is equally advantageous for the introduction of the vertical system.

The coal-store on the north side of the retort-house is 139 feet long, with an average width of 56 feet, and is capable of storing 5000 tons of coal. The coal brought from the canal barges is tipped over a small hopper, from which it is fed over a screen on to a breaker. The coal from the screen and breaker is fed into a gravity bucket conveyor. This conveyor runs in a passage under the floor of the coal-store, and thence up a brick shaft to the roof, where it is supported on the upper part of the roof trusses, which are specially designed to accommodate it. Coal can also be fed on to the conveyor from openings in the floor of the coal-store. It is, therefore, possible with the one conveyor to deliver coal to or from any part of the store, and also to the boot of the elevator supplying the retort-bench coal-bunkers. The coal-breaker, elevators, and conveyors are driven by electric motors; the power being derived from a dynamo direct-coupled to a 40-H.P. gas-engine.

The vertical retort-bench is entirely supported on steel stanchions and girders; the bottom of the brickwork being 10 feet above the floor-level. There are nine settings, each containing four retorts. There are, therefore, 36 retorts in all, forming two rows of 18 each. The retorts are about 25 feet in length, oval in section, and taper from 29 inches by 20 inches to 20 inches by 8 inches.

The retorts are heated from producers at the front of the settings; the space round the upper part of the retorts forming the combustion chamber. The retorts with their supporting walls practically divide the combustion chamber and the whole of each setting into four parts, each of which is efficiently controlled by dampers—enabling the flow of producer-gas, primary air, secondary air, and waste gases to be regulated at will.

The coal is introduced into the retorts through a drum which rotates about once in two minutes, giving a feed of coal at each revolution more than sufficient to keep the retort always full of coal right up into the iron mouthpiece. The main work of the men on the top of the bench is to watch the coal entering the drum. If the drum does not take in coal at each revolution, it is then necessary to find the cause of the stoppage. Means are provided by which rods can be readily introduced when for any reason the coal sticks, and does not flow regularly into the retort. Stoppages occur most frequently with very soft, dusty coal—especially if the coal is one which cakes very readily. Nuts containing only a small proportion of dust do not cause much trouble in this way.

For the continuous carbonization of coal, the introduction of coal into the retort is comparatively simple. The problem of how best to remove the coke has been the one which has caused most trouble to inventors. The method finally adopted by Messrs. Woodall and Duckham commended itself to me, when I first saw it, as an admirable solution. The mechanism for this purpose resolves itself into two parts—the extractor shaft, by which the coke is continuously withdrawn from the retort, and the discharging drum, through which it passes into the open air.

The coke in the retort is supported on a curved cast-iron extension of the retort, at one side of which is a rotating shaft having projecting arms, which draw the coke out of the retort horizontally into the space over the discharging drum. This shaft rotates very slowly, making one revolution in from 45 to 55 minutes. This slow motion is obtained by a wedge-shaped pawl, actuating a grooved wheel. The pawl is driven from a rocking-shaft, the length of the arm on which it is adjustable. This adjustment regulates the speed of extraction, and therefore the rate of carbonization of the coal.

The discharging drum is similar in principle to that by which coal is fed into the retort; but, instead of continuously revolving, it is arranged to automatically reverse when it has accomplished a little more than half a revolution. Its capacity is sufficient to accommodate about half-an-hour's make of coke; and it is ar-

ranged to discharge about four times in the hour. A small quantity of water is introduced into the chamber above the extractor shaft to prevent the shaft and discharging drum from getting too hot. That the quantity of water is not excessive is shown by the fact that the coke contains less than ½ per cent. of moisture. The actual quantity of water used is about one gallon per retort per hour.

It is only during the last three days that we have been in a position to measure the gas produced by the verticals separately. I regret, therefore, that I am not yet in a position to give any results as to yield per ton of coal, inasmuch as in so short a period it is not possible to make an accurate estimate of the quantity of coal used.

In spite of many difficulties incidental to a new process, I feel that we shall soon be able to realize the hopes with which the installation was erected.

Discussion.

Mr. T. DUXBURY (Oldham) said they were all very much indebted to Mr. Leather for his most interesting description of the installation of the Woodall-Duckham system of vertical retorts; but they were at a disadvantage in not being able to discuss the subject, because they had no figures before them for the purpose. Unfortunately, Mr. Leather had not been able up to the present to dissect the working of the two plants—one for the inclined the other for the vertical. He (Mr. Duxbury) had hoped that by this meeting Mr. Leather would have had some information to lay before them as to the working of the new plant—such as the make per ton, the illuminating power more particularly, and also in respect to the tar and coke obtained from the verticals. They were all pleased with what they had seen; and they wished Mr. Leather every success with the new plant. He would like to ask Mr. Leather whether he had experienced difficulty with respect to stopped pipes. When he (Mr. Duxbury) was at Burnley five or six weeks previously, Mr. Leather had had, he understood, some difficulty in this direction when working at very high heat; and in order to ascertain if this was the cause, he contemplated reducing the temperature. He would like to know if Mr. Leather had during the last week or so experienced any benefit from reduced heat in working the retorts, and if he was still troubled with stopped pipes.

Mr. R. WATSON (Doncaster) had also a question to ask. But first of all he wished Mr. Leather and his Gas Committee success in their new installation. They all knew what Mr. Leather had achieved in the past with inclined retorts, and no doubt in good time he (Mr. Leather) would have something good to tell them about vertical retorts, after fuller experience with the working of them. The question he wanted to ask was, to his mind, an important one to those considering the matter of vertical retorts. As the Burnley installation was now complete, he would like to know if Mr. Leather was in a position to give them any information as to the capital involved—information which would be much appreciated by them all.

Mr. DUCKHAM (Messrs. Woodall and Duckham), at the invitation of the President, addressed the meeting. Dealing with the improvements which had been effected recently in the system, he said that one of the difficulties they had was with regard to the coke extraction. This had been the most troublesome part of their work. He was pleased to say, however, they had got over this trouble, and now had as perfect a control of the coke as it was possible to obtain. He was not altogether satisfied with the "show" given that day—one of the retorts having a certain amount of leakage, which was not in evidence before the previous day. There had been a change in the class of coal being tried in the retort. As to the question of capital cost, he put it down at £125 per ton, adding that in the case of a second installation the cost would not be as great. The Kensal Green plant in London was working most satisfactorily; and if they would like to see it, he would be delighted to make arrangements.

Mr. WATSON asked what the £125 per ton covered.

Mr. DUCKHAM replied that it did not include the coal-conveyor.

Mr. J. WILKINSON (Halifax) wanted to know if Mr. Leather could furnish any particulars as to the illuminating power of the gas produced from the vertical retorts and as to that obtained from the inclined retorts which he had working. He would also like to know the amount or the percentage of breeze made in the coke.

Mr. G. S. SAYNER (Harrogate) said he had been on the benches, and it seemed to him that the atmosphere was not exactly salubrious. Perhaps Mr. Leather would be able to tell them if this condition prevailed in normal times.

Mr. LEATHER, in responding, said that when Mr. Duxbury was at the Burnley works some weeks ago, they were certainly having some difficulty with stopped pipes; but he did not remember that the question of reducing the heat was spoken of as a means to ascertain if that was the cause. There was certainly something said about a slightly reduced heat with a view to trying a new coal. Whatever the cause of the stopped pipe, he did not think it would be affected by reducing the heat. There was no doubt about this—they had had difficulty in working a coal which was very dusty; and it must be remembered it took time to get used to the working of the plant. As he had remarked that morning during the inspection of the new plant, they had working on these vertical retorts men who had been accustomed to work two hours and then rest—playing draughts or dominoes—for an hour-and-a-half. These men were now more in the position of the

weaver, walking backward and forward continually to see that everything was going on all right. It took time to accustom them to this condition. They must understand that there was a fairly continuous supervision required, in order that they might find out at once if the retort was not working, because if it was not attended to immediately the trouble was intensified. The real cause of the trouble they had had was because the men did not do their work as well as they should have done. As to the cost of the installation, it was £10,400; and if they added to this the mechanical power, the capital cost would come within the figure given by Mr. Duckham—namely, £125 per ton. Answering another question put at this stage, Mr. Leather said this figure included royalties and patent rights. The plant, he added, had not been working sufficiently long and smoothly for him to give any definite figures as to the illuminating power. During the past week, it had been rather high—so high that they did not like to put it down. In regard to the coke, they did not reckon to make breeze at all. As a matter of fact, what they had was used for mixing with lime. The coke from the verticals was light, and very free from moisture. As to the observation of Mr. Sayner, he did not think that there was much to complain about in regard to the atmosphere.

VENTURI METERS FOR MEASURING LARGE VOLUMES OF GAS.

By J. L. HODGSON, B.Sc.(Lond.), A.M.Inst.C.E.

[A Paper read last Saturday before the Manchester District Institution of Gas Engineers.]

About fifteen years ago, the managers of the group of gold mines situated on the Witwatersrand (around Johannesburg) felt the desirability of establishing a central station for the supply of compressed air to the mines under their care. The difficulties in the way of such a scheme were enormous. About 40,000 H.P. in air had to be distributed to various mines along a line nearly 12 miles long—each mine taking (roughly) 2000 H.P. The capital outlay necessary was about £2,000,000.

One of the greatest difficulties in the way of the proposed scheme of air distribution was that of metering, at a reasonable cost, the air supplied to the various mines. For this reason, it for a long time seemed probable that the power would have to be distributed electrically—each mine obtaining the compressed air it needed from its own electrically-driven compressors. The balance was turned in favour of the compressed air distribution when, in 1908, Mr. J. L. Hodgson, of Messrs. George Kent, Limited, guaranteed to supply reliable air-meters by the date at which the Company were under agreement to deliver power.

The conditions laid down by the engineers of the Rand Mines with regard to the meters, were very stringent. The meters must not have any working parts in the pipe-line subject to derangement. Preferably they must be independent of the pipe-line altogether. They must correct automatically for pressure and temperature; must meter up to 2000 H.P., with the air at 120 lbs. per square inch pressure; and yet must not involve a friction drop

of more than 3 inches of water gauge. They must measure down to one-thirtieth, and register accurately down to one-twelfth of full load. Lastly, their cost must not exceed £300 to £400.

Before deciding the lines upon which the new meter was to be developed, Messrs. Kent very carefully considered the suitability of every possible type of meter. The ordinary station gas-meter was of no use on account of its high initial cost, which cost would have been still further increased by the high pressure of the air which had to be metered. Meters of the fan type were barred on account of their having derangeable parts in the pipe-line. Displacement meters fitted with pistons were also unsuitable owing to the complicated nature of their parts, and the high pressure drop involved and the large initial cost. There remained only meters which involved the use of the Venturi tube or of the Pitot tube. Finally, it was decided to base the new meters upon the Venturi tube.

Messrs. Kent had had many years' experience with the Venturi tube in connection with the metering of large water-mains. They were entirely satisfied with its behaviour as a metering instrument; but no calibration experiments of any magnitude or accuracy had been performed anywhere to test its possibilities in regard to the metering of air and gas flows.

To this end, a calibration plant, costing several thousand pounds, was erected at Messrs. Fraser and Chalmers' works at Erith, Kent, by means of which the behaviour of Venturi tubes of all sizes was investigated. It was thus in connection with the Rand Air-Power Scheme that the Venturi meter for gas measurement was developed.

The Venturi tube itself consists merely of a short length of the pipe-line, in which the area is reduced by means of a converging cone, and then increased to its original amount by a diverging cone. The two cones are connected at their narrowest part by a parallel portion known as the Venturi throat. Since the throat is of smaller area than the rest of the pipe-line, the velocity of the air is greater at this point than elsewhere. Consequently, there is a fall of pressure between the commencement of the coned part above the throat (which is called the upstream) and the throat itself—just as there must be a fall of pressure between the inside and the outside of a vessel out of which fluid is escaping. It is this fall of pressure between the upstream and the throat which is a measure of the quantity of air or gas passing through the pipe-line.

Hence, if the relation between this fall of pressure (or Venturi head) and the quantity passing be known, the flow of gas may be accurately measured by nothing more complicated than the Venturi tube and a water-gauge.

The relation between the Venturi head and the quantity passing is given by the formula:

$$Q = K.A_1 \sqrt{\frac{h}{T} \cdot \frac{V}{(N^2 - 1)} \cdot \frac{1}{D}}$$

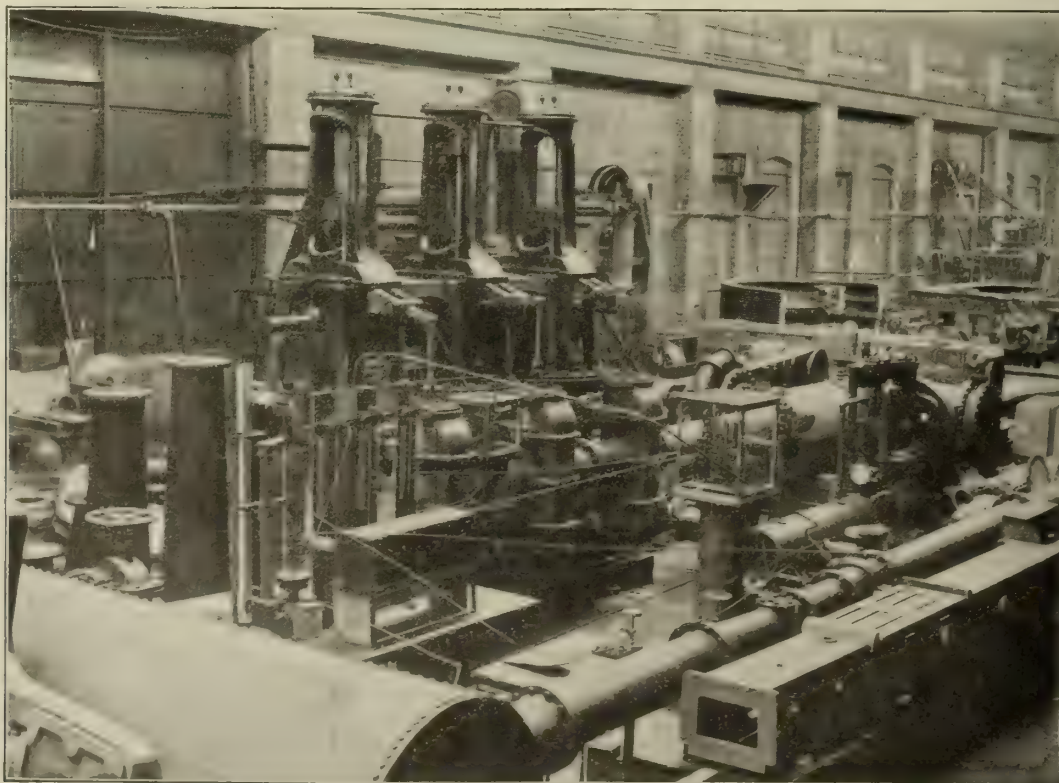
where Q is the quantity of gas passing per second, reduced to cubic feet at standard temperature and pressure.

A_1 is the area of the upstream of the Venturi tube.

h is the absolute pressure of the gas at the metering point, in inches of water.

T is the absolute temperature in degrees Fahr. of the gas at the Venturi tube.

V is the Venturi head.



The Air and Gas Meter Calibration Plant at Fraser and Chalmers' Works, Erith.

N is the ratio of the area of the upstream of the Venturi tube to that of the throat.

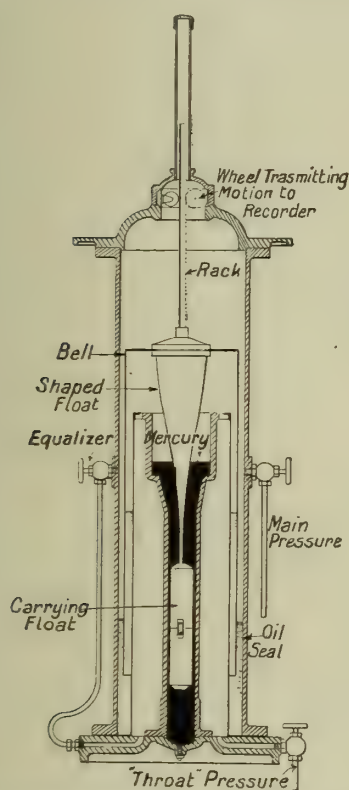
D is the ratio of the density of the gas measured to that of air.

K is a constant whose value depends upon the size and throat ratio of the tube.

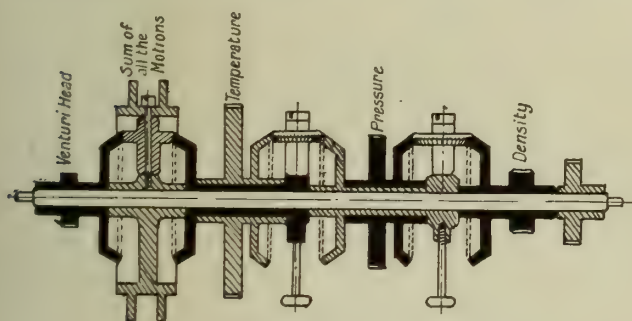
The experiments at Erith were directed to obtain the value of "K" for all sizes of tubes. This was successfully accomplished; and it is now possible with the data there obtained to say exactly, without further calibration, what will be the discharge of any particular tube.

Conjointly with these experiments, a recorder was devised by the author, whose function it was to automatically solve the equation given above; so that the quantity of air flowing, as indicated by the Venturi head, was measured and accurately recorded on a counter.

Messrs. Kent now construct three types of Venturi air and gas meters: (1) Those which correct for both pressure and temperature; (2) those which correct for pressure only; (3) those which, like the ordinary station gas-meter, correct for neither pressure nor temperature.



Bell and Float Actuating Mechanism of the Venturi Meter Recorder.



Differential Shaft on the Venturi Recorder.

It is this last type of meter—correcting for neither pressure nor temperature—which will probably prove most suitable for use in connection with gas-works, where it is part of the necessary routine to observe and make allowance for variations in the pressure and temperature of the gas. The readings of such a meter are corrected to standard pressure and temperature by means of a table of constants in the usual way.

In this connection, it is interesting to note that with the Venturi meter the corrections for any variations in the pressure and temperature of the gas are only half as great as are found with the ordinary station gas-meter.

That this is so will be obvious from an examination of the formula, where it will be seen that the correction for pressure and temperature varies as the square root of the factors, instead of being directly proportional to them as in the case of the station-meter. If, therefore, no correction for any variation of these quantities is applied, only half the error is involved.

The Venturi gas-meter recorder consists of two essential parts: (1) The part which measures the Venturi head and obtains from it a movement proportional to the quantity of gas passing at any

instant. (2) The part which converts this movement proportional to the quantity into a registration on the counter.

The Venturi head is measured by the movement of a light inverted bell immersed in an oil-seal; the throat pressure acting on the underside of the bell and the main pressure on the outside. An increase of the flow causes the bell to sink. The weight of the bell is taken by a carrying float, which is always totally immersed in mercury. The amount of movement of the bell is determined by the shaped float—the bell descending until the difference of pressure due to the Venturi head is balanced by the buoyancy of the immersed portion of the shaped float. The bell carries a rack by means of which its motion is transmitted to a wheel, and thence through a gland to a cam placed outside the bell-chamber.

At the low Venturi heads, the bell gives a movement of 1 inch with perfect definiteness for a change in the Venturi head of only $\frac{1}{1000}$ lb. per square inch, and is sensitive to variation of pressure of less than $\frac{1}{100000}$ lb.

The recorder may be placed at any distance up to 500 feet from the pipe-line; and, if desired, several recorders may be used in conjunction with one Venturi tube.

The cam above-mentioned operates a feeler and sector which rotate a stop-arm through an angle proportional to the quantity of gas flowing. The sleeve to which the stop arm is attached is carried on a shaft which is revolved once every two minutes by means of a clock. This shaft carries a pawl which engages with a ratchet wheel fixed to a third shaft on the same centre and connected to the counter. The pawl is thrown into gear each time at the same point in the revolution of the clock-driven shaft. The position at which it is thrown out of gear, and consequently the quantity added to the counter reading, is determined by the position of the stop-arm.

It is in this simple manner that the meter measures the quantity of gas flowing. The bell causes the stop-arm to move through an angle proportional to the quantity flowing; and every two minutes the clock-driven shaft adds to the counter the amount of gas passed during that time. If the flow is so variable that it is advisable to have counter readings at less than two-minute intervals, this can easily be arranged for.

The meter is thus equivalent to an ordinary station gas-meter, but with the following points of difference: (1) It has no working parts in contact with the gas. (2) The recorder can be placed at practically any distance from the gas-main; and more than one recorder may be fixed to one Venturi tube. (3) By simply changing the Venturi throat, the meter can be arranged to deal with any permanent increase in the flow. (4) Its first cost, and the cost of installation, are much less than those of a station gas-meter.

In cases where tar or naphthalene is likely to be deposited from the gas, the Venturi tube, in common with the rest of the pipe-line, becomes coated with the deposit. This can be obviated by placing a steam or hot-air jacket round the throat and the upstream of the Venturi tube during the colder months of the year.

The drop of pressure across the Venturi tube is about 3 inches of water-gauge at full load. The recorder will register down to one-thirtieth of full load. At flows below this, it automatically cuts itself out and registers nothing.

It is possible that this limitation of range will prevent the employment of the Venturi gas-meter in the smaller gas-works, where the variation of the flow may be greater than this. A range of about 1:600 can, however, be secured by installing two Venturi tubes in parallel and two recorders—one set to deal with the larger and the other with the smaller flows.

The first Venturi gas-meter to be constructed has been installed at the Bromley and Crays Gas Company's works at Bromley, Kent.* The success of the Venturi meter for gas measuring purposes is to a very large extent due to Mr. Woodward, the Engineer to the Company, who has with the utmost kindness placed his great experience at our disposal, and assisted us in every possible way.

At the close of the paper,

The PRESIDENT complimented the author upon the way in which he had marshalled his facts and demonstrated his points by means of slides thrown on the screen, and said he understood the Venturi meters were being more largely used for the refinement of measurement in plants similar to water-gas plants than they were in the habit of doing at present in gas-works. It was evident, from what they had heard that afternoon, that the meters could be usefully employed where refinement in measurement was required.

Mr. E. A. HARMAN (Huddersfield) was of opinion that the Venturi system could be utilized with advantage for measuring the trade effluent to be paid for, and asked if Mr. Hodgson considered the meters suitable for this purpose.

Mr. HODGSON answered in the affirmative, and, in reply to a further question, said the meters cost from £150 up to £400—adding humorously that they were never likely to be adopted for the penny-in-the-slot system.

Mr. J. P. LEATHER (Burnley) thought the Venturi meters might be used for measuring the flow of gas in the mains, but was not sure if they could be adapted for this purpose.

Mr. HODGSON replied that this could be done. He thanked the meeting for their reception of him.

* Some interesting particulars regarding this installation were given in the "JOURNAL" for March 29, p. 869.—ED. J.G.L.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

The Eighth Annual Meeting of the Association was held on Friday at the Cripplegate Institute, Golden Lane, E.C.—the PRESIDENT (Mr. W. J. Liberty) in the chair. The business of the evening included the reply of Mr. J. G. Clark to the discussion on his recent paper, adoption of the report and balance-sheet, and election of officers for the ensuing year.

Reply of Mr. J. G. Clark to the Discussion on his Paper entitled "Some Practical Aspects of Radiation: Having Reference to the Uses of Illuminating Gas"—see "Journal" for April 26, p. 236.

The PRESIDENT, in calling upon Mr. Clark, pointed out that there was no time to properly answer the questions put when the paper was read.

Mr. CLARK said that, in reply to Mr. Sproston, who put the first questions, he could only confirm the statement in his paper in regard to the thermal radiation which passed over the imaginary semi-cylinder. Such heat was, he thought, of no great value, and might be neglected for practical purposes. As to that gentleman's second question, it might perhaps be best answered by asking another question. Why did they assume an imaginary line passing through the centre of the earth and inclined at, he thought, about 67° with the ecliptic, and call it the earth's axis? Simply because it was around such a line that the axial motion of the earth was symmetrical, and it therefore served as a convenient origin for the latitudinal and longitudinal division of the earth. Similarly with the lighting problem. Having surrounded the source of light by a sphere, it was convenient to consider the distribution of the light by referring to a line about which the desired illuminating effect was symmetrical. The only such line one could think of, was a line at right angles to the surface illuminated; and from this the horizontal and the other latitudinal lines naturally followed. The horizontal line was therefore not arbitrary, but had an important practical significance.

Mr. K. SPROXTON remarked that one could not put the axis of the earth in any other place; whereas with the author's diagram (which seemed to him rather misleading) he found that if he read the diagram when lying down, the horizontal rays were depreciated and the vertical and downward rays were increased.

Mr. CLARK: I may point out that, though the relative position of the horizontal line to the line of vision would vary with the latter, it did not affect the argument. The horizontal must be considered as one parallel to the surface illuminated—i.e., the ground surface or a table. You will see that the methods of calculating the spherical and hemispherical values of sources of light depend upon the same idea; the candle powers at the various angles being multiplied by the factors given in the table in the paper.

Mr. SPROXTON: The light from an ideal point is distributed evenly in all directions. But as there is so much more light distributed horizontally, because there is a very much greater area, than in the downward direction, these rays should be collected and distributed where they are wanted.

Mr. CLARK replied that this was the very idea he developed in the paper. He showed the high value possessed by these horizontal rays, and endeavoured to make it clear that it was of great benefit to collect them by means of reflectors, and throw them where they were wanted.

Mr. SPROXTON: As to my first question, can you tell us from your actual experience, taking a horizontal line from the top of the radiating surface, up to what angle your radiometer measures from the horizontal. Is it about 70° ?

Mr. CLARK: I think it would be nearer the vertical than that.

Mr. SPROXTON: What struck me was that your treatment of the horizontal radiation was very different from the vertical radiation. You presume that all the radiation over an angle of 80° or 75° is lost; but in measuring the horizontal radiation, you go right round to the angle of 90° .

Mr. CLARK: The horizontal and vertical planes are rather different from each other. While the radiation lost over the top of the imaginary semi-cylinder is of no great value, since it falls on a small patch of the ceiling, that which is intercepted by the extreme side edges of the semi-cylinder falls upon the floor and ceiling, and does useful work, and should therefore be placed to the credit of the fire. I may say that it was only after careful consideration of the whole question that the semi-cylinder was decided upon as the standard heat-receiving surface. It is, of course, quite obvious that, instead of using a straight calorimeter tube, we might use one of semi-circular or quadrant form. Such tubes would, when placed at the various positions round the fire, trace out a hemisphere or a quarter sphere, and so intercept the whole of the radiation; but I am of opinion that a straight tube used on the lines described in my paper is the most satisfactory.

Mr. SPROXTON: In the case of apparatus having a very large radiating surface, do you make any alteration?

Mr. CLARK: The instrument is intended for the measurement of the radiation from an incandescent surface—a coal, a coke, or a gas fire—within any reasonable limits. Any common gas-fire would come into those limits quite easily. Continuing his reply to other speakers, he said that Mr. Hogg took it that the diagram referring to radiation from the fire just showed the alteration of the intensity of heat over angles in the horizontal plane. He asked whether he had thought it was at all desirable to measure the variation in angles over the vertical plane, similar to the light rays. His reply was that the diagram obtained with the thermopile

referred to a horizontal plane level with the centre of the fire. He had not considered it desirable to explore the vertical plane in the same way. A serious objection to the use of the thermopile for this purpose was, in his opinion, the fact that the radiation reached the pile partly by direct transmission and partly by reflection. This could be illustrated best by a diagram. Let the sketch represent a section through the head of the thermopile. The

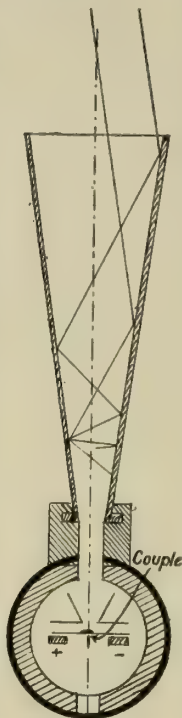


Diagram No. 1.

interior of the conical receiver was highly polished, so that the radiation which fell thereon was reflected towards the couples. If they assumed that the instrument was set up opposite the centre and 4 feet from a 14-inch fire, then the lines entering the mouth of the receiver would represent a portion of the radiation from the extreme outer edge of the incandescent fuel. It seemed quite clear that, before the radiation reached the pile, it was reflected a number of times. In order, therefore, that the readings on the galvanometer should be proportional to the radiation which entered the receiver, either the polished surfaces must have a reflecting efficiency of 100 per cent., or the proportion of reflected to direct radiation which reached the pile should be constant. The first condition was practically impossible; and the second could not be ensured, because if a fire was surrounded by a hemisphere, then the solid angle subtended by the incandescent surface of the fire at any point on the surface of the hemisphere, would vary with the position of the point. He had considered as a means of getting over the difficulty the disuse of the conical reflector or the blackening of its interior; but the radiation then reaching the galvanometer was rather small. That they should have strict proportionality between the radiation entering the mouth of the receiver and the potential difference set up by the pile was of the greatest importance if the galvanometer indications were to be taken as a basis for the calculation of the thermal value of the radiation. Time would

not permit of the discussion of the matter in full; but perhaps he had said enough to indicate its importance. He had, however, prepared a short analysis which the members might have an opportunity of perusing in print.* As to Mr. Canning's point, it appeared, in round numbers, that about one-third of the energy of combustion in a gas-fire took the form of radiation. The questions of quality and type of fuel, character of flame, form of the fire-front, and a number of other factors, entered into the problem. With reference to the heat lost from the calorimeter when in action, he presumed that Mr. Canning was alluding to the heat which might pass from the water to the surrounding air. This, however, was not necessarily a loss, but (as was more usual in practice) it might be a gain—depending upon whether the water in the tube was cooler or warmer than the surrounding air. But if with the calorimeter in a given position they could assume the loss or the gain to be the same whether the radiation was obscured from or absorbed by the calorimeter tube, the obscuration method cancelled it out. The only question was, Was the loss or gain the same? The temperature of the water passing through the calorimeter tube was from 1° to 4° lower when the radiation was obscured than when it was absorbed; and probably the heat which passed between the water and the surrounding air would vary in consequence. It was for this reason that the rise of temperature of the water in passing through the calorimeter was limited to 4° or 5° C., as by so doing the possible error was minimized. He intended to investigate this point, and, if necessary, to obtain a correction curve. In answer

* It is interesting to trace the course of a ray through a conical reflector such as is used with the thermopile.

Let the angle of incidence of a ray when it first reaches the surface at A be θ , and let the angle between the walls of the reflector be α . The angle of reflection at A will, of course, be θ ; but the angle of incidence when it reaches the opposite surface at B is only $\theta - \alpha$. It appears, therefore, that the angle of incidence is reduced by α at each reflection; and if the ray does not reach the pile before the angle becomes 0° or a minus quantity, it will not reach the pile, but will actually return.

If the ratio $\frac{\theta}{\alpha}$ is a whole number, the angle of incidence will ultimately become 0° , which means that the ray will return upon itself.

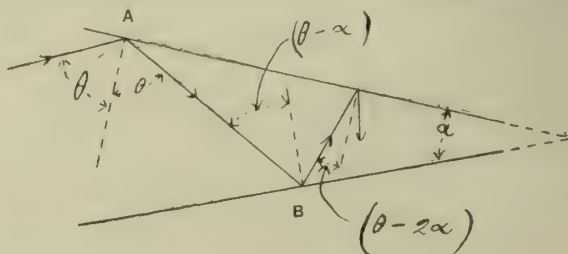


Diagram No. 2.

to Mr. Ainsworth, he thought with the modern gas-fire 15-10ths to 17-10ths was a good working pressure. The grill referred to in the paper was a cast-iron fret heated by a single burner having two rows of flames.

Mr. AINSWORTH: Do you take the same pressure for the grill?

Mr. CLARK: For that you might take about 20-10ths. Continuing, he remarked that there was, of course, a good deal in what Mr. Eldred said about the use of diagonal opal globes for shop front lighting. Some shopkeepers preferred, however, to make their windows conspicuous by obscuring the light in other directions. It was largely a matter of taste. The general effect of the diagonal opal globe as a reflector would be similar to that of the parabolic reflector alluded to in the paper. As to Mr. Wedd's queries, the height of the incandescent fuel of the fire above the surface of the hearth was a very important matter from a practical point of view, and one which might be profitably studied. But it opened up much too large a field to be discussed fully on the present occasion. He could not speak definitely with regard to the comparative radiation from the incandescent mantle and an argand flame. The radiant energy of the argand flame was no doubt very high, though of a low order from a luminous point of view. The radiation was due to the incandescent carbon in the flame; and carbon was an exceedingly good radiator. He might say, in reply to Mr. Hewett, that the use of the radiation calorimeter in a portable form had been considered. It was probable that a smaller instrument could be made for this purpose, in order to minimize the water requirements. With reference to the reading of the thermometers, these were not so far apart as to raise any difficulty. He had, however, considered, from the point of view of convenience, the use of a prismatic eyepiece for the lower thermometer. The line of sight would then be vertical; and the readings could thus be taken more comfortably. He was interested in Mr. Fenn's remarks on the subject of the front bars of a gas-fire. In conclusion, he appreciated very much Mr. Lacey's kindly criticism, and fully agreed with him as to the importance of research regarding the utilization of gas. No one who was watching the signs of the times would have any doubt as to the bright prospects before gas as a domestic and industrial servant; and these prospects would be made still brighter by further research.

General Business.

The members then proceeded to transact the ordinary business of the annual general meeting. Before doing so, however, the PRESIDENT referred to the loss sustained by the nation through the passing away of King Edward VII., and said it was only fitting that they should testify their esteem of the late Monarch and sympathy with the bereaved Royal Family.

This having been done, the meeting then proceeded to the consideration of the report of the Council, recommending that the Association should in future meet at the Westminster Technical Institute, Vincent Square, Victoria. The report was adopted unanimously. After the adoption of the balance-sheet, the following were elected as Officers and Council for the session 1910-11.

President.—Mr. L. F. Tooth (Commercial Gas Company).

Vice-Presidents.—Mr. T. F. Canning and Mr. J. G. Clark.

Members of Council.—Messrs. F. Ainsworth, H. Rothwell, E. Scares, K. Sproxton, P. J. Smithers, E. G. Stewart, W. Upton, D. J. Winslow, and W. J. Liberty (*ex officio*).

Hon. Secretary.—Mr. S. A. Carpenter.

Hon. Treasurer.—Mr. J. Hewett.

Hon. Auditor.—Mr. E. G. Merry.

The PRESIDENT then gave a *résumé* of the work for the session, in the course of which he mentioned that the membership was now 127, representing 37 gas undertakings (as against 21 last year). The membership at the end of the 1908-9 session was 113; and there was thus a net increase of 14 on the present occasion. In addition, there were two honorary members and 23 patrons. The resignations numbered 23; while 37 names were added to the roll. These 37 new members were the result of his plan of communicating with the engineers of works outside London. The wide area from which the members were now drawn, made it really a "Southern" Junior Association, and not London only. The Association never stood higher in the esteem of the seniors than now. The year had been one of progress in engineering science, and marked by many new methods in the industry; and he could but repeat the words used by him last session—namely, "Many are the changes taking place; and fortunate are the members who are in training in the profession during this time of transition and new development." He had nothing but pleasant memories as a result of his two years of office.

A vote of thanks was then passed to Mr. W. J. Liberty for the manner in which he had occupied the presidential chair and worked for the Association during the last two years—and more especially for his having come forward to take the position of President for a second period at a time of emergency. It was resolved that the vote be suitably inscribed, framed, and presented in due course.

The PRESIDENT, in reply, assured the members that, though he was taking off his armour, he was not casting it away, but would be ready to put it on again in future to serve the Association.

A vote of thanks was also passed to Mr. S. A. Carpenter (Hon. Secretary), Mr. J. Hewett (Hon. Treasurer), and Mr. E. G. Merry (Hon. Auditor).

REGISTER OF PATENTS.

Production of Recoverable Ammonia in the Manufacture of Producer Gas.

MASONS GAS POWER COMPANY, LIMITED, of Levenshulme, Manchester, MOORE, Q., jun., of Glasgow, CUNNINGHAM, J., of Banbury, and STOKES, J. W. B., of Tollcross, Lanark.

Nos. 28,053-54; Dec. 24, 1908. Accepted March 24, 1910.

According to an abstract of these two specifications appearing in a recent number of the "Journal of the Society of Chemical Industry," the producer described in the first patent is of the type having three zones of different temperatures—viz., a combustion zone lined with fire-brick, an intermediate zone above it, and a cool zone at the uppermost part of the producer; the supply of raw fuel and the removal of ash taking place continuously. The arrangement is such that the uppermost zone acts as a condenser for the more volatile hydrocarbons, while the intermediate zone is kept at from 400° to 475° C., being about half the temperature of the combustion zone, so that the heavier tars are condensed on the coal therein and are carried down with it and converted into fixed gas in the combustion zone. The producer is elliptical or rectangular in plan, and increases in cross section from top to bottom. The intermediate zone, which is water-jacketed, is about 8 feet high, or twice the height of the combustion zone. The uppermost zone, which may be air-cooled or water-cooled, is of less height than the combustion zone. The total height of the producer is great compared with its cross section. The producer is blown with air and a large quantity of steam; the steam being obtained from the water-jacket and also by a jet of water playing on the ashes. In the second arrangement, the producer is similar to that described above; the temperatures of the three zones being kept at 800° to 1000° C., 300° to 450° C., and 80° to 150° C. respectively. By this means the excess of steam necessary to prevent destruction of ammonia in the producer is reduced—over 60 per cent. of the steam used being decomposed. The gases leaving the producer are cooled in surface condensers, and the ammonia is extracted without the use of acid, by washing with water.

Treatment of Residues Obtained by the Burning of the Spent Oxide of Gas-Works.

WILLIAMS, P. E., of Leytonstone, Essex.

No. 2813; Feb. 5, 1909.

This invention relates to the treatment of the residues obtained by burning off the sulphur from spent oxide produced in the removal of sulphuretted hydrogen from coal gas; and it has for its object the production from such burnt residues of an efficient purifying material suitable for re-use in the absorption of sulphuretted hydrogen from gas.

The burnt residues referred to, the patentee points out, vary very much in composition, and in many cases contain much sulphate of calcium, which is an inert material so far as the purifying efficiency of the residue referred to is concerned. In burnt residues of the kind alluded to, ferrous sulphate is invariably present, and often in considerable quantity.

To treat the burnt residues in such a manner that they will form an efficient absorber of sulphuretted hydrogen from coal gas, the iron salts formed in the residue by the burning process are converted into hydrated oxides of iron, which are mixed with the iron oxide forming the bulk of the residue left after burning.

According to one way of carrying out the invention, the burnt residue is treated with warm water in such a manner as to dissolve out from it the soluble iron salts, and also some of the sulphate of lime that may be present. The burnt residue may be treated as described, by placing it in warm water immediately on removal from the spent oxide burner, or it may be stored in the ordinary manner and kept either wet or dry and treated with warm water as and when required.

For dissolving out the salts, there may conveniently be used a shallow tank formed of suitable material—brick, wood, or iron—in which the material to be washed is placed and then covered with water (preferably warm), so as to dissolve out the soluble iron salts present; the solution being run off, through a filter if necessary, into a tank, and the washing repeated or not as may be desired. The quantity of sulphate of lime present in the residue may be reduced by further washing with warm water.

The solution of iron salts thus obtained is then treated with an alkali, for which purpose caustic soda is preferred, although other alkalies may be used if desired; and the whole of the hydrated iron oxide formed is allowed to settle. The supernatant liquor is preferably afterwards run off and the hydrated oxide of iron thrown on to an absorbent material (say) sawdust, in order to absorb the excess of moisture and assist in giving porosity to the finished material. Or the hydrated oxide of iron may be freed from the solution of sulphate of soda, to a considerable extent, by allowing the solution to percolate through a filter of any convenient form, after which the hydrated oxide of iron may be thrown on to sawdust. After being washed, as described, the burnt residue is preferably rendered slightly alkaline by adding to it a solution of an alkali; the alkaline solution being allowed to drain off if desired. The washed burnt residue and the precipitated hydrated oxide of iron with sawdust are then intimately mixed together in suitable proportions, and, if necessary, more sawdust is added.

A very active material, suitable for purifying coal gas, can be obtained by adding to the washed burnt residue as little as 1 per cent. of the precipitated hydrated oxide of iron; but the activity of the material can be increased by increasing the proportion of hydrated oxide of iron (say) up to 5 per cent. Where it is found that insufficient soluble iron salts are present in the burnt residue, a solution of ferrous or ferric salt obtained from some other source is used, and precipitated as described. As a rule, the patentee states, more ferrous sulphate is found in the burnt residue than is needed for the preparation, according to this

invention, of an active purifying agent. In this case, the excess portion of the solution of iron salts can be treated for the preparation therefrom of crystallized sulphate of iron, or for making additional oxide of iron, by precipitation, for use in the purification of gas or for other purpose.

Instead of dissolving out the salts from the burnt residue, precipitating the hydrated oxide of iron from the resulting solution, and mixing the hydrated oxide of iron, or some of it, with the washed burnt residue as described, the burnt residue may be at once treated with a hot alkaline solution, as by dropping it into such solution, so that the iron salts in it will, by interaction with the alkali present, be converted into hydrated oxide of iron; while the alkali will be converted into an alkaline salt which will dissolve in the liquid present and can be drained off. The resulting product, consisting mainly of burnt oxide of iron and hydrated oxide of iron, can then be mixed with sawdust to render it ready for re-use.

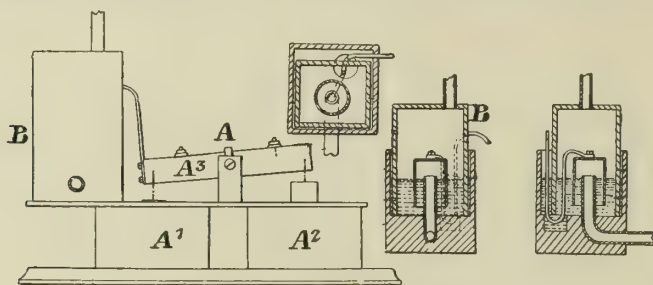
The mere neutralization of the free mineral acid contained in burnt residues of the kind referred to does not, the patentee proceeds, necessarily render the material suitable for the efficient removal of sulphuretted hydrogen from coal or other gas. He has found in practice that when the burnt material has been merely treated with an alkali to neutralize the free acid in it, and the material has been again used for the absorption of sulphuretted hydrogen from coal gas, it has again become acid and the absorption of gas retarded, owing to the presence of the sulphate of iron therein. The conversion of the iron salts in the burnt residue into hydrated oxide of iron, as described, is therefore essential for the preparation from such residues of a purifying material that can be relied upon to absorb a high percentage of sulphuretted hydrogen from coal gas.

Controlling the Supply of Gas.

RORKE, T. J. & E., of Barnes, Surrey.

No. 8551; April 8, 1909.

This apparatus for controlling the flow of gas for use in heating, lighting, or other purposes, consists essentially of a controller adapted for being actuated by an electrically-operated switch in conjunction with thermostatic or other means, either from a distance or otherwise. It comprises an electro-magnetically controlled switch, of the type described in patent No. 12,175 of 1908, the rocking arm of which is provided with a member adapted to act in conjunction with a liquid seal whereby the desired control is effected upon actuating the switch.



Rorke's Gas Controlling Apparatus.

The illustration shows an elevation of the whole apparatus, with sections of the inlet and outlet passages for the gas.

A is an electro-magnetically controlled switch; and A¹ A² are electro-magnets. A³ is a rocking member or tube containing a moving mass of mercury which serves to control the energizing of the electro-magnets as described in the earlier patent. One or both ends of the rocking member are provided with a bent extension or arm which carries a bell, which acts in conjunction with the outlet pipe to close it and form a liquid seal for the gas. The liquid seal is formed in the end chamber B, which comprises two members fitting one within the other; the inner member carrying the inlet pipe for the gas and the latter member the outlet pipe. The outlet pipe projects upwards within the outer vessel, and the bell, which is carried by the rocking member of the switch, is adapted to cover it, so that the flow of gas is interrupted by the liquid around the outlet pipe, into which the bell projects when the arm is deflected upon the actuation of the switch A. The outer vessel is formed with a well, which allows of the depression of the arm whereby the movement of the bell is effected without disturbing the inner member of the gas-chamber B.

When the gas enters the chamber B, the bell is raised out of the liquid, and the gas flows through the outlet pipe to the place where it is required for use. To avoid danger of explosion by leakage of gas, the bell is provided with an opening at its upper end to allow a small quantity of gas to pass, so as to ensure the ignition of the larger volume which passes when the bell is raised out of the liquid seal, in order to allow the unrestricted flow to take place.

The apparatus may be employed for "flash advertisements" by arranging a series to control the illuminated compartments of the sign. In this connection, an automatically operated switch would be employed to operate the several sets of apparatus.

When the apparatus is used in connection with a heating system, the flow of gas may be regulated automatically by providing a thermostatic arrangement, as described in patent No. 9481 of 1908, for controlling the circuits of the actuating electro-magnets, so as to render them operative at a maximum and a minimum temperature.

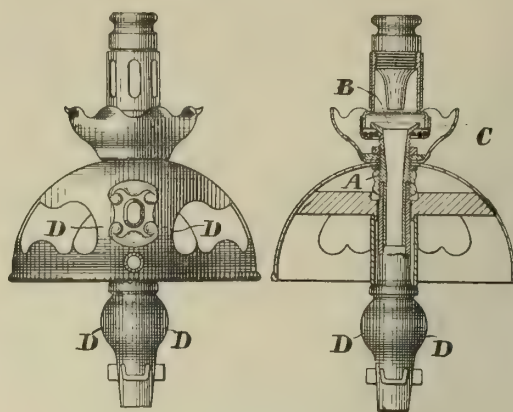
Inverted Incandescent Gas-Burners.

SPERRY, G. N., of Birmingham.

No. 9757; April 24, 1909.

This invention has reference to burners provided with means for preventing damage to the mantles from vibration or shocks, as shown in the elevation and sectional elevation.

The mantle-supporting portion of the fitting is connected to the in-



Sperry's Inverted Incandescent Burner.

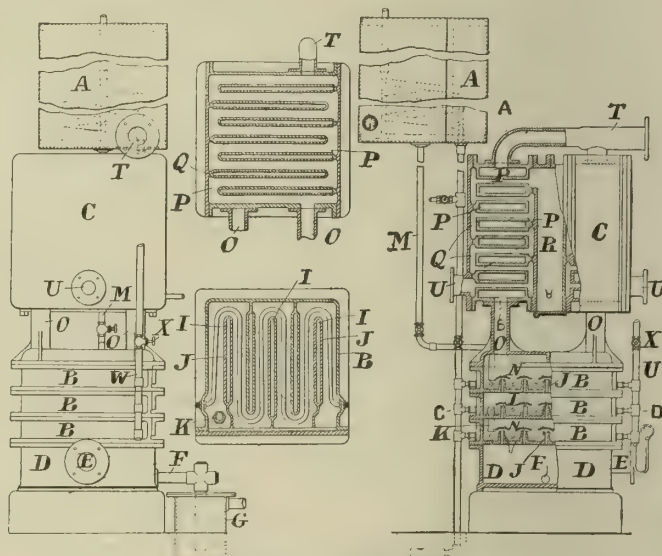
jector tube A by a small screwed muff B; and it is flared at the top so as to rest on the spring C, which supports the part D of the fitting. All the parts in this portion D are connected to the flared injector tube, and by this are supported from the centre of the spring C without other connection to the upper part. Shocks or vibration on the support are thus prevented from coming on the part which supports the mantle. Also, owing to the support on the flared injector being practically in one plane, the part D is allowed a degree of freedom to pivot, so that a knock or blow on it causes it to give way or swing on its support—thus avoiding damage.

Carburetting Gas.

TULLY, C. B., of Hythe, Kent.

No. 13,549; June 9, 1909.

This invention relates to a still of the kind in which liquid-containing superposed trays are formed with slits to permit of the passage of fluid in thin streams through it, and passing the gas, on its way to a fixer, successively through the tray slits and over the liquid hydrocarbon in the still, "so that it becomes rapidly enriched." The invention is particularly applicable to the carburetting of methane hydrogen gas with hydrocarbons evolved from tar.



Tully's Gas-Carburettor.

In the construction illustrated, A is the dehydrating tar-tank, B a series of perforated stills, and C a pair of fixing-chambers. The stills are mounted upon a receiver D, having an inlet E for the gas to be treated and an outlet F for tar communicating with a sump or other receptacle by way of a seal-pot G. The stills comprise three superposed trays, each having a series of slits I arranged in vertical walls or partitions J, so disposed as to form a sinuous channel along which tar can flow from one end to the other, where an outlet delivers it to the initial end of the tray beneath—the discharge of the lowermost tray taking place into the base section. K is the outlet from the intermediate tray to the lowest one.

The tar is delivered into the tank A, which is at such a height above the carburettor as to cause the tar to flow, under pressure, through a pipe M leading to the initial end of the upper tray B, provided with a control valve for varying the tar supply.

The slits in the trays are surmounted by baffles N, which deflect the gas as it rises through the slits on to the tar in the trays, whence it finally passes into the inlets O of the pair of fixing-chambers C. The chambers are supported above the uppermost tray B, and each of them has a sinuous upwardly extending passage P, constituted by hollow walls, plates, or partitions arranged to constitute a sinuous downwardly extending flue Q for the passage of heating gases from a combustion chamber R between the fixing-chambers. The carburetted and fixed gas from both fixing-chambers is led off at T—an outlet common to both fixing-chambers; but the spent heating gases may afterwards be led away by independent outlets U.

For the purpose of heating the tar in the several trays, sinuous steam pipes are arranged in the channels shown, and connected (it may be in parallel) to a steam supply pipe W; the opposite ends of the pipes being connected to a pipe which may extend downwardly and termi-

nate in a steam-trap, and upwardly for connection to a heating coil in the tar dehydrating tank. By means of a steam inlet valve X and a valve in the steam-pipe leading to the tar-tank, the stills alone can be heated to the desired extent with the aid of the steam-trap, or the tar in the tank may, in addition, be heated to drive off moisture from it by admitting steam to the coil therein.

Gas-Purifiers.

KÖLNISCHE MASCHINENBAU ACTIEN-GESELLSCHAFT, and
WEGESCHIEDT, C., of Cologne.

No. 16,243; July 12, 1909.

This invention has for its object "to utilize in the most favourable manner possible the space of the purifier, and to obtain the best possible purification, and to manufacture purifiers having a very large

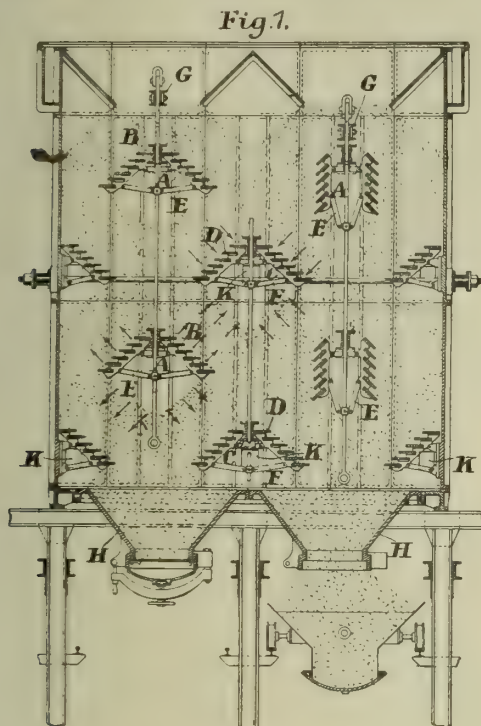


Fig. 2.

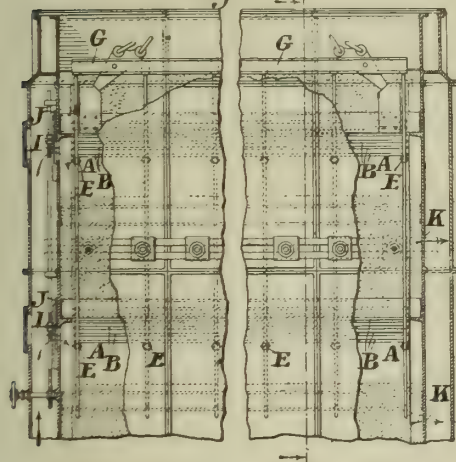
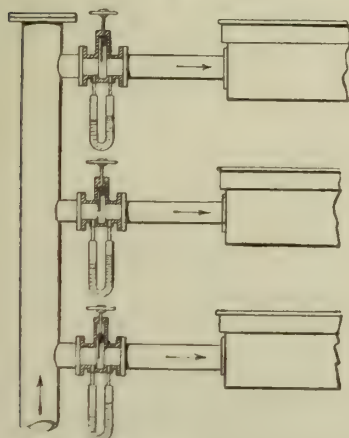


Fig. 3.



A German Purifier Arrangement.

can be varied according to the distance of the introducing conduit from the discharging conduit; and at the same time it is possible to make purifiers of any desired output, "as the gas to be purified has merely to travel from its supply pipe to the discharge pipes which are adjoining it, so that apparatus of any desired height may be built."

Fig. 1 is a vertical section through the purifier, in a direction transverse of the gas-conduits. Fig. 2 is a portion of the purifier (partly in section and partly in side elevation) in the direction parallel to the gas-conduits. Fig. 3 is a diagrammatic view of the regulating and indicator device for different pipes, branching off from a single supply.

The purifier chamber has its two front walls at right angles to the gas-conduits arranged in the purifier. They are formed as double walls, and support a number of girders, which, in their turn, support louvres. The louvres pass through the purifier from one wall to the other, and are distributed as uniformly as possible in the space. The louvres which afford support to the purifying mass form "canal-like hollow spaces" in the interior of the purification mass, which hollow spaces form flues for the gas. The louvres are divided into two groups—one group A forming, with the supporting plates B, the supply conduit for the gas; and the other group C forming, with the support plates D, outlet conduits for the gas. The louvres are pivoted at their upper ends to projections on the girders, while the bottom ends are pivoted by links E or F to longitudinally adjustable rods mounted vertically in the purifier, and connected at the upper end by strong girders at G. The girders are held in the raised position by a supporting device consisting of cams rotatably mounted in connection with abutments secured to the apparatus. The lower end of the apparatus is provided with conical outlet branches H for the purifying mass, which are held closed by lids with closing brackets.

The working of the purifying device is as follows: Before the purifier is started, it is filled with the purifying mass in such manner that under each of the louvres A B is left a conduit-shaped hollow space, the shape of which on the lower surface is determined by the angle of slope of the material. After the apparatus has been filled, gas is admitted and spreads among the various conduits closed by the louvres A, passing through the openings I. By suitably adjusting the slide valves J, the admission of gas to the conduits corresponding to the louvres A can be regulated. From the inlet conduits arranged under these louvres, the gas passes through the intermediate spaces between the supporting surfaces B, into the purifying mass, and penetrates through the layer of it between the supply conduit and the outlet conduits arranged all round and formed by the louvres C. From the outlet conduits under these louvres, the purified gas passes through the openings K into the space between the walls, and is carried away from that point. The layer of the purifying mass through which the gas is to pass can be made of any desired thickness, but a thickness of layer of about 600 mm. has been found very suitable.

When it is desired to empty the purifier, the rods are moved from their raised position into the lower position. The rotatable supporting plates then slide away from the abutments, so that the rods sink; the louvre assuming the position shown in one group. Owing to the rotation of the louvres, all support is withdrawn from the purifying mass; so that when the closing devices are opened, the purifying mass is freely discharged through the outlet cones H.

Fig. 3 shows a device for a more accurate control of the flow in the various gas-conduits, by means of adjustable throttling valves mounted in the supply conduits arranged side by side. Branch conduits lead from the pipes in front of, and behind, the throttling valves to a differential pressure gauge, which indicates the currents in the pipe sections. Calculation shows that if the cross-sectional area of passage left free by the throttle valve be indicated by F, the quantity of gas passing through the pipe by V, the difference of pressures in front of, and behind, the throttle valve by h and a constant by C, then $V = C \cdot F \cdot \sqrt{h}$. If F is fixed as a function of h in a table for a given V, it is possible, without difficulty and special training, to adjust the passage of gas, in accordance with the indications of the pressure measuring devices, to the desired extent.

In order to provide the purifier illustrated in figs. 1 and 2 with the regulating device described with reference to fig. 3, the pipe sections carrying the throttle valves and the pressure-gauge devices could be mounted on the wall of the purifier in alignment with the inlet openings I. A plurality of rows of inlet openings would, of course, require a plurality of rows of pipe sections with throttle valves and pressure-gauge devices.

Differential Pressure Gauges.

KENT, W. G., and HODGSON, J. L., of High Holborn, W.C.

No. 17,638; April 27, 1909.

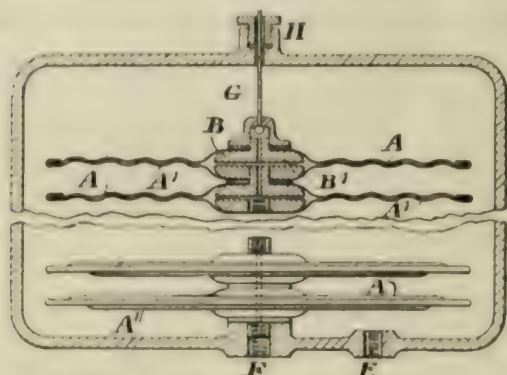
This differential pressure gauge is said to be "very sensitive to small differences of pressure and less sensitive to large differences of pressure; while it cannot be damaged by overloading."

In its simplest form, it consists of a pair of flat discs corrugated to render them flexible and united together around their peripheries, so that as the load is put on they come into contact with one another from the periphery towards the centre.

The illustration on p. 568 shows the gauge made in its closed position due to the maximum difference of pressure.

A A¹ are the two members of each pair of discs (substantially flat, but corrugated to render them flexible) provided with stiff centre-pieces B B¹, so arranged as to allow any number of pairs of discs to be secured together. The discs are contained in a pressure-tight box to which the high pressure may be connected by the inlet E, while the lower pressure may be connected to the interior of the discs by the inlet F. One end of the series of discs is secured to the box, while the other end carries a rod or wire G, which passes out of the box through a gland H. It is pulled upwards by a spring or equivalent device, so that normally—that is, when the pressure outside the discs is equal to that inside—the discs are deformed, and there is a gap between the centre-pieces B B¹, and the discs touch only around their peripheries. When, however, there is a difference of pressure, the discs tend to come together; their motion being resisted by the pull of the wire G. As the pressure increases, the discs close together from the circumference inwards; so

output." With the arrangement proposed, the thickness of the layers of purifying material through which the gas to be purified has to pass



Kent and Hodgson's Differential Pressure Gauge.

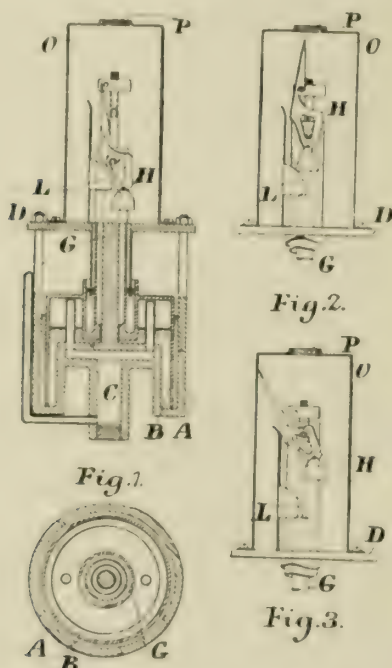
that the area of unsupported disc exposed to the pressure gradually diminishes. Finally, when the maximum desired difference of pressure is reached, the discs and the centre-pieces touch one another at every point, and no further increase of the difference of pressure causes any further motion. The motions of the wire G can, of course, be transmitted to an indicator.

Igniting and Extinguishing Gas-Lamps.

MOWAT, J., of Helensburgh, N.B.

No. 18,243; Aug. 7, 1909.

This gas-lamp igniting and extinguishing apparatus is of the kind wherein variation of the pressure of the gas in the mains is utilized to effect ignition from a pilot jet and also extinction of the light.



Mowat's Gas-Lamp Lighter and Extinguisher.

Fig. 1 is a vertical and horizontal section of the apparatus. Figs. 2 and 3 show the upper part of the apparatus in different positions.

The gas-main is connected to a tank A within which is fitted an inverted gas-container B, guided in its vertical movement by a central rod G. The space between the tank and the container is filled with mercury, so as to form a seal between them as heretofore. A small tank, concentric with the container B, also contains mercury, and forms a seal between it and a tube suspended from, and rigid with, a platform D held fixed above the tank A by supports. A tube or sleeve attached to the inner tank extends through the mercury seal in the tank and through the platform D, and carries at its upper end a movable hook H, provided with a triangular slot; while a movable weight which is attached to the lower end of the hook acts as a balance. The hook is adapted to engage a pin secured to a block on the upper closed end of a tubular extension of the guide-rod G. A fixed cam L serves to push the hook H into the position shown in fig. 1, in which position the inner container is at its lowest or normal position. The pipe C admits gas from the mains; while a bye-pass attached to the pipe allows of the ignition of the gas when required. The gas is admitted from the central tube to a container O.

The *modus operandi* of the apparatus is as follows: The gas is admitted by the passage C into the interior of the container B, which remains stationary when the pressure is normal or at the ordinary working pressure. When the pressure is raised above the normal, the container B will rise until the upper end of the inner tank comes in contact with the lower side of the platform D. When the container B is in this position, the lower part or bottom of the mercury seal within the tank will be above the level of the mercury in the tank A, and the gas from the interior of the container B will have a clear passage between the inside of the inner tube and the exterior of the central rod or guide G. During the upward movement of the container B, the recess in the hook H will be engaged by the pin on the block, so that the hook is suspended therefrom, and thereafter a hook-like projection will clear the pin on the block. On the gas pressure being again brought to the normal, the hooked projection comes in contact with the pin, and the

container B will be suspended as shown in fig. 2, and the gas will pass from the container into the chamber O, and thence, by the outlet P, to the burner.

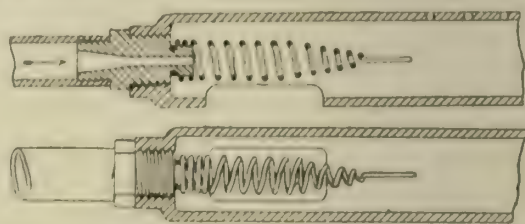
On the pressure being again raised above the normal or working pressure, the container B will be again raised until the inner tank comes in contact with the platform D. At the same time the pin will have passed up the front of the slot in the hook H, and the latter will be thrown off the balance due to the pin engaging the recess, and will assume the position shown in fig. 3, in which position the hook-like projection clears the suspending pin, and the container B will drop down to the position shown in fig. 1, and cause the mercury seal to prevent the gas from passing between the tube and the rod or guide G. The hook H, by coming in contact with the cam L, will be pushed forward; and on the container B being again raised, the pin will engage with the recess.

Preventing Back-Lighting in Atmospheric Gas-Burners.

EHMANN, C. P., of Fallowfield, Manchester.

No. 21,078; Sept. 15, 1909.

This atmospheric gas-burner consists in an "improved special coil device" in the mixing-chambers for preventing back-lighting—"a coil of wire of small diameter fixed to the gas-nozzle and wound rather open; the coil being partly cylindrical with a conical continuation and the end set straight."



Ehmman's Atmospheric Burner.

The device, represented in section and in outside view, consists of a helical coil of wire attached to the gas-nozzle screwed into the mixing-tube. The nozzle is reduced in diameter at its end, and has a groove turned in it. The coil is wound close at the end fitting on to the nozzle; and the first lap is constricted to fit into the groove, while the following laps fit upon the reduced end of the nozzle, to hold the coil in position. The coil is cylindrical for some distance and then tapered; the pitch of the convolutions here decreasing proportionally with the diameter of the coil.

The device is readily applied to existing atmospheric burners as well as to new burners, and is said to prevent back-lighting effectively.

Utilization of the "Waste" of the Purification of Illuminating Gas.

SIMONIN, H., of Pierrefitte (Seine), France.

No. 20,504; Sept. 7, 1909.

This invention relates to the utilizing of the residual products of the purification of illuminating gas ("waste") for the purpose of extracting therefrom nitrogen and sulphur, and of utilizing the materials in the waste, when freed from nitrogen, for the manufacture of sulphurous and sulphuric acids. The process allows, on the one hand, of the production from the waste of nitrogen in the form of sulphate of ammonia or soluble ammoniacal compounds, and, on the other hand, the production either of pure sulphur or of sulphurous acid, by the combustion of the residue when freed from nitrogen, or by its dry distillation with the exclusion of air, without formation of sulphides of calcium or sulphate of lime or sulphite of lime. For the production of nitrogen in the form of soluble ammonia compounds, the process is carried out as follows: The waste is exhausted in a closed vessel in the cold in a diffuser—for instance, by an ammoniacal solution containing about 10 per cent. of commercial ammonia (liquid volatile alkali of 22 Beaumé) corresponding to about 2 per cent. of anhydrous ammonia. By this treatment, all the ammoniacal compounds and cyanogen compounds contained in the waste are rendered soluble. The waste thus exhausted by this ammoniacal solution is then exhausted with ordinary water for the purpose of removing the whole of the soluble products that are retained mechanically in the waste. The ammoniacal and aqueous solutions are placed in a column for distilling ammonia; and after the addition of a caustic milk of lime in calculated quantity for decomposing the resulting ammoniacal compounds, they are subjected to ordinary distillation for the purpose of recovering the ammonia therefrom.

The residue of the distillation now contains the cyanogen compounds, which are converted into ammonia by distillation in the presence of caustic soda and water vapour. The ammoniacal vapours may be recovered, either for the manufacture of volatile alkali or in the form of sulphate of ammonia by passing these vapours through sulphuric acid. The waste exhausted, as described, is then free from its contained nitrogen. It now contains oxide of iron, free sulphur, tars, naphthalene, and, in certain cases, sawdust. It is necessary to free the exhausted waste from the tars and from the naphthalene if it is desired to extract the sulphur therefrom.

In a previous process for the preparation of sulphur and compounds of sulphur from the fouled iron oxide from gas-works, the "waste," with or without a preliminary treatment with acid to dissolve out mineral matter, and after complete or partial drying, is (the patentee explains) heated in a closed vessel, having an exit pipe, to a temperature slightly below the distilling point of sulphur, so as to distil off organic and tarry matter, and then heated to a higher temperature to distil off the sulphur. In another process for treating gas-works residues,

the latter were first dried and then distilled in the presence of superheated steam; the tars and naphthalene being driven off before the sulphur began to distil over. In both these processes sulphuretted hydrogen is evolved in considerable quantities; and "as this gas forms an explosive mixture with air, its presence is very dangerous and objectionable in an industrial process."

In the process according to the present invention, water in any form is completely eliminated from the waste in order to prevent the former from reacting in the dry distillation upon the sulphur and oxide of iron so as to form sulphuretted hydrogen and iron sulphides. On the other hand, since this distillation, previous to any distillation of the sulphur, is ended at a temperature of 150° Celsius, the tars and the naphthalene are eliminated during this drying operation, which may be carried up to 200° C. if the waste is derived from the purification of gases from boghead coal for the purpose of eliminating shale oils therefrom.

For this dehydration, use is preferably made of hot air drying apparatus, or of the hot waste gases escaping from furnaces; care being, however, taken to provide a dust-catching chamber in order that no ignited combustible substance shall be able to reach the materials being dried, and cause the sulphur to ignite. The waste thus freed from nitrogen, and dried, is then subjected to ordinary distillation in a closed vessel, for the purpose of recovering pure sulphur therefrom, either in the molten or in the sublimated state—this distillation being effected by the means usually employed for the production of refined sulphur.

If it is then desired to regenerate the oxide of iron contained in the mass which has been freed from sulphur as described, it is sufficient to continue the heating of the distilling retorts while injecting air to burn the woody portions derived from the sawdust that is employed in the purification.

If only the manufacture of sulphurous and sulphuric acids is desired, then the mass, freed from nitrogen and from tar in the manner stated, is treated in the usual manner in a furnace for burning pyrites or for burning sulphur, and the sulphurous acid is either condensed or utilized by ordinary means for the manufacture of sulphurous acids, sulphites, byposulphites, or sulphuric acids.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Carbonizing Systems—Dr. Geipert's Reply to Mr. Harris.

[TRANSLATION.]

SIR,—Since Mr. Harris, in his letter (*ante*, p. 506), shifts the discussion on to personal grounds, it makes it difficult for me to answer him. That I do so nevertheless is in order to prevent misunderstandings among readers of the "JOURNAL." I have nothing to alter in my earlier remarks; and in regard to Mr. Harris's point, that pressure in the retorts increases the formation of scurf, I can only recommend the perusal of some text-book on the thermo-dynamics of gas reactions. According to accepted theory, the dissociation of substances is not favoured, but is hindered, by pressure. The pressures which occur in retorts are, however, so inconsiderable that they are totally incapable of influencing the primary or secondary phenomena of gasification.

When Mr. Harris emphasizes the difference in the quality of the different descriptions of coal, he certainly refers to a quite well understood fact. His comment, however, does not apply to the case in question. In gas-making trials undertaken to establish the efficiency of a setting, care is taken to use only such coals as are known to be good gas coals. These descriptions of coal, however, generally display such a small difference one from the other in regard to yield of gas that it is quite justifiable to compare the efficiency of the settings, even though the same descriptions of coal were not used in the trials. For the rest, it was far from my intention to conceal anything of Mr. Harris's communication, to the published report of which I expressly drew attention.

The interruptions in the working of the vertical retort-settings mentioned by me certainly referred in some cases only to the letting-down of the settings to a dull red heat, but in most cases to their being cooled-down completely, which may be realized from the fact that in Oberspree we work in the busy season with four settings of vertical retorts, but in the summer with only one setting.

R. GEIPERT.

Mariendorf, Berlin, May 23, 1910.

Burner Maintenance.

SIR,—Further with reference to your remarks about burner maintenance, and realizing the importance of the subject, might I suggest that the Institution of Gas Engineers give an hour for the free discussion of this subject at their first meeting. I think it might be a profitable hour; and the result of it might be the appointment of a Committee to consider the whole question. I feel that the maintenance of the gas industry's position as suppliers of light turns on this question. Hence this letter.

May 28, 1910.

METHOD.

Calorific Values and High Temperatures.

SIR,—In reply to your correspondent's remarks concerning my article on calorific values, I would like to point out that the conclusion stated was arrived at mainly on theoretical grounds, as given. Some general observations were also made, which seemed to support the statement; but no series of graded tests were performed.

While experimenting more recently on the effect of high heats on naphthalene production, some discrepancies were noticed, and several analyses were made. These certainly did not show any regular decrease of methane content with increase of temperature, but were rather irregular.

My attention was first directed to this question by a paper read by

Mr. Henry O'Connor in February last before the Scottish Section of the Society of Chemical Industry; and I have undertaken several investigations on the matter with practically negative results.

I should be very grateful indeed to Mr. Edwards if he would kindly give us the benefit of his experience.

G. STANLEY COOPER.

Ferry, May 25, 1910.

Naphthalene v. Choked Ascension Pipes.

SIR,—As I have been one among the many sufferers from naphthalene trouble for some years, I have read most of the papers and articles published on the subject for some time back—including Dr. Harold G. Colman's valuable report. I was, therefore, greatly interested in Mr. G. Stanley Cooper's instructive article on "Naphthalene Formation and Removal," published in your issue of the 24th inst.

My object in writing is to explain a simple and inexpensive experiment which has relieved (if not altogether cured) the trouble. I cut a number of slots in the foul main, 20 inches long by 2½ inches wide, and inserted several screens—keeping each screen a certain distance apart. These screens are inserted where the gas is at a high temperature and are continued in groups at certain distances apart until the gas is reduced in temperature (by travel) to about 100° Fahr. The screens act as scrubbers, and are supplied with light oils and solvents from the crude gas, and thus bring down a great part of the naphthalene, which runs off with the tar.

In regard to choked ascension pipes, I am of opinion that few small works had more trouble than this one. For some years back, 75 per cent. of our ascension pipes were blocked full daily—summer and winter. Every morning they were cleaned out; and a 5-inch rymer passed through each 6-inch pipe, only to find them choked before the following morning. But this has all been changed in a simple manner without any patent appliance or water apparatus, so that for several weeks we have not had one pipe choked and no appearance of anything gathering. The coal used is the same, and the heat of the retorts is equally good, as the make of gas per ton some days reaches over 12,000 cubic feet.

Hollywood, Co. Down, May 26, 1910.

THOS. FRIZELLE.

LEGAL INTELLIGENCE.

LIABILITY FOR REINSTATING A ROAD.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, May 26.

(Before the LORD CHIEF JUSTICE and Justices CHANNELL and COLERIDGE.)

Metropolitan Water Board v. Bradley.

This was an appeal by the Board from a decision of Mr. Curtis Bennett, one of the Metropolitan Magistrates, by which he convicted the appellants, and fined them £10, for not complying, within 48 hours, with a notice to repair a road which had been injured by the bursting of a water-pipe. The proceedings in the Court below were reported in the "JOURNAL" for Dec. 28 last (p. 895).

Mr. COURTHOPE-MUNRO appeared for the appellants; Mr. MORTON SMITH represented the respondent, Mr. J. W. Bradley, the Engineer and Surveyor to the Corporation of Westminster.

Mr. COURTHOPE-MUNRO said the Board proceeded with the work required to be done, but were two or three days late, owing to the fact that the notice served upon them, which was the first of its kind ever issued, was ambiguous in its terms; and it took the Engineer two days to find out what it meant. When the work was being carried out, the men were stopped by the Westminster Council, who insisted on doing it themselves; and they then summoned, and obtained the conviction. The real point, which arose under the Metropolis Management Act, 1855, was upon whom lay the obligation of repairing the road when it had been damaged by the bursting of a water-pipe, as distinguished from the case of a road opened by the Board for the purpose of laying or repairing a pipe. There was no doubt that in the latter case the obligation lay upon the supplier of water; but by the Act in question the Local Authority had the option, on giving notice, of doing the work themselves, and charging the supplier with the expense. In a case in which the Chelsea Water Company were concerned, it was decided by the Court of Appeal that, in the absence of negligence, there was no liability on them for damage done by the bursting of a water-pipe. In the present case, on the accident being discovered by the appellants, they at once opened the ground, repaired the pipe, filled in the excavation, and gave the proper notice to the Local Authority to make good the surface—specifying the spot and the dimensions of the pavement requiring to be restored. But when the respondent went to view the place, he saw that a much larger portion of the pavement required renewal, owing to injury having been done by the escaping water. In consequence of a previous decision by Mr. Curtis Bennett, that the Local Authority could not recover the cost of a similar replacement when no notice to repair had been served on the Water Board, the Engineer on Saturday, Oct. 30, served a notice on the appellants, requiring them within 48 hours to take up the pavement and well and sufficiently repair and make it good. This was in accordance with section 112 of the Act; and if it had stopped there, it would have been a good notice. But it went on: "Further take notice that the said Council will make good the pavement, &c., instead of permitting such work to be done by the Board, and will charge the Board with the expenses. Please inform me when the Board have broken up or opened the surface, so that I may give the necessary instructions for the pavement or soil to be made good." This being apparently a notice to do something and not to do it, when the Engineer of the Board received it on the following Monday morning he was naturally puzzled, and took it to the solicitor next day. On the Wednesday,

instructions were given to the contractors; and on Thursday the work was commenced. Counsel read the case from which the above facts appeared, and, continuing his argument, submitted, first, that the notice in question was too ambiguous to form the subject of an information; and, secondly, that a notice under section 112 could only be given to repair a pipe, and that when this was served the pipe had already been repaired and the ground filled in. He contended that this was an attempt to combine sections 112 and 114 in one, or to make the penal provision of the former apply to the latter, in which there was no such provision.

After a short argument from Mr. MORTON SMITH in support of the conviction,

The LORD CHIEF JUSTICE gave judgment. After stating the facts and reading the sections cited, he said it was not disputed that nothing was done within 48 hours after the service of the notice; and he could see no reason why section 114 should not be read together with section 112. There was nothing inconsistent in the view that the opening of the road was to be done by the Water Board pursuant to the notice, and that when opened up the Local Authority, if they deemed it expedient, might fill in the ground and make good the pavement. He therefore thought the view taken by the Magistrate was right, and that the appeal must be dismissed with costs.

Justices CHANNELL and COLERIDGE concurred.

AFFAIRS OF THE MID OXFORDSHIRE GAS COMPANY.

In re a Petition of a Debenture Holder.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, May 25.

(Before Mr. Justice SWINFEN EADY.)

This was an application by a debenture holder in the Company, who had obtained judgment in the King's Bench Division.

Mr. C. H. CARDEN NOAD, who appeared for the petitioner (Lucy Ann Richards), said there was only the statutory affidavit in support of the petition; and on the previous day—some three weeks out of time—they received an affidavit from the other side which stated that a resolution had been passed for a voluntary winding-up of the Company.

Mr. GALBRAITH said he appeared for unsecured creditors (to the amount of £6720) to oppose the petition.

Mr. NOAD said the principal creditor opposing was Mr. Preston, who was the promoter of the Company, and who claimed to be a creditor for £6000.

Mr. CHRISTOPHER JAMES said he appeared for the Company. There was no doubt that a resolution had been passed for winding-up voluntarily, though it was not strictly proved.

His LORDSHIP asked whether this was the Company in respect of which a Receiver had recently been appointed on behalf of various classes of debenture holders, and if he was the Liquidator.

Mr. JAMES said it was the same Company [see *ante*, p. 446]. The Receiver was not willing to act as Liquidator, and therefore another gentleman was appointed.

Mr. NOAD said he was informed that the Liquidator ultimately appointed was a nominee of Mr. Preston. The meeting was held at Bicester, and there were only two independent shareholders present, one of whom moved the adjournment of the meeting, but was outvoted by shareholders who were officials of the Company. Counsel submitted that he was entitled to an order; but if his Lordship thought the voluntary liquidation, although not proved, ought to be considered, he should ask for an opportunity to adduce evidence of prejudice, for which he had ample material.

Mr. MOSSOP, who appeared for another debenture holder for £2000 to support the petition, said he also could, if necessary, furnish evidence of prejudice.

After some further discussion, the petition was ordered to stand over until the 7th prox., with leave to amend and adduce further evidence.

Additional Capital for the Newport (Mon.) Gas Company.—It will be seen, from an announcement which appears elsewhere, that the Directors of the Newport Company are inviting tenders for an issue of £16,000 of consolidated stock, bearing a maximum dividend of 5 per cent. per annum. It will be offered in lots of £100 each, at a minimum price of £112. Tenders are to be delivered by 10 a.m. on Friday, the 17th of June. As the Company have paid full maximum dividends for upwards of fifty years, it is not likely that the Directors will experience much difficulty in obtaining the additional capital they require for meeting the demands upon their prosperous undertaking.

Meters Limited.—Presiding at the annual meeting in Manchester of Meters Limited, Alderman John Miles said the accounts (*ante*, p. 446) were of a very satisfactory character, particularly when they considered the state of the general trade of the country during the twelve months. They had not increased their output by leaps and bounds; but they had decidedly improved on the previous year. They had not been helped in the matter of the price of the tin and copper used; for while they had had a slight advantage in one, they had had a disadvantage in the other. Prices, therefore, had been practically the same as last year. The good result shown was due to the satisfactory turnover and the excellent management of the works. They took every opportunity of putting down new machines and tools, so that they could produce the very best article possible; experience having shown them that the quality of their manufactures was the best asset the Company could have. It was proposed that £6000 should be placed to the reserve fund, which would then stand at £66,000. They might look hopefully for the continued success of the Company in the coming year. During the two months which had already elapsed, the turnover showed an improvement upon that of the corresponding period of last year. The report was adopted; and dividends at the rate of 5½ per cent. per annum upon the preference shares and of 8 per cent. per annum on the ordinary shares (making the ordinary dividend 6 per cent.) were approved.

MISCELLANEOUS NEWS.

LISBURN GAS-WORKS PURCHASE.

Arbitration Proceedings.

Arbitration proceedings were commenced at the Surveyors' Institution, Great George Street, Westminster, last Thursday, with respect to the purchase of the undertaking of the Lisburn Gas Company, Limited, by the Lisburn Urban District Council. Mr. RAM, K.C., presided as Umpire; and the Arbitrators were Mr. CORBET WOODALL and Mr. H. E. JONES.

The Company were represented by Mr. JOHN GORDON, K.C., M.P., and Mr. CLEAVE; and the Council, by Mr. HONORATUS LLOYD, K.C., Mr. VESLEY KNOX, K.C., and Mr. C. C. HUTCHINSON.

Mr. GORDON, in opening the case for the Company, described Lisburn as a flourishing town, with a population of something over 11,000; and he said it was a place where the supply of gas was likely to increase. Besides Lisburn itself, the Company also supplied gas in the surrounding district; and the Council had taken powers to supply, not only their own district, but certain outside areas which would roughly correspond to the Company's present limits of supply. The Company was formed in 1837, and till 1857 was carried on as an ordinary partnership concern. Then it was formed into a limited liability Company; and its record was one of continuous prosperity. In 1878, the share capital was fixed at £15,000; and that was as it stood at present—£12,000 being subscribed. From 1882 till 1909, there had been a uniform dividend of 10 per cent. paid, with the exception of about three occasions, when it was a little less. During these 28 years, depreciation to the extent of 2 per cent. had been provided; and, in addition, there had been a very large expenditure on new works and in keeping the old works in a state of efficiency. A reserve fund of over £6000 had been created. The profits had gradually increased; and the number of private consumers had grown considerably. For the last five years, a uniform price of 3s. 4d. per 1000 cubic feet had been charged, and discounts had been allowed. The price previously had been 3s. 6d. These figures compared very favourably with the rates charged in other towns where the gas undertakings were similar. In some places in Ireland the price was as high as 5s. There were only two undertakings supplying at a lower figure than Lisburn; and they were in the hands of local authorities. With regard to leakage, in the last three years the loss had been—17·5 per cent. in 1907, 18·2 per cent. in 1908, and 17·7 per cent. in 1909. This might be considered very excessive leakage; but the Local Authority had been putting down a new sewerage system, and the mains had been affected in consequence. Generally, however, the loss was attributed to a large number of small leaks. The Company's mains were about 13 miles in extent. They had been carefully examined by all parties. Some 28 or 30 borings had been made; and in all cases, with the exception of perhaps three or four, they were found to be good. In one instance, a main was discovered to be quite soft on account of the action of some chemical; but this was found to be purely local. The buildings and plant were sufficient for their purposes; but they were told that some of the plant was not worked as economically as it might be, and that if a little more scientific knowledge were applied the profits could be increased. But the works were in good order. They were a non-statutory Company, and had lived a most harmonious life with the Local Authority in Lisburn, with the exception of the last two years, when the question of purchase arose. There could be no complaint about the gas. In the Act obtained by the Local Authority, they had a limitation of 4s. per 1000 cubic feet. It had been suggested to him that this was a matter of agreement, and not compulsory purchase; but he could not understand how this question could arise. Two years ago, the Local Authority suggested to the Company that they wished to acquire the concern; and the attitude of the Company from first to last had been that they did not want to sell, and did not think they ought to be compelled to do so.

Mr. William Cash gave evidence with regard to the accounts of the Company. He said that during their operations there was money which the Company had chosen to devote to the benefit of the consumers which they might have placed in their pockets. Considerable sums had been put to the reserve fund, amounting in all to £12,125. On one occasion, £2400 was taken out of the fund and added to capital, and on another £73 was taken in order to make the dividend up to 8 per cent. The reserve fund was invested to the extent of £5000. The cash in hand amounted to £2000. There had been a slight decrease in the amount of gas sold.

Cross-examined by Mr. HONORATUS LLOYD, witness said that £4700 represented the whole of the cash that had been brought in as capital other than moneys provided by the consumers. There had been transferred to capital account, either from the reserve fund or the profit and loss account, a sum of £6100. In 1878, the assets of the Company were re-valued and written-up to the extent of £1200; and the share capital was written-up by the same figure. These were the facts; but he did not wish the impression left on the minds of the Court that there was anything improper in them, or that there was not value for the amount in the undertaking. Originally, there were 500 shares of £5 each. These were raised by £2 in 1863, and in 1872 another 100 shares were issued at £12 each. To-day there were 600 shares of £25 each nominal. As the nominal value of the shares had increased, transfers had been made from the reserve or profit and loss account to capital account.

Mr. HONORATUS LLOYD: Out of a sum of £4700, which was the only money ever brought into the undertaking apart from transfers, the Company have paid, with the exception of three years, 10 per cent. on the capital, which would be 20 per cent. in the earlier years, and getting on for 25 per cent. or more in the later years, and laid by a reserve fund the balance of which is over £6000, and accumulated an undivided profit of £4000?

Witness: Yes.

Replying to further questions, witness said the balance carried down

for 1909 was £2374, which was equivalent to 16·7d. per 1000 cubic feet sold; the total reserve fund was now £6000 odd on the nominal capital; and the carry-over was £3700.

Re-examined by Mr. CLEAVE, witness stated that he did not know of any complaint against the quality of the gas supplied by the Company; and since 1882 the price charged had been very moderate. However, the shares had been raised, and whether or not they had been increased in value, the 10 per cent. had been maintained, which was not unusual in a company such as this. The undertaking had been very successful, and from a financial point of view was in an extremely strong position.

Mr. CORBET WOODALL: Has the capital of the Company risen at a greater rate than the increase in the business?

Witness: No; I should think the reverse.

Mr. E. H. STEVENSON was the next witness. He said the buildings connected with the gas-works were mostly of stone. Some of them, he admitted, were a little inconvenient; but so far as the structures themselves were concerned, they were good and substantial. If the works were absolutely modern and well managed, there was no doubt that they could make 40 to 50 per cent. increase in the profit on the present make of gas. There were 56 retorts, two exhausters, four purifiers, and three gasholders of a total capacity of 195,000 cubic feet, which he considered sufficient. The maximum make in 1908 was 216,600 cubic feet. The mains were from 12-inch to 14-inch. In 1909, the mains were examined at numerous borings; and in one place they found a pipe which had become so soft that it could be cut with a knife or a spade. The pipe was laid under a channel in the road, opposite the entrance to a weaving factory; and it had been damaged by some chemical action. Some openings were made a few yards on either side of the damaged point; and the pipe was there found to be perfectly good. Certain of the pipes which had been in the ground for 15 years were just as though they had been laid yesterday; and he had been told that one pipe was 60 or 70 years old. As pipes, they had not depreciated at all. He was sure that the unaccounted-for gas was due to a large number of small leaks; but the percentage in this case could easily be lowered. In a well-managed undertaking, the unaccounted-for gas should not exceed 6 per cent. They ought to have 25 years' purchase as a non-statutory Company. The undertaking was so well managed that he could not conceive it making less profit than at present; but he could conceive the making of a very much higher profit from the same quantity of gas sold. Local authorities made a great mistake when they thought they were going to acquire undertakings such as this, on a non-statutory basis, at a cheaper rate than if they had first had their capital regularized. His valuation of the undertaking was £63,235. The balance of profit earned in 1909 was £2374, and the maintainable profit £2210.

Mr. HONORATUS LLOYD: That will give the Company £1800 per million. Is that reasonable?

Witness: Yes.

If you have your way, the Company will receive £63,235 for the works?—Yes.

They would be entitled to the cash they have, the undivided balance, and the reserve fund; and they would have in their pockets some £74,000?—Yes.

And they have found out of their own pockets something under £5000?—That is entirely wrong. They have found out of their own pockets every penny that has been expended upon the undertaking. They found it so profitable that they put further money into the concern that they might have placed in their pockets.

In respect of the £5000, which is all the shareholders ever risked, they would receive £74,000?—Yes.

So they would receive 1380 per cent. for the money they risked?—Yes, money which they originally risked about eighty years ago. I do not consider that is at all exorbitant, taking into consideration the number of years, and that the shareholders have always been putting their profits into the business.

These people have now for years been only receiving something like 25 per cent.?—I think they have been exceedingly reasonable.

If they get what you ask, they could put it into the Dublin Gas Company, and get an income of £4400 a year on it?—I should not advise it.

Replying to further questions, witness said that if the Council had not bought them up, their future would probably have been that of a statutory Company. He generally advised his clients to obtain statutory powers, because he considered it more satisfactory to all parties. A fixity of tenure would give them a slightly better secured income; but the number of years' purchase depended upon the circumstances of each case.

Mr. HONORATUS LLOYD: The future you have valued on is the future of remaining a non-statutory Company?

Witness: The probability is that we should become a statutory Company, and that might have been very good or very bad for us. We cannot value a thing on problematical conditions of which we have no knowledge.

Continuing, witness said there were certain shortcomings in the works; and some of the plant was slightly deficient. The standard price had always been fixed, upon opposition, with reference to what the gas could be supplied at—that was, the cost of the gas under proper management, plus the dividend required.

Second Day.

Mr. STEVENSON, continuing his evidence on Friday, said that when gas companies nowadays asked Parliament for further capital powers it was generally for £750 per million cubic feet of gas—the figure varied between £150 and £850; £750 being the average. This was more than they used to ask for, because if all the work of the gas undertaking was done out of capital it was most costly, in consequence of providing materials and so on. The general rule was to provide for some of it, if not all, out of revenue. In this case, he would certainly have asked Parliament for £850 per million.

A question arose at this point with reference to the correspondence between the parties; Mr. GORDON pointing out that it was without prejudice. Mr. Honoratus Lloyd read a letter from the Company to the

Council, in which the Company said they had not thought of selling; being perfectly content with the position of affairs. If the Council, however, thought it would be for the interest of the town that the works should be acquired, any proposal would be considered by the Board. He also read another letter in which the Company said the Directors could not see their way to make any proposal for the sale of the works; but if the Council decided to buy, and a price could not be amicably agreed upon, they would suggest that the whole matter be referred to arbitration.

Mr. HONORATUS LLOYD: It has been said that the shareholders might have taken out of the Company certain profit instead of putting a large portion to reserve, and re-invested it in the Company; but before re-investing it, they would have declared not a 10 per cent., but a 20 per cent. dividend?

Witness: I do not think they would have done that.

Continuing, witness said that if they had done this from time to time in building up the undertaking, they would not have divided much of a bonus, because the profits would not admit of a bonus, nor even of more than about 7 per cent. on the capital itself. The Company had been depreciating capital year by year, as well as adding to it.

Mr. HONORATUS LLOYD: If the real facts had been appreciated by the consumers, they would not have stood it for five minutes; and one of the reasons why the position was not appreciated is by reason of the fact that you declare a dividend of 8 per cent. and a bonus.

Witness: The consumers in the town get gas at as low a price as any company is supplying in the whole district in the north of Ireland, even including large companies.

Replying to further questions, witness agreed that if the Company were under Statute of any sort all matters would be properly regulated, and the consumer would be so much the better off.

Mr. HONORATUS LLOYD read a report prepared by Mr. Brodie, the Manager of the Gas-Works, from which it appeared that the works as a whole were in a manner commodious, but required reconstructing. With regard to the retort-house, the settings wanted rebuilding in order to obtain the most economic result. The condensers, scrubbers, purifiers, and station meters were all very deficient in capacity. Roughly speaking, the works were worth from £35,000 to £40,000.

Witness pointed out that since that report was written the retorts had been very materially improved. If the retorts gave better results, they would have bigger profits. He did not know that some of the retorts were 22 in. by 15 in., with mouthpieces 18 in. by 13 in.; and he did not know that the hydraulic mains were of cast iron, and much too small. He agreed that the purifying plant was not sufficient in area. The station-governors were not laid down with the object of passing as much gas as could be pushed through them. The works were never built to anything approximating what was shown by the capital account.

In re examination by Mr. GORDON, witness said that had this been a statutory company he would have fixed the number of years purchase at 28.

Mr. GORDON: The Company have capital fully paid-up of £12,000, and the capital expenditure on works is about £30,000. How do you think that the Company would be treated if they were to go before Parliament?

Witness: I think in the case of a company who were supplying gas as cheaply as this one is, and against whom practically no complaints have been made, Parliament would grant them £12,000 as original capital and 10 per cent. upon it, and the balance at 5 per cent.

Continuing, witness said that if the Company had in times past found the capital out of their own pockets, and it had been put into capital account, there would have been no reduction in the price of gas. A fair average profit made by gas companies in the whole kingdom ranged between 8d. and 2s. 6d. per 1000 cubic feet. There could never have been any real concealment of the profits made by the Lisburn Gas Company, because some of the members of the Local Authority were shareholders.

Mr. JONES: Do you think Irish companies would give as low a return for investment as an English company of the same standing?

Witness: I think it would be about the same; but it is very difficult to find one in Ireland of the same standing.

Have you ever known them to be 1 per cent. more than the same class of English companies?—I believe that, even with the questionable management one sees in most of the Irish undertakings, there is not 1 per cent. difference; and if they were managed as well as the English companies, there would be little, if any, difference. But most of the companies over there are not well managed.

Mr. J. Hepworth gave evidence generally bearing out that adduced by Mr. Stevenson. His total structural valuation, which he had based on the profits for 1909, was £28,048. He also agreed that gas management in Ireland was out of date.

This closed the case for the Company.

Mr. Frank Jones then gave evidence on behalf of the Council. He said the works were conveniently situated for the purpose of manufacturing gas. There was no doubt that the position of the non-statutory company had depreciated very much in recent years; and this was especially so in Ireland. He had examined the works; and his valuation amounted to £20,513. Describing the condition of the works, he said the exhausters and purifiers were in very bad order, the condenser was too small, and in many cases the service-pipes were too small. He agreed that, so far as the leakage was concerned, it was due to a large number of small leaks. If the Company had not been bought up by the Council, their future would have been that of a statutory company; and he had taken this into consideration in making his valuation. Considering the state of affairs with regard to finances, he thought the consumers, had they known what the state of affairs was, would never have allowed the Company to continue; and if the District Council had known, he thought that they would have stopped it. Sufficient money had not been spent upon the works to keep them in proper repair. Instead of spending £5500 in this direction, it had been placed to reserve.

In cross-examination by Mr. GORDON, witness said the works had not cost more than £11,982, unless the money had been wasted; and the value of the mains and land brought the total up to £21,000. The daily make of gas was, roughly, 240,000 cubic feet, and the gasholder capacity 195,000 feet. If another holder were erected in connection

with the works, he thought the cost would be £30 per 1000 cubic feet, because they would probably have to buy land for the purpose. Generally speaking, the pipes were in good order; but many of them would have to be replaced. He would not put the Company on anything like as high a plane as a good class English company. In the case of a statutory company earning a profit such as the Lisburn Company did, he would give 19 years' purchase. But non-statutory companies in Ireland had been having a pretty "rocky" time of it.

Mr. GORDON: So far as the shareholder is concerned, it is wholly immaterial to me whether I take the dividend out and put it in the bank for six months and then hand it over to the Company and get shares for it. But assume that they made a net profit of £2200 a year, what would that pay them, supposing they divide it?

Witness: Ten per cent. But I do not think Parliament would have given them £21,000 at 10 per cent.

Continuing, witness said that, on the assumption that there was no question of Statute, and that the Company could go on as in the past and conduct their affairs as a private business, the most that they could take out of it would be about £1500 a year, including reserve, insurance, and all the proper lands.

In re-examination by Mr. HONORATUS LLOYD, witness said his chief complaint with regard to the retorts was as to the ironwork itself. The fires were bad, and the make of gas was small compared with the material used. If the works remained in their present condition, they could not continue to earn their present income. The Company would not have been allowed to continue as they were for long, because the Council would have looked upon it as a scandal, and either the price of gas would have had to be substantially reduced, or the Council would have gone to Parliament.

Mr. GORDON pointed out that the Solicitor to the Council was a Director of the Company, and another member of the Council was a shareholder.

Third Day.

Mr. William Newbigging gave evidence on Saturday. He said that, so far as the works were concerned, there were deficiencies at practically every stage from the retort-house to the holders. With regard to the retorts, the deficiency was principally with the hydraulic mains, which were of such a character that he was satisfied there must be trouble with them. The condensers were seriously deficient; and the exhausting plant was not in duplicate, as it should be. The scrubbing and washing plant was deficient; and the latter was quite unequal to its work. A new station-meter was required. The maximum day's make was 228,000 cubic feet; and the storage capacity was less by 30,000 cubic feet. The system of governing only existed by day; at night the governors were weighted down. There was a pressure on the mains at night of something like $4\frac{1}{2}$ inches, which was due to the smallness of the distributing mains. Owing to the smallness of the distributing mains, the governors were put out of action. He considered that the 3-inch mains to the extent of 7264 yards ought to be taken up and replaced. They were too small. His opinion was that the Company had starved the concern. With regard to repairs and maintenance, there should be expended, on an average, 7d. per 1000 cubic feet, which, in the case of Lisburn, was a reasonable figure. This meant that the Company should have spent, including meters and stoves, £995, instead of £592—the figure which appeared in the accounts. It was not his experience that small companies had to pay more for repairs than large ones. The Lisburn Company were very largely dependent upon the sale of coke to balance the profit. In this connection, the receipts for coke in 1909 were £2478. He had valued the undertaking upon the basis of a statutory company, which was its only possible future. His structural valuation was £20,284, included in which was an item of £635 for land, which would have to be deducted. He believed that the fixing of the standard price would have been at a lower figure than 3s. 4d.

In cross-examination by Mr. GORDON, witness said that a sum of £5500 should be spent upon the works in order to make them thoroughly efficient. This would have to be expended to ensure a satisfactory supply. Under the present condition of the works and mains, it was absolutely impossible to give a satisfactory supply.

Mr. GORDON: Do you agree that the expenditure of £5500 will be remunerative in the sense of creating new profit?

Witness: I agree that a portion of this expenditure will tend to increase the profits. But the expenditure on the works is solely for the purpose of ensuring a safe and satisfactory supply.

Do you say there can be no profit unless this sum is expended?—You would run a grave risk of losing the balance of profit. Unless the money is expended, you would not be able to carry on the works; and owing to the condition of the apparatus, you may at any time have an accident.

Replying to further questions, witness said they would not have to stop unless there was an accident; but owing to the state of the plant, the management had already experienced great anxiety. He agreed that the makers of the retorts were good, substantial firms.

Mr. GORDON: At the expense of this selling Company, you want a perfect plant?

Witness: I will not say "perfect."

But you would have it in a highly satisfactory condition?—In a satisfactory condition.

Continuing, witness said he would have the plant in such a condition that they could maintain whatever profits there might be. His opinion was that 19 years' purchase should be given for a statutory company, and 16½ years for a non-statutory company. Statutory companies in Ireland were in a worse position than statutory companies in England. The point certainly came within the limits of these proceedings that the people interested in the Lisburn undertaking could take the money they got for their shares and invest it in an equally good company.

Mr. GORDON: First of all you assume that this is a statutory Company? Then you assume that the selling Company should expend a certain sum of money which would ensure its profits?

Witness: Yes.

Thirdly, you say that these profits should be in no way taken into account in arriving at the value of the undertaking?—Not under the circumstances of this case.

Fourthly, an Irish company cannot get money for doing its work on the same principle that an English company can?—That is so.

You ignore the fact that this Company has practically £10,000 of available cash?—Yes, I ignore that.

And if you can find out any gas company in which you can get 5 or 6 per cent. for your money, you ought not to give these people anything more than would produce that income?—I take the market value of gas undertakings as the basis on which I have valued this undertaking.

Re-examined by Mr. HONORATUS LLOYD, witness said he did not mean that all companies ought to spend 7d. every year on repairs and maintenance, but that an amount should be spent which represented 7d. per 1000 cubic feet, taking one year with another over the average life of the works.

Replying to Mr. CORBET WOODALL, witness said he had heard complaints from residents in Lisburn as to the unsatisfactory pressure of the gas.

The UMPIRE: Apart altogether from any increased outlay on repairs and improvement, the new management of the existing works would produce better results?

Witness: Yes.

If the £5500 you suggest were expended, and supposing there was no question of purchase, would this expenditure have enabled the Company to go on as in the past as to the amount of profit they have realized?—No. They could not have maintained their present balance of profit.

Would the expenditure of £5500 enable them to give a satisfactory supply to the district?—Yes.

And given a satisfactory supply, the profit would take care of itself?—Yes.

Mr. H. E. JONES: You do not suggest that the expenditure of £5500 will turn this into a first-class gas company?

Witness: No.

Do you consider the plant can go on doing its work without being entirely reconstructed?—To make a first-class gas undertaking of this concern, it must be entirely reconstructed.

The hearing was adjourned till June 11.

MANCHESTER GAS PROFITS.

Allocation in Aid of the Rates—Unfair Competition of the Electricity Committee.

At a Special Meeting held last Wednesday to deal with the estimates for the current year, the Manchester City Council rejected, without a division, a proposal that the Gas Committee should be called upon to contribute £60,000 instead of £46,500 in aid of the rates. Originally the Committee proposed to allocate a sum of £40,000 out of the profits; but, in response to an urgent appeal from the Finance Committee, they agreed to increase the amount to £46,500, so that there might be no advance in the rates for the year. Now, Alderman Wainwright moved an amendment that a further £13,500 should be taken from the Gas Department, and Mr. Hargreaves seconded it.

The Chairman of the Gas Committee (Alderman Gibson) made a vigorous protest against this attempt to further squeeze his department. He said Alderman Wainwright had not shown how the extra money was to be found by the Gas Committee—assuming apparently that the Committee had some source where they could dig up money as miners dug up coal. It was true that the Gas Department had allocated as much as £70,000 in one year in relief of rates; but this was a solitary case, and must be taken as a proof that they had never been appealed to for a contribution which was not readily made if it could be done. The position was different to-day; and the Committee felt that £40,000 was as much as they could give this year. They had estimated to make a profit of £32,000, but hoped to make more. In response to an urgent appeal, they agreed to increase the contribution from £40,000 to £46,500, in opposition to their judgment as business men; and by doing so they ran the risk of having to find money somehow with which to make up the contribution. He reminded the Council that last year they made £48,000 profit, but paid in aid of rates £50,000—being thus £2000 on the wrong side; and that during the seventeen years he had been Chairman of the Committee, £851,000 had been handed over out of profits in relief of the rates. They were now faced with the keen and unfair competition of the Electricity Committee; and to be asked for an additional £13,500 was absurd. The Electricity Department was slowly murdering the Gas Department; and he was determined not to allow this to be accomplished quietly.

As already stated, the amendment was rejected, so that the contribution from the Gas Department will be £46,500, compared with £50,000 last year. An amendment to the effect that the Electricity Committee be called upon for £20,000, instead of £15,000, as proposed by them, was also defeated, although a strong case was made out by Alderman Holt, the ex-Lord Mayor, who moved the amendment. He said his object was to bring the Electricity Committee into line with the Gas Committee. He argued that the policy of the former Committee had been to sell current practically at cost price. This was all very well; but if they were to allow the Electricity Committee to do this, why should they not permit the Gas Committee to do it? The Electricity Committee were supplying at the average price of 1.30d. per unit current which cost, on an average, 1.27d. to produce, which left only 0.03d. per unit. There were cases, he believed, where the current was supplied at less than cost price. This was affecting the Gas Department; and it was his point that no ordinary business firm would allow two departments of their business to so compete, as was the case here. The time had come when they must make up their minds whether or not to allow the Electricity Committee to continue this policy. It was not fair that the ratepayers should pay £2,500,000 for the benefit of about 9000 well-to-do consumers. He knew all the arguments about a day-load being necessary; but if the Committee did not take care, they would have so much day-load that they would lose the night-load. If the machinery of the department was not fully employed, how was it the Committee were increasing their capital account? He was in favour of a reduction in price, but not to the point where

profit vanished. Incidentally, Alderman Holt mentioned that a conference was to be held between the officials of the two departments to consider the question of fixing prices on an equitable basis.

The net result of the further squeezing of the trading departments and a cutting-down of the estimates is that the rates will be 6s. 9½d. in the pound—a decrease roughly of ½d. on last year.

SALFORD CORPORATION GAS SUPPLY.

Important Alterations in Price Suggested.

The Gas Committee of the Salford Corporation propose to make several changes in the charges for gas. In the first place they will ask the Council to-morrow to authorize them once more to charge meter-rents, after doing without these charges for nearly seventeen years. Then the quantity of gas allowed for rd. by prepayment meters is to be reduced from 30 to 27 cubic feet. On the other hand, it is proposed to lower the prices to large consumers of gas both within and outside the borough—rd. per 1000 cubic feet for consumers of 2 millions and under 4 millions, and 2d., 3d., 4d., and 5d. per 1000 cubic feet to consumers of larger quantities, in proportion to the amount used.

BIRMINGHAM GAS, WATER, AND ELECTRICITY SUPPLIES.

The Past Year's Results—Mr. R. S. Hilton Appointed Gas Secretary and Manager.

A Meeting of the Birmingham City Council was held last Tuesday, when the annual reports of the various trading departments (*ante*, pp. 449, 511) came up for consideration. Alderman BOWATER, the Lord Mayor, presided.

A NEW SECRETARY AND MANAGER FOR THE GAS DEPARTMENT.

Alderman Sir HALLEWELL ROGERS presented the report of the Gas Committee, together with the balance-sheet and statement of accounts for the year ended March 31, and moved the adoption of a recommendation that Mr. R. S. Hilton be appointed Secretary and Manager of the department at a salary of £1500 per annum, rising to £1600 on the completion of one year's service. He reminded the Council that at the meeting on Feb. 1 last, the Committee were authorized to submit for approval the name of a gentleman to occupy the position. Since then, they had given much time and anxious deliberation in their endeavour to secure the services of a thoroughly competent commercial man. They did not advertise the vacancy; and he had no reason to believe they would have received any more favourable applications than they had by so doing. He was equally sure that many of the gentlemen who had made application, including Mr. Hilton himself, would not have answered an advertisement. As a matter of fact, the vacancy was widely known, through the technical journals, in the gas world, in local industrial circles, and generally in the engineering profession. Applications were received, not only from all quarters of the United Kingdom, but from the United States and South America. Last February he outlined to the Committee the qualifications they thought applicants should possess, and stated it was not their intention to interfere in any way with the engineering side of the department. The Committee had every confidence in their Engineers' working, as they were, in charge of their own works. He thought the balance-sheets for the past two years showed that the arrangements for the management of the undertaking entered into on the retirement of the Engineer-in-Chief (Mr. Henry Hack) had proved eminently satisfactory. All that was wanted now was a thoroughly capable business man. The difficulty of finding a suitable man for the post was evidenced by the fact that practically all the principal gas undertakings throughout the country were primarily under the control of an Engineer-in-Chief. The Committee sought the advice of several leading men in the gas industry; and their choice had fallen unanimously upon Mr. R. S. Hilton, Manager of the Clay Cross Company's Collieries at Chesterfield. Mr. Hilton had been General Manager at these extensive collieries for the past five years, and had had to sell the output of coal, amounting to 800,000 tons per annum, and also 75,000 tons of coke, in addition to coke breeze. The Clay Cross coal was largely used for gas-making; and the greater part of the coke was made in bye-product ovens, the recovery plants in connection with which yielded sulphate of ammonia and tar, with the disposal of which Mr. Hilton had also had to deal. He had further had to deal with all mechanical questions at the pits; and large extensions had taken place under his control. The collieries employed over 3000 men; and all questions of magnitude connected with their control had been dealt with by Mr. Hilton. His knowledge of the coal trade would be of considerable assistance to them, seeing that the Committee purchased about 600,000 tons of coal per annum. But, apart from this, the Committee were impressed with Mr. Hilton. After interviews with him, they came to the conclusion that he was a capable business man, and that his engineering and general business knowledge fitted him for the position of Manager of the department. Testimonials received from those who had known him, both privately the whole of his life and in business, proved him a thoroughly straightforward gentleman. With regard to the salary proposed, it might be thought by some members of the Council that the Committee were endeavouring to force their opinions as to adequate remuneration for the position, and that, because the Council refused to approve their recommendation of an increase from £1400 to £1600 for the late Secretary, they were not justified in submitting the name of a gentleman with a commencing salary of £1500. The Council would remember they asked to be given a free hand in the matter of salary; and they did so because they did not think it wise to fix a definite figure without knowing what applications they would receive. Had he been pressed at the February meeting of the Council to name a figure, he would probably have said they hoped to secure the services of a gentleman at about £1250, or within £200 or £300 on either side of this sum. He

might say they received applications from men receiving £350 and upwards. Mr. Hilton was already receiving £1400 a year; and, naturally, he would not give up his present position unless he obtained an advantage. It would thus be seen that they could not secure Mr. Hilton's services for a lower sum. He wished it to be understood clearly that, while they were not looking out for a man at this figure, it was the figure at which the only really good man who presented himself was to be had.

Alderman J. H. LLOYD having seconded the motion,

Mr. PENTLAND moved that the recommendation be referred back. He said he had in mind the present position of the city in regard to trade; and in his view they were taking a step in the wrong direction to the interests of the ratepayers.

The amendment was not seconded; and, on a vote being taken, all but Mr. Pentland voted for the motion, which was declared carried.

GAS PROFITS.

Alderman Sir HALLEWELL ROGERS then moved the adoption of the Gas Committee's report. He said the figures in the balance-sheet were very satisfactory, as they constituted another record. The gross profit was £189,934. The turnover was £940,000, which was £4823 more than in the preceding year. It might be remarked that in giving £72,491 as a cash contribution to the rates, they were doing so at the expense of the consumers. He would like to point out, however, that had the price of gas been the same as in 1908, their turnover would have been £45,000 more. The output had been increased by 228,000,000 cubic feet compared with the previous year. During the year, 8000 new consumers had been added. It would be seen that the £189,000 was taken over in the profit and loss account, and, after the necessary charges were made, was brought down to £72,491. The good profits for the year were due to various causes. In the first place, the late Mr. Hampton Barber bought his coal exceedingly well twelve months ago. Then the Engineers at the works had got the best out of the coal, and every member of the staff had worked excellently.

The report was approved.

WATER-WORKS DEFICIENCY.

Alderman BEALE presented the report of the Water Committee, with the accounts and balance-sheet for the year ended March 31, 1910. Dealing with the accounts, he said no doubt the report would be received with some disappointment. The story was a very simple one. The fact was that the stagnation in the demand for water still remained. There was a slight increase; but it was abnormally small. The total increase was 1.78 per cent.; and if they excluded Coventry—which for the purpose of comparison with previous years ought to be excluded—the increase was something less than 1 per cent. Domestic rental had increased 1.59 per cent. This was naturally low because the stagnation in trade had stopped enterprise in house building. The metered supplies showed a reduction of 0.55 per cent. The Council were about to receive a report from the Electric Supply Department, which showed a largely increased output. He would point out that an increase in the electric output meant, in a great measure, the substitution of electric for steam power; and this resulted in a decreased demand for water. About 11 per cent. of the gross receipts was paid away in rates and taxes. This amount was, of course, spread all over the aqueduct—over all the parishes from Wales to Birmingham. A new item came into charge this year for the first time—the sinking fund for the Welsh capital. They were allowed a period of grace by Parliament. This had now expired; and the charge relating to the loans raised sixteen years ago came in. Next year further amounts would come into charge. The Committee recommended that provision should be made for a contribution from the borough fund and rate account of £65,000. It was a question whether they ought not to ask for more. If they did not do better next year than this, they would have to ask for a supplementary grant; but they did not want to ask more from the rates until they were absolutely obliged. There was an important paragraph in the report giving the total cost of the first instalment of the Elan supply works. When Sir Thomas Martineau presented the report to the Council on which the water scheme was sanctioned in 1892, he had before him only the parliamentary estimate. Looking back on it all, and knowing the magnitude of the work and what had happened, how they ever relied on the parliamentary estimate was a marvel to him. It was simply a rule-of-thumb method adopted by engineers to satisfy the requirements of Parliament. When they encountered underground conditions, and met with extraordinary difficulties in carrying out the work, they soon realized that the parliamentary estimate was of no value whatever for a financial forecast. It was not until 1902 that the late Alderman Parker was able to tell the Council what he thought the ultimate cost would be. The work was now complete; and he was glad to say the cost was £72,344 below the estimate.

Mr. MURRAY suggested that afforestation of some of the hillsides of the Welsh estates might result in eventually increasing the revenues of the department. Something had been done in this direction; but he saw no mention of it in the report.

Sir G. H. KENRICK said that if they grouped the trading committees, it would be found that the increased profit which they reported came to £4704; whereas the extra deficiency on the Water Department was £4823. It would be seen that there was a large increase in the consumption of water—equal to about 6 per cent. in the domestic supply. As this was not represented by a corresponding increase in the revenue under this head, it meant that the consumers were now using a greater quantity of water.

Alderman BEALE, in reply, said that the trees which had been planted on the watershed were growing satisfactorily; but it would be a long time before there would be any revenue.

The report was adopted.

PROGRESS IN ELECTRICITY SUPPLY.

Mr. ELLAWAY submitted the report of the Electric Supply Committee, and moved that authority should be given for the provision of additional plant, and the provision of a sub-station at Harborne at a total estimated cost of £143,250. He explained that the last vote for extensions for prospective increase of output was made in 1907, and was expected to meet requirements for the three succeeding years. The output had been growing by leaps and bounds for lighting and power

purposes. The increase of units for lighting and power in 1907 was 1½ millions, in the following year it was 2½ millions, in 1909 3 millions, and last year 4½ millions. Altogether the forecast of the Committee had been very satisfactorily exceeded. While their capital had been increased by about 15 per cent., the output had increased about 50 per cent.; and during the three years 1908-10, they would, if that day's accounts were passed, have paid £20,000 to the rates, besides £16,000 to the renewals fund, and £62,000 for writing off obsolete plant. They had also made concessions to consumers, in reduced charges, equal to about £11,000.

The report of the Committee, including accounts showing a surplus of £12,553 to be carried to the improvement rate, was approved.

NOTTINGHAM CORPORATION GAS UNDERTAKING.

Gas Profits Relieve the Rates.

At the Meeting of the Nottingham City Council on Monday last week, the Chairman of the Finance Committee (Mr. E. Mellor) submitted the Budget. He first pointed out where the estimates presented last year had been exceeded, and then came to the estimated receipts for the coming year. Referring to the gas undertaking, he said he could speak of it with unmitigated pleasure. A few years ago it was in a state of disorder. There was a divided Committee, and complaints were made from customers as to the quality of the gas—a general position which, to say the least of it, was unsatisfactory. But during the last three years the Mayor and his Committee had brought about a very great improvement. Twelve months ago, a reduction was made in connection with the slot-meters, which saved the gas consumers between £4000 and £5000 annually. This year the Gas Committee were making the Finance Committee a grant of £35,000 in relief of the rates, as against £31,000 last year; and in addition to this they had put £10,000 out of profits to the ordinary reserve fund, and were again reducing the price of gas to the extent of 2d. per 1000 cubic feet to small consumers and 1d. per 1000 cubic feet to large consumers. He emphasized very strongly the fact that the Committee's contribution was not made at the expense of the stability of the undertaking, for the reserve fund never stood so high as it did now. In 1899, out of a net profit of £25,690, £24,000 was taken in relief of the rates; and in 1910, out of a profit of £54,281, the Finance Committee had only asked for £35,000. The total estimated expenditure for the year was £494,562 (including £99,958 for purposes of education), less receipts of £155,027; leaving a balance of £339,535 to be met by the rates, towards which 6s. 3d. in the pound would produce £339,000.

Sir E. Fraser severely criticized the Budget, which he said professed to be that of the Finance Committee, though it had been amended, and as he thought spoiled, by the Gas Committee. It was for the first time the production of two Committees instead of one. Commenting upon the policy adopted by the Corporation to meet the enhanced expenditure, he said the method they proposed was, he believed, absolutely unjustifiable. They were the proprietors of certain trading concerns, which at different times were granted by Parliament as monopolies; but if they were not careful, and turned a reasonable monopoly into a grinding one, they would have it interfered with or taken away. He believed firmly that public utilities should belong to the people or their representatives, with the condition that the monopolies should be managed so that the benefit might be shared between the ratepayers who find the money and the consumers. What they were doing in Nottingham, in taking practically the whole of the profits in aid of the rates, would be impossible under modern legislation; and whenever they went for more money, the principle now followed by Parliamentary Committees might be applied to them, and their present undisputed control over the profits done away with. The Gas Committee were giving an additional £4000; but the Council must bear in mind that the gas consumers were not necessarily the ratepayers. The reduction in the price of gas would amount to not less than £8000; so that the Committee were denuding their resources by the two sums combined. The concession to the consumers was moderate and reasonable; but he did not think the Committee were able to do both. The undertaking had had a very good year, due to a great extent to the low price of fuel. If the gas-works were to be reconstructed on more economical lines, to produce better results, a huge reserve fund would have to be built up; but should the present course be pursued, they would never see the new gas-works, because they themselves had frustrated the idea by giving away the profits of the undertaking.

Sir J. T. McCraith expressed his concurrence to a large extent with what had been said by Sir Edward Fraser by way of criticism of the Budget; but at the same time he considered it would have been more helpful if he had indicated in any direct way how a change could be made in the general expenditure. Dealing with Sir Edward's remarks on the gas undertaking, and his statement that the Committee were denuding themselves of all their profits, if he (the speaker) had taken the figures down correctly, there was £19,000 left after the £35,000 handed over for the reduction of the rates; so he thought the Committee were putting a very large sum to the reserve. Sir John went on to point out that when the Chairman of the Finance Committee came into office he was burdened with a heavy loan, and that the Council, by their practices in the past, had saddled them with a debt of £2,500,000 for what, after all, was a lot of unremunerative work, leaving out the loans for gas and electricity. It was plainly their duty not to allow the Committee to spend more than was allocated to them. If they did, then it was their own fault.

In the course of his reply, Mr. Mellor said the decrease in the price of coal last year by no means accounted for the profits made by the Gas Committee. Notwithstanding, the depreciation of property in the centre of the city, the increased rateable value was £11,124. He had not taken this into account in his estimate. They must not harbour the belief that they were all going into bankruptcy. He did not see any reason why there should not be a balance in hand at the end of the year of from £4000 to £6000.

The estimates were then adopted.

WEST BROMWICH GAS UNDERTAKING.

The Past Year's Working.

The Borough Treasurer and Secretary to the Gas Committee of the West Bromwich Corporation (Mr. Thomas Hudson) has presented to the Committee his report for the year ended the 31st of March, which is accompanied by an abstract of the accounts for this period. The report furnishes the following particulars.

The borrowing powers stand at the same amount as at the date of the previous report—viz., £209,309. The loan indebtedness also remains at £136,999, and is equivalent to 8s. 6d. per 1000 cubic feet of gas sold, which is a slight increase compared with the previous year, by reason of the decrease in the quantity of gas sold. In addition to the debt extinguished, there is a sum of £13,672 in the sinking fund, available for further redemption of debt as opportunities arise; and this amount, deducted from the £136,999, leaves a net indebtedness of £123,327—a reduction of £4600 during the year. The capital outlay account has been reduced by £899—the difference between the cost of the abandoned water-gas plant, which has been written off, and that of the new carburetted water-gas plant of a modern type which has been installed in lieu thereof, and which has been defrayed out of the year's revenue. The total amount, therefore, debited to this account to date is £241,066, of which £136,999 is owing to the stockholders.

The total income for the year on revenue account was £55,105—a reduction of £394 compared with the previous year. The sales of gas amounted in the aggregate to £39,344, or a decrease of £1185, entirely due to the reduced consumption by lighting consumers. Mr. Hudson says the decrease is no doubt attributable in a large measure to the adoption of newer and improved appliances for more economical incandescent gas lighting, both by manufacturers and by private consumers. The sales for power purposes, however, show an increase of £155. While there is a decreased income from the sales of gas, there is, on the other hand, an increase of £396 from residual products, by reason of a larger production of coke, tar, and ammoniacal liquor.

The total quantity of gas sold was 321,506,600 cubic feet—a decrease of 7,841,788 cubic feet, or 2·38 per cent., when compared with the previous year. The quantity of gas lost by condensation and leakage was 20,063,400 cubic feet, or 5·78 per cent. The amount sold was equal to 6,818,361 cubic feet per mile of main, or a decrease of 214,577 cubic feet per mile compared with the year 1908-9.

The number of houses in the borough in November last was 15,086; 5569 being supplied with gas through ordinary meters, and 5800 by means of prepayment meters—a total of 11,369. The total number of consumers of all classes at the end of the financial was 11,680, or an increase of 158.

The total expenditure on trading account amounted to £42,736; being £1156 less than in the previous year, consequent upon there being a reduction in the output of gas. The total of the manufacturing costs, including maintenance of works and plant, shows a decrease of £1610. Notwithstanding the reduced output, the profit per 1000 cubic feet of gas sold is higher than before.

The gross trading profit carried to the profit and loss account is £12,369, against £11,608—an increase of £761. This account has been charged with interest on loans and Corporation stock and the proper instalment for the redemption and extinction of the debt, amounting together to £8258; leaving a balance of £4111 as the net profit for the year, compared with £3317 before. The amount of the contract for capital outlay on the new carburetted water-gas plant already referred to—viz., £1778—has been charged against the net profits; and the available balance is consequently reduced to £2333. The balance brought forward to the credit of the profit and loss account at the commencement of the year was £12,785, of which sum £1400 was transferred in aid of the general district rate, and £556 to the credit of the extensions suspense account; leaving a net balance of £10,829, which, with the surplus of £2333 for the past year, makes a total of £13,162 to be carried forward.

Accompanying the report of Mr. Hudson is that of Mr. Harold E. Copp, the Borough Gas Engineer, from which we make the following extracts.

The most important work undertaken during the past year was the installation of a new carburetted water-gas plant, superseding the original Dellwik-Fleischer "blue" water-gas plant. This work was carried out by Messrs. Humphreys and Glasgow in a highly satisfactory manner. The plant consists of a generator, a carburettor for the gasification of oil, a superheater or fixing chamber, and two tar-separators—one of the "Cyclone" type, for extracting tar vapour from the crude gas, and the other for the separation of water from the tar by the action of gravity. The total cost of the installation—viz., £2017—has been borne out of revenue. Owing to the highly efficient manner in which oil is gasified in this plant, it has not been found necessary to use the Peebles oil-gas plant, which was installed in 1907 for the purpose of improving the quality and partially enriching the "blue" water gas as previously manufactured.

The stoking machinery continues to work in a most satisfactory manner. The maintenance of the plant during the past year amounted to 0·88d. per ton of coal carbonized for the discharging-machine, to 0·35d. per ton for the charging-machine, and to 0·20d. for the engine and dynamo—a total of 1·43d., against 1·37d. the previous year. The total cost of carbonizing came to £2044, or 1·41d. per 1000 cubic feet of gas made, compared with £2107, or 1·41d. per 1000 cubic feet of gas made, during the previous year—a figure which will compare favourably with other works of similar size.

The quantity of coal carbonized was 27,370 tons, yielding 312,408,000 cubic feet of gas, or 11,414 cubic feet per ton. This is the highest yield obtained in the history of the undertaking. During the previous year, 27,315 tons of coal were carbonized, yielding 304,316,000 cubic feet of gas, or 11,141 cubic feet per ton. The increase in yield was due to less difficulty experienced with stopped ascension-pipes. The quantity of coke used for the production of water gas was 568 tons,

yielding 34,442,000 cubic feet, of which 4,900,000 cubic feet were "blue" and 29,542,000 cubic feet carburetted water gas. The quantity of oil employed was 52,083 gallons. The cost of water-gas manufacture, including benzol and oil for enrichment, was £1480, or 10'33d. per 1000 cubic feet, compared with 11'20d. for benzolized water gas only during the previous year. The carburetted water gas, as now manufactured, is of much greater value than the benzolized water gas previously made, and more nearly approaches the composition of coal gas. The proportion of water gas was 9'9 per cent., compared with 14'62 per cent. the previous year. The total quantity of gas made was 346,850,000 cubic feet—a decrease of 9,597,000 cubic feet, or 2'7 per cent., compared with the year 1908-9. The total wages at the works amounted to £5750, or 3'98d. per 1000 cubic feet of gas made, against £5684 11s. 6d., or 3'81d. per 1000 cubic feet before. The total manufacturing costs came to £30,337, compared with £31,948, from which it will be seen that the greatest care was constantly exercised throughout the year with a view to the economical production of gas.

The coke produced during the year was 16,484 tons, against 16,971 tons; and 5230 tons were used for manufacturing purposes, compared with 5888 tons. The yield of tar was 10'76 gallons, and of ammoniacal liquor 30'71 gallons per ton of coal carbonized, compared with 10'06 and 29'09 gallons respectively before. The ammonium sulphocyanide recovered amounted to 1'43 lbs. per ton of coal carbonized, compared with 1'40 lbs.

I regret to have to report a further decrease in the sales of gas during the past year, amounting to 7,838,788 cubic feet. This is largely attributable to the indifferent state of trade, and also to the great economies and improvements in the uses of gas which have been effected by many of the large consumers. I am strongly of opinion, however, that the causes of the decrease are of a temporary character. During the past two years, gas undertakings in all parts of the country have suffered either a depression or a decreased rate of progress; but recently issued returns show considerable increases in the sales of gas.

The number of gas-stoves put in during the year was 87, compared with 83 before; and there was a considerable increase in the number of radiators, gas-fires, &c., fixed in comparison with previous years. The number of meters fixed was 418, against 375; and 235 new services were laid and 175 repaired, compared with 250 and 154 respectively. New mains were laid of a total length of 564 yards, against 373 yards in 1908-9; the increased length of mains amounting to 480 yards. The number of public lamps is now 1087, of which 846 have incandescent burners, against 1081, of which 797 were fitted with incandescent burners last year. Breakages of lamps in portions of the borough are so frequent that it has not been found expedient to fix incandescent burners.

LEIGH (LANCS.) GAS AND WATER SUPPLY.

Work of the Past Financial Year.

The Engineer and Manager of the Leigh (Lancs.) Gas and Water Works (Mr. James Gibson) has presented to the Gas and Water Committee his eighth annual report, furnishing particulars in regard to the working of the undertakings under their control in the year ended the 31st of March last.

The total revenue of the gas undertaking was £22,429, and the expenditure £9848; leaving a gross profit of £12,581. Interest and sinking-fund payments required £9633, sums amounting to £387 were expended on capital account, and the balance of £2561 was carried forward. This result was achieved notwithstanding that the revenue was diminished by the reduction of 3d. per 1000 cubic feet in the price of gas from July 1, 1909. In the twelve months covered by the report, 249 houses were provided with penny-in-the-slot fittings at a cost of £241, which was defrayed out of revenue. During the year, 318 new gas-services were laid, and 67 defective ones replaced by new. At the beginning of the year there were on the register 2745 consumers on the ordinary and 4963 on the slot system; but at the end of the year the numbers were 2728 and 5340—showing a decrease of 17 ordinary, and an increase of 377 slot consumers. The total number of both classes on March 31 was 8068; being an increase of 360, or 4'67 per cent. The number of gas-stoves in use on March 31 was 2469, compared with 2445 on March 31, 1909. The number of incandescent public lamps at the end of the year was 426, or an increase of 39, and of ordinary public lamps 366—a decrease of 23. The total number of lamps on March 31 was 792. Of the 426 incandescent lamps, 331 are fitted with single and 95 with double burners.

The total quantity of gas sent out during the year was 149,128,000 cubic feet; being an increase of 3,831,000 cubic feet, or 2'63 per cent. The quantity sold (including public lighting) was 141,719,000, or 3,726,400 cubic feet (2'7 per cent.) more than before. This, Mr. Gibson states, is largely due to the progressive policy of the Committee in fixing slot fittings. During the year, the consumers who have these fittings took 1,906,100 cubic feet of gas, as against 351,100 cubic feet the previous year. At the end of March there were 30 gas-engines connected with the mains; and during the twelve months 2,579,900 cubic feet of gas were sold for power purposes. Of this quantity, 2,006,600 cubic feet were charged for at the reduced power rate, which came into operation on the 1st of July.

The quantity of coal carbonized was 13,270½ tons; and, in addition, 4439 gallons of benzol and 3336 gallons of oil were used. The cost of the raw material delivered was 11s. 3'68d., or 5'42d. less than before. The total bulk of gas produced was 149,329,000 cubic feet, of which 1,890,000 cubic feet were carburetted water gas. The make of coal gas was 11,110 cubic feet per ton; of coke, 10'70 cwt.; of tar, 1'12 cwt.; of ammoniacal liquor, 2'48 cwt.; of sulphate of ammonia, 25'32 lbs., compared with 23'86 lbs. in the previous year.

Mr. Gibson reminds the Committee that the income of the undertaking will be considerably lower in the current year, owing to the reduction in the price of gas for street lighting and to the slot-meter consumers; and he says the expenditure will probably be higher by an advance in the price of coal, by the increased cost of renewals of retorts, and by higher rates and taxes.

With regard to the Water Department, there was a loss of £1295 on the revenue account, compared with £1086 in the year 1908-9. Mr. Gibson says the deficit is the outcome of a steadily increasing consumption of water, due partly to the alteration of dry to water closets, and the conversion of the old system of supply into the new, whereby each consumer can have a separate service-pipe. The quantity of water used is thus increased without raising the revenue. Since no addition to this can be expected from the assessed charges, Mr. Gibson says it will be advisable for the Committee to avail themselves of every possible source of revenue. The total quantity of water received from the Corporations of Liverpool and Manchester during the year was 255,675,000 gallons, of which 3,806,900 gallons were sold in bulk to the Astley Parish Council. Its distribution produced £9638, compared with £9701 in the year 1908-9; the average yield being 9'04d. per 1000 gallons, against 9'26d. before. The total capital invested in the water undertaking up to the 31st of March was £61,937; and the expenditure under the Leigh Corporation Act, 1913, to the same date was £19,746.

The report came before the Committee on Monday last week, and was passed by them.

EVESHAM CORPORATION GAS DEPARTMENT.

Annual Report.

At the last Quarterly Meeting of the Evesham Corporation, the accounts of the Gas Department for the year ended the 31st of March were presented with the minutes of the Gas Committee, before whom they came on the 4th inst. Mr. Fisher, in moving the confirmation of the minutes, said that the total receipts amounted to £9023 net, and the total expenditure to £6535, which left a balance of £2488. The net receipts from the sale of gas were as follows: Public lighting, £401; private lighting, £3627; and prepayment meters, £2354—making a total of £6382, or an increase of £270. The balance of the revenue account was dealt with as follows: A sum of £759 had been written off the several capital accounts for depreciation; instalments of loan and interest absorbed £294; and there was left £1435 to be carried to the profit and loss account. The loan account showed that of the £15,000 borrowed £13,518 had been repaid out of revenue; leaving a balance of only £1482 outstanding. The expenditure for the year in extension of mains and services, new stoves, &c., amounted to £922; and the outlay on new meters came to £178. The stock in hand on March 31, the amounts due for gas, residuals, and fittings, and a credit balance at the bank made a total of £4754. On the other side of the balance-sheet, the amounts due to sundry creditors other than the loan accounts were £1083, which left a balance of £3671. The number of new consumers during the year was 75; and 100 cookers had been fixed. Though he did not expect the consumption of gas to increase so rapidly in the future as it had done in the past few years, the Council would see that they were still steadily progressing. The make of gas for the year was 46 million cubic feet—an increase of 2 million cubic feet. The minutes were adopted.

TIVERTON CORPORATION GAS UNDERTAKING.

The Disposal of the Profits.

Alderman J. Thorne, the Chairman of the Lighting Committee, submitted to the Tiverton Town Council yesterday week the annual statement with reference to the gas undertaking. The Borough Treasurer's report showed that the gross profits amounted to £3089, and that after deducting £2541 for interest and sinking fund there remained a balance of £548 to carry to the reserve fund, which, with this addition, would amount to £3214. New retort-settings on the regenerative principle had been installed during the year at a cost of £1247, of which sum £600 had been charged to capital; the balance being repaid in instalments out of revenue. The amount collected from slot-meters was £2082—an increase of £251 on the previous year. Considerable improvement had been made in the lighting of several of the streets by the adoption of the incandescent system. Alderman Thorne remarked that the statement was a most satisfactory one. The profit of £548 was entirely due to the new plant which had been installed. They had used 350 tons less coal, and had made a million cubic feet more gas. The unaccounted-for gas was lower than ever. It had been as high as 10 per cent. of the total make; but it was now only 4'7 per cent. This was largely due to a new and efficient governor. They all recognized the skill and capacity, as well as the industry, of the Manager (Mr. Clark Jeffery) in the production of such a statement as the one submitted. It had been proposed to carry the balance of £548 to the reserve fund; but the Lighting Committee now suggested that £400 should be applied in the reduction of the rates. Mr. Rowcliffe thought the price of gas should be reduced before the profit was used as proposed; and he moved that there be a reduction of 1d. per 1000 cubic feet. Alderman Thorne said the price of gas at Tiverton compared favourably with that of any town of similar size; and, under the circumstances, the Committee considered they would be justified in making a contribution to the district fund. The Mayor (Alderman W. Thorne) joined in the tribute paid to the ability of Mr. Clark Jeffery, and said they also owed a great deal to the interest which the Chairman of the Lighting Committee took in the financial arrangements of the gas undertaking. The proposal to reduce the price of gas was rejected; and it was decided that £400 of the balance of profit should be utilized in the reduction of the rates.

Gas-Works for Sumner (N.Z.).—H.M. Trade Commissioner for New Zealand reports that the Borough Council of Sumner, a suburb of Christchurch, propose to raise a loan of £12,000 for the purposes of establishing municipal gas-works. If the scheme receives the sanction of the ratepayers, and financial arrangements are made, approximately £9000 will be spent in gas plant and about eight miles of 6 inch to 2-inch cast-iron pipes, &c.

SOUTH AFRICAN LIGHTING ASSOCIATION, LIMITED.

Decrease in Consumption and Municipal Electrical Competition.
Views of Gas Engineers.

The Ordinary General Meeting of the Association was held last Wednesday, at the London Offices, No. 90, Cannon Street, E.C.—Sir DANIEL F. GODDARD, M.P., in the chair.

The SECRETARY (Mr. William Cash) read the notice convening the meeting.

The CHAIRMAN, in moving the adoption of the report and accounts, said he regretted he could not give such a report as it had been his good fortune to do in previous years. There were in their business some things which could be controlled, and some things which could not be controlled. They could easily control matters applying to the manufacture of gas—to the various methods of economy and improvement of plant which provided new outlets for profit, and for bringing into use all the most recent developments of science. They could do all this; but unfortunately they could not control trade and its effects, nor could they control the serious competition which had been the main cause of reducing their profits during the year. At the last meeting, he referred to the badness of trade in South Africa; and to the serious competition from the municipal electricity supply. Regarding the first matter, he was happy to say there was no doubt there had been an improvement all round in the condition of trade in Cape Colony. The Company hoped to share in it; and they were doing so already to some little extent. The general commercial conditions having turned the corner, they trusted the improvement would be rapid and continuous. Concerning the competition of the electric light, he was sorry to say he could not make any similar hopeful report. The Company were subjected to the keenest competition; and he did not think it was altogether reasonable competition, because in this case (he was not able to speak with certainty) it could scarcely be possible the Municipality were reaping any advantage from the lowness of the prices at which they were supplying current. He understood it could only be done, at the prices charged, at considerable loss. However that might be, the competition took from the Gas Company their consumers; and this municipal competition (which was bolstered up by the rates) was very difficult to get over. He was sorry to say the Company had lost the custom of the railway, which was a very important customer; and the Post Office had also thrown out gas. These losses had been a heavy blow to them. He also reported last year that the public lighting had been taken over by the Municipality. This was only to be expected with the Municipality running electricity. He feared the Company had not yet quite got to the end of their troubles. At any rate, he preferred not to take too hopeful a view just at present; for although they were operating the concern as well as they possibly could, there was no question this sort of thing was a serious hindrance. That was the bad side of the account; and the other was that they were improving in their methods of manufacture, and were showing economies. In respect of this, it was really very satisfactory to be able to report that the net cost of gas into the holders had been reduced by 3d. per 1000 cubic feet in the year; and this compared with a year that was the previous lowest on record. He hoped this would be taken as showing that the officials of the Association were doing their level-best

to meet the case, and to bring the working costs down to the lowest possible point. Of course, the shareholders would realize that working costs, when the output was reduced, naturally rose; and that there must also be an increase in the cost of capital whenever the output was diminished. Up to the present time, they had not materially diminished their maintenance costs, and had kept up the works thoroughly. The Directors considered this was good policy. They were also not without hopes that there were steps that might be taken to effect some reduction in salaries—in fact, in respect to one official who had returned to England, this meant a saving of some hundreds of pounds. If the accounts were looked into carefully, he thought it would be seen that they showed really good working. Coal presented a reduction in cost of £2662 on the year. Part of this was, of course, due to the fact that they had carbonized so much less coal, and also to the fact that coal and freights were cheaper. He was afraid that, in the current year in this particular item, they would not be able to effect any reduction. Coal was now rather dearer; and, although the Directors had done the best they could, there would be a little extra expense in this direction. Then £363 was saved in water gas; and the wages at the works were £295 less. Of course, this was partly due to the less work, and not to any reduction of individual wages. The great drop was in respect of the sale of gas, which had diminished by rather more than 18 per cent.—representing a decrease in money of £4640 at Port Elizabeth, of which he was only speaking at the present time. Then there was a decrease in the rental of meters, which was naturally due to the falling off in the number of consumers. Practically all the working costs had been reduced; but the make of gas per ton of coal had increased from 10,812 to 11,203 cubic feet. This was an excellent result; and it indicated that every care had been taken by their Engineer. Then the Directors and the Manager had sought new outlets for business. Hitherto they had had great difficulty in realizing any profit from their ammonia. It would be remembered that some time ago they put down an ammonia plant for the purpose of turning their ammoniacal liquor into anhydrous ammonia. At the present time, however, there was not much sale for it. But they were able to make a commercial article which was known as cloudy ammonia, for which there was a considerable demand in South Africa. They were hoping for much from this industry. The plant was in thorough working order now; and the sales were constantly increasing. There had also been a great demand for tar. If the Company could have supplied more, they could have made a larger profit on tar than ever before. Not using such a large quantity of coal as usual, they did not make so much tar. But they had been able to send tar from this country, which they had been able to sell, for road purposes and so forth, at good profit in Cape Colony. Concerning the unaccounted-for gas, the percentage was rather heavy. But he believed it was one of those figures that was always illusive. When the amount of gas sold was reduced, the percentage of unaccounted-for gas naturally increased. He (the Chairman) believed the leakage per mile of main to be very favourable indeed as compared with that of any other gas company. But when put into a percentage it was somewhat large—11·8.

Mr. H. E. JONES: It is not large for a place like that.

The CHAIRMAN (proceeding) said with regard to Grahamstown, he could speak with more confidence. Business there was growing; and he thought he might say there was every prospect of a steady increase. Of course, it was a much smaller place than Port Elizabeth. The

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 545.

| Issue. | Share. | When ex Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue. | Share. | When ex Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|--------|-------------------|--------------------|------------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|--------------------|----------------------------|-----------------|---------------------|------------------------|
| £ | Stk. | | p.c. | | | | £ s. d. | £ | Stk. | | p.c. | | | | £ s. d. |
| 1,471,000 | Stk. | Apr. 1 | 5 | Alliance & Dublin Ord. | 82-84 | .. | 5 19 1 | 4,940,000 | Stk. | May 12 | 0 | Imperial Continental | 177-179 | .. | 4 9 5 |
| 1,000,000 | Stk. | Jan. 1 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 15 5 | 1,235,000 | Stk. | Feb. 10 | 3 1/2 | Do. 3 1/2 p.c. Deb. Red. | 94-96 | .. | 12 11 |
| 200,000 | Stk. | May 12 | 7 | Bombay, Ltd. | 63-65 | .. | 5 9 10 | 195,242 | Stk. | Mar. 16 | 6 | Lea Bridge Ord. 5 p.c. | 122-124 | .. | 4 16 9 |
| 4,000,000 | Stk. | Feb. 25 | 7 | Do. New, £4 paid. | 46-48 | .. | 5 9 2 | 561,000 | Stk. | Feb. 25 | 10 | Liverpool United A. | 222-224 | .. | 4 9 3 |
| 5,000,000 | Stk. | Feb. 25 | 15 | Bourne- 10 p.c. | 29-31 | .. | 5 0 0 | 718,100 | Stk. | Feb. 25 | 7 | Do. B. | 164-166 | .. | 4 4 7 |
| 311,000 | Stk. | Feb. 25 | 7 | mouth Gas B 7 p.c. | 162-164 | .. | 4 3 7 | 306,083 | Stk. | Dec. 29 | 4 | Do. Deb. Stk. | 105-105 | .. | 16 2 |
| 75,000 | Stk. | Feb. 25 | 8 | and Water Pref. 6 p.c. | 15-15 1/2 | .. | 3 17 5 | 75,000 | Stk. | Nov. 26 | 6 | Malta & Mediterranean. | 41-45 | .. | 0 0 0 |
| 375,000 | Stk. | Feb. 25 | 12 1/2 | Brentford Consolidated | 241-244 | .. | 4 18 5 | 560,000 | Stk. | Apr. 1 | 5 | Met. of 15 p.c. Deb. | 100-102 | .. | 4 15 0 |
| 3,000,000 | Stk. | Feb. 25 | 9 1/2 | Do. New | 175-179 | .. | 5 0 0 | 250,000 | Stk. | Apr. 1 | 4 1/2 | Melbourne 4 1/2 p.c. Deb. | 100-102 | .. | 4 8 3 |
| 5,000,000 | Stk. | Apr. 1 | 8 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 0 | 541,920 | Stk. | May 27 | 3 1/2 | Monte Video, Ltd. | 125-127 | .. | 5 7 8 |
| 200,000 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 101-103 | .. | 3 17 8 | 1,775,892 | Stk. | Feb. 23 | 4 1/2 | Newcastle & Gt. Sheff. Con | 164-166 | .. | 4 2 7 |
| 22,000 | Stk. | Mar. 16 | 11 | Brighton & Hove Orig. | 213-216 | .. | 5 1 0 | 529,435 | Stk. | Dec. 29 | 3 1/2 | Do. 3 1/2 p.c. Deb. | 91-93 | .. | 3 15 5 |
| 240,000 | Stk. | Apr. 1 | 8 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 55,940 | Stk. | Feb. 25 | 7 | North Middlesex 7 p.c. | 124-126 | .. | 5 1 10 |
| 240,000 | Stk. | Apr. 1 | 10 1/2 | British A 5 p.c. | 44-45 | .. | 4 14 8 | 300,000 | Stk. | Apr. 29 | 8 | Oriental, Ltd. | 137-140 | .. | 5 14 4 |
| 180,000 | Stk. | Apr. 25 | 6 1/2 | Bromley A 5 p.c. | 118-120 | .. | 5 0 0 | 60,000 | Stk. | Apr. 1 | 8 | Ottoman, Ltd. | 6-6 1/2 | .. | 6 0 0 |
| 150,000 | Stk. | Apr. 25 | 4 1/2 | Do. B 3 1/2 p.c. | 82-90 | .. | 5 0 0 | 31,800 | Stk. | Feb. 25 | 13 | Portsea Island A. | 134-136 | .. | 5 1 0 |
| 150,000 | Stk. | Apr. 25 | 5 1/2 | Do. C 5 p.c. | 100-102 | .. | 5 2 1/2 | 60,000 | Stk. | Apr. 1 | 13 | Do. B. | 126-128 | .. | 5 1 7 |
| 50,000 | Stk. | Dec. 29 | 3 1/2 | Do. 3 1/2 p.c. Deb. | 87-89 | .. | 3 15 5 | 100,000 | Stk. | Apr. 1 | 12 | Do. C. | 119-121 | .. | 4 19 8 |
| 50,000 | Stk. | Dec. 29 | 7 | Buenos Ayres (New) Ltd. | 90-92 | .. | 4 0 0 | 114,800 | Stk. | Apr. 1 | 10 | Do. D and E. | 100-102 | .. | 4 18 0 |
| 25,000 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 90-100 | .. | 4 0 0 | 398,490 | Stk. | Apr. 29 | 8 | Primitiva Ord. | 71-73 | .. | 4 1 4 |
| 100,000 | Stk. | Dec. 29 | 4 | Cape Town & Dis., Ltd. | 4-5 | .. | — | 796,980 | Stk. | Apr. 29 | 5 | Do. 5 p.c. Pref. | 71-73 | .. | 4 1 4 |
| 100,000 | Stk. | Dec. 29 | 6 | Do. 4 1/2 p.c. Pref. | 6-7 | .. | — | 480,000 | Stk. | Apr. 29 | 8 | Do. 4 p.c. Deb. | 99-101 | .. | 19 1/2 |
| 100,000 | Stk. | Dec. 29 | 4 1/2 | Do. 6 p.c. 1st Mort. | 40-42 | .. | 6 0 0 | 1,000,000 | Stk. | Apr. 29 | 8 | River Plate Ord. | — | .. | — |
| 100,000 | Stk. | Dec. 29 | 4 1/2 | Do. 4 p.c. Deb. Stk. | 87-89 | .. | 5 1 2 | 312,000 | Stk. | Apr. 29 | 8 | Do. 4 p.c. Deb. | 99-101 | .. | 19 1/2 |
| 100,000 | Stk. | Dec. 29 | 5 | Chester 5 p.c. Ord. | 117-119 | .. | 4 10 1 | 250,000 | Stk. | Apr. 29 | 9 | San Paulo, Ltd. | 114-116 | .. | 5 14 3 |
| 1,111,000 | Stk. | Feb. 25 | 5 1/2 | Commercial 4 p.c. Stk. | 100-102 | .. | 4 15 3 | 62,500 | Stk. | Apr. 29 | 0 | Do. 6 p.c. Pref. | 114-116 | .. | 5 10 0 |
| 50,000 | Stk. | Dec. 29 | 5 | Do. 3 1/2 p.c. Deb. Stk. | 81-83 | .. | 3 12 3 | 125,000 | Stk. | Apr. 29 | 0 | Do. 5 p.c. Deb. | 58-60 | .. | 4 17 1 |
| 400,000 | Stk. | Dec. 29 | 7 | Do. 5 p.c. Deb. Stk. | 80-100 | .. | 5 0 0 | 125,000 | Stk. | Apr. 29 | 10 | Sheffield A. | 222-224 | .. | 4 5 5 |
| 50,000 | Stk. | Dec. 29 | 7 | Continental Union, Ltd. | 100-102 | .. | 5 0 0 | 200,000 | Stk. | Apr. 29 | 10 | Do. B. | 126-128 | .. | 4 5 1 |
| 200,000 | Stk. | Dec. 29 | 7 | Do. 7 p.c. Pref. | 100-102 | .. | 5 0 0 | 52,500 | Stk. | Apr. 29 | 10 | Do. C. | 126-128 | .. | 4 5 5 |
| 40,000 | Stk. | Dec. 29 | 8 | Derby Con. Stk. | 121-123 | .. | 4 9 5 | 70,000 | Stk. | Apr. 29 | 10 | South African | 125-127 | .. | 5 0 8 |
| 10,000 | Stk. | Dec. 29 | 8 | Do. Deb. Stk. | 100-102 | .. | 3 16 2 | 6,439,895 | Stk. | Apr. 29 | 10 | South Met., 4 p.c. Ord. | 126-128 | .. | 4 9 7 |
| 10,000 | Stk. | Dec. 29 | 12 | East Hull 5 p.c. Ord. | 96-98 | .. | 5 2 0 | 1,000,000 | Stk. | Apr. 29 | 10 | Do. 3 p.c. Deb. | 80-82 | .. | 3 11 1 |
| 40,000 | Stk. | Dec. 29 | 12 | European, Ltd. | 100-102 | .. | 4 16 0 | 200,000 | Stk. | Apr. 29 | 10 | South Shields Con. Stk. | 127-129 | .. | 5 1 3 |
| 10,000 | Stk. | Dec. 29 | 12 | Do. £7 10s. paid. | 100-102 | .. | 4 16 0 | 60,000 | Stk. | Apr. 29 | 10 | Sth Suburb'n Ord. 5 p.c. | 127-129 | .. | 4 18 0 |
| 10,000 | Stk. | Dec. 29 | 12 | Gas 1 1/2 p.c. Ord. | 100-102 | .. | 4 9 3 | 100,000 | Stk. | Apr. 29 | 10 | Do. 5 p.c. Pref. | 121-123 | .. | 4 1 4 |
| 2,000,000 | Stk. | Dec. 29 | 12 | light 3 1/2 p.c. max. | 100-102 | .. | 4 11 6 | 100,000 | Stk. | Apr. 29 | 10 | Do. 5 p.c. Deb. Stk. | 121-123 | .. | 4 1 4 |
| 2,000,000 | Stk. | Dec. 29 | 12 | and 4 p.c. Con. Pref. | 100-102 | .. | 4 11 6 | 100,000 | Stk. | Apr. 29 | 10 | Tottenham Ord. | 127-129 | .. | 4 9 9 |
| 2,000,000 | Stk. | Dec. 29 | 12 | Coke 3 p.c. Con. Deb. | 100-102 | .. | 3 12 3 | 100,000 | Stk. | Apr. 29 | 10 | Do. 5 p.c. Deb. Stk. | 121-123 | .. | 4 1 4 |
| 2,000,000 | Stk. | Dec. 29 | 12 | Hastings & St. L. 3 1/2 p.c. | 100-102 | .. | 3 12 3 | 100,000 | Stk. | Apr. 29 | 10 | Tottenham Ord. | 127-129 | .. | 4 9 9 |
| 2,000,000 | Stk. | Dec. 29 | 12 | H. & C. 5 p.c. Pref. | 100-102 | .. | 3 12 3 | 100,000 | Stk. | Apr. 29 | 10 | Edmonton 4 p.c. Deb. | 127-129 | .. | 4 19 0 |
| 2,000,000 | Stk. | Dec. 29 | 12 | H. & C. 5 p.c. Pref. | 100-102 | .. | 3 12 3 | 100,000 | Stk. | Apr. 29 | 10 | Do. 5 p.c. Deb. Red. | 127-129 | .. | 4 19 0 |
| 2,000,000 | Stk. | Dec. 29 | 12 | H. & C. 5 p.c. Pref. | 100-102 | .. | 3 12 3 | 100,000 | Stk. | Apr. 29 | 10 | Tynemouth, 5 p.c. max. | 127-129 | .. | 4 19 0 |
| 2,000,000 | Stk. | Dec. 29 | 12 | H. & C. 5 p.c. Pref. | 100-102 | .. | 3 12 3 | 100,000 | Stk. | Apr. 29 | 10 | Wanda B 3 1/2 p.c. | 127-129 | .. | 4 19 0 |
| 2,000,000 | Stk. | Dec. 29 | 12 | H. & C. 5 p.c. Pref. | 100-102 | .. | 3 12 3 | 100,000 | Stk. | Apr. 29 | 10 | worth 3 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |

Prices marked * are "B" prices.

increase in sales was 2 per cent.; the costs were decreasing; and the profits were steadily rising. Indeed, for the first time, they were now realizing in Grahamstown a profit of 10 per cent. on the undertaking. Although they had been paying 10 per cent., taking the two concerns together, this was the first year in which they had realized 10 per cent. on that concern alone. He could not hold out any very great hope of improvement in the fortunes of the Company during the current year; but he was anticipating they would have no further set-back than he had had to report on this occasion, which had resulted unfortunately in having to pay a reduced dividend.

Mr. JAMES MACALISTER seconded the motion.

Mr. H. E. JONES remarked that it was quite clear the Company were suffering from drastic competition, fortified by rates inflicted upon the Company as well as others. They must not, however, despair, but must fight this competition in the only possible successful way. They must if necessary go through hardships, and even, if necessary, forfeit their dividend. But they must beat the competition out of the field. He was accustomed to dealing with gas in different parts of the world; and he invariably found one policy did enable them to beat the competition. An electric undertaking which began to compete with one of his companies had after a time to hold back even the dividend on its debentures. Since then it had been in the hands of the liquidators. It had now been sold to a Company who might make a better show of it. The Gas Company reduced their charges four times; and they were, before the new Company started, going to make a further reduction in price. That was the drastic policy he suggested to the Directors of this Company for application in South Africa. There was very heavy competition with municipal electric lighting in this country. But whatever increase in lighting was to be got out of a district, gas obtained it; and this was done by reducing the price. He ventured to say that the great cause of the falling off in the case of this Company was the price of gas; and if they allowed the business to slip away from them, it would be felt not only in the wear and tear, wages, and maintenance, but in the cost of standing charges. They must not let the standing charges run away with them; but they must increase the sale of gas. The Company would make more profit with gas at 6s. than at 8s.; and they would have to make some heavy reduction like that to do any good. This view was based on a long experience—some thirty years—in the competition with electricity. It had been demonstrated in this country beyond a shadow of a doubt that electricity could not, given equal conditions, be produced in competition with gas. Electricity undertakings had to pay equal prices for coal; and they had no residuals, such as bad gas undertakings. The Company had a good market for tar; and ammonia for refrigerating purposes was very valuable. In his opinion, this was an instance where drastic measures would be most effectual.

Mr. ALEX. MITCHELL remarked that 18 per cent. reduction in consumption was something enormous; and apparently the Company had lost some large consumers. He had had some experience of electrical competition; and he felt that nothing the Company could do would

bring the lighting back. Some people would have electric light for special purposes. In his own case, they made large reductions not for lighting, but for power to meet the competition in that direction. The trouble of competing against corporations was that if the latter did make a loss, they did not trouble much, as it came out of the ratepayers' pockets. He did not know what relationship the Company's price for gas bore to the price of electricity; but if it was too high, it would have to be reduced. At home the price of gas and electricity had a certain proportion; and it would have to be so in South Africa. He took it their Manager was trying to make up, by heating and cooking, what was an irretrievable loss to electric lighting. They could not crush out electric light; and their business was to push gas for fuel as much as possible. Electricity had only one field; and they would find that people who would have electricity for lighting would not have it for cooking. He instanced an hotel where all the cooking, instead of being done by coal, was now done by gas. The hot-water arrangements utilized coke for heating. The bedrooms were lighted by electricity for convenience; and the public rooms by gas, because it was found the cheaper. The consumption of gas must be increased by every possible means; but it was not to be done by any unreasonable reduction in price. The price must be reasonable, however, to make gas available for every useful purpose besides lighting. At the same time the people of Port Elizabeth should be shown the positive absurdity of the Corporation selling electricity at a loss. He noticed the Directors could have paid a little extra dividend by taking something from the reserve fund; but their safest financial course was the one taken.

Mr. J. B. FERRIER supported the remarks of Mr. Mitchell, and regarded the advice of Mr. Jones as rather too courageous. It was impossible for the Company to meet the competition of the Corporation who had the ratepayers' money behind them. The practical way of recouping lost lighting business was to find means of applying gas for cooking and for power. He was sure the Board had their minds turned in that direction, because they could not compete for lighting purposes with municipal electricity.

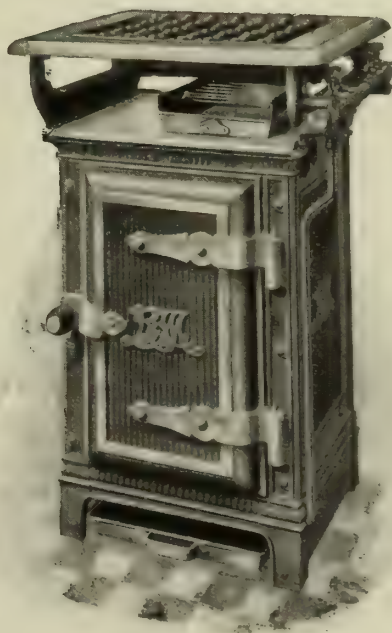
Mr. CASH, replying to a query by Mr. SAMUEL WHILE, as to the expenditure for new services, said that for a number of years the Company charged the whole of their new services to revenue. But for the last three years they had charged part of the cost to capital account. The sum had grown from £1287 to £1631.

The CHAIRMAN added that last year they had 843 new connections; but 1170 disconnections.

Mr. CORBET WOODALL said he did not think he had ever heard two more useful speeches at a shareholders' meeting than they had had on this occasion. He shared Mr. Jones's optimism with regard to the future of gas, whether at home or abroad; but he confessed to some doubt as to whether it would be wise to make the severe and heavy reductions in price he recommended. They had brought down the price until it was the lowest in South Africa, though they were not the largest Company; and the Directors and their Manager had considered carefully every method of increasing the outlets for gas beside

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lighting. But he was not by any means disposed to say that the day of gas, even in South Africa or other hot climates, was over for lighting. He believed the Company would get back a considerable amount of that which had been lost. The disadvantage of having two supplies in a house was considerable; and when people needed (as they did) gas for warmth and for cooking, they would also have it for lighting. With regard to the prospects in Port Elizabeth, he was sure Mr. Jones would be the last man to disparage efforts in reducing costs. To these the Directors were giving very careful attention. As the Chairman truly remarked, costs as a rule increased as the business declined; but in this case, they had not done so. On the contrary, the cost of gas per unit of gas sold had been reduced; and he was quite sure they had not reached the end of possible economies in this direction, without diminishing in any sense the efficiency of the supply. They were not going to diminish their expenses in the direction of giving instruction, cookery lectures, show-rooms, and so forth. Then the opening up of business in ammonia, he believed, would be helpful. At Grahams-town, the growth of the profit was eminently satisfactory; and there the Company had the advantage that they had the right to supply electricity as well as gas if a supply was demanded. It was most unfortunate that the Municipality of Port Elizabeth elected at all to enter upon the supply of electricity; it was particularly unfortunate they should have come to the arrangement when they did. They started at a time when Port Elizabeth was under a cloud of depression; and it was perfectly natural they should strain every nerve to get the utmost business they could so as to diminish the loss the town would inevitably sustain. They took over the public lighting at an increased cost to the town, as compared with an equal amount of light from the Gas Company. Altogether the competition of municipalities in matters of this sort was deplorable to a degree; and it could not be dealt with as could ordinary competition upon business lines. The Municipality, having taken the false step of commencing to supply at all, would, as had been mentioned by all those who had spoken, stand at very little in order to get business for their plant. He believed they must be losing heavily by the supply, but that only spurred them to make further efforts to get additional business. With regard to the Post Office and the railway, they were both State institutions; and the connection between State and Municipality was very intimate. The Company had spent a considerable amount of money on the lighting of the Railway Station, and had made of it a great success. Notwithstanding this, and the fact that the gas supply was undoubtedly the cheaper with regard to the amount of light, it had gone. The Company would not cease to hammer away in the hope of getting it back once again, but it would be a hard fight. Looking at the position as a whole, he was not by any means seriously depressed. He thought that, as he had said, they would get back from, rather than lose further to, electricity. The general trade of the country was decidedly improving; and with this improvement, the Company would prosper. While one much regretted the set-back, he personally felt thankful for the long career of prosperity that had attended the Company; and he did not believe they had reached the end of it.

The CHAIRMAN said to show that their officers were doing their very best to introduce all the newest forms of using gas, he might say that nearly 50 per cent. of the consumption at Port Elizabeth in the last half year was used in stoves. As to reductions, there had been no spirit of meanness in connection with them. The smallest reduction ever made was 5d. per 1000 cubic feet; and the Directors had generally gone to 10d. When the Association commenced, the price of gas was 12s. 6d. per 1000 cubic feet; it was now 8s. or 8s. 4d.

The motion was unanimously carried. Proposed by the CHAIRMAN, and seconded by Mr. HENRY WOODALL, a dividend of 7 per cent. was declared, free of income-tax, and less the interim dividend.

Moved by Mr. ANDREW L. DON, seconded by Mr. H. E. JONES, Sir Daniel Goddard was re-elected to his seat at the Board; and Mr. P. D. Griffiths, F.C.A., was re-appointed Auditor, on the proposal of Mr. G. CRISPE WHITELEY, seconded by Mr. MITCHELL.

On the motion of Mr. JAMES CLOUDESLEY, seconded by Mr. WHITELEY, the thanks of the shareholders were cordially passed to the Chairman and Directors and to the officers—special mention being made of the devoted services of Mr. Arnott.

The CHAIRMAN, in the course of his acknowledgment, said that that morning they had received a message from their Manager informing them that last month they had had the smallest falling off in consumption that they had had for two years. He (the Chairman) did hope they were now turning the corner, and that next month would show a slight increase.

Increased Consumption at Sedgley.—The quantity of gas made at the works of the Sedgley Urban District Council during the year ended March 31 was 32,093,500 cubic feet, as against 30,096,500 cubic feet the previous year—an increase of 1,997,000 cubic feet. The quantity of coal carbonized was 2812 tons, as against 2590 tons; the amount of gas made per ton of coal was 11,413 cubic feet, as against 11,620 cubic feet in the previous year.

Cardiff and the Rhondda Water Bill.—At a meeting of the Cardiff Parliamentary Committee, the Town Clerk read a report of the proceedings before the House of Commons Committee on the Pontypridd and Rhondda Water Bill, when the Corporation's opposition was defeated. He also read a resolution, since adopted by the Water Committee, in favour of continuing the opposition in the House of Lords. Alderman Beavan said that, personally, he felt they would have very little prospect of success. The Commons Committee, and particularly the Chairman, were very emphatic against what they regarded as a monopoly; and he feared the Lords Committee might take the same view. Cardiff had been forced to spend tens of thousands of pounds in order to make provision to carry out their Taff Vawr scheme; and now they were being crippled in this way. On the motion of Mr. Vivian, seconded by Mr. Morgan Thomas, it was decided not to continue the opposition; but it was understood that the Corporation would be represented to watch the progress of clauses.

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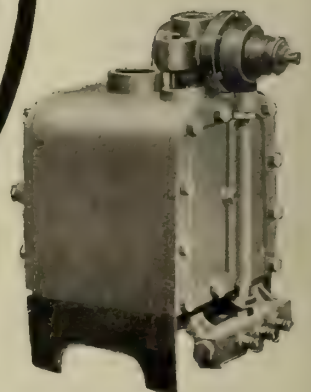
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MONTE VIDEO GAS COMPANY, LIMITED.**Increased Consumption in the City Compensates for the Reduced Price Charged.**

The Ordinary General Meeting of the Company was held last Thursday, at Winchester House, Old Broad Street, E.C.—Mr. T. C. TATHAM in the chair.

The SECRETARY (Mr. Henry Kearns) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, and commenting on the principal items of the latter, said on the debit side of the balance-sheet it would be noticed that the reserve account remained at £32,000, and the insurance fund at £12,500. This year they had transferred £4000 from profit and loss to reserve for renewals account, which increased that amount to £10,500. At the last meeting, he mentioned that it would be necessary to commence the reconstruction of a retort-house before the end of 1909. Finding, however, that they could get through the winter of this year with the old retort-house, the Directors decided to defer the new work until they had obtained actual experience of a full year's trading at the reduced prices, so that they could gauge with greater precision the requirements of the future. The work having been postponed for five months, the Board had definitely arrived at a decision as to the capacity of the plant to be installed, and which would provide to a relative extent for the future. It was intended to have the new carbonizing plant ready if necessary for work by April, 1911, which was the commencement of their winter season in Monte Video. By the process they were adopting, it was anticipated that a considerable saving would be effected in fuel and labour; and this he hoped would be advantageously reflected in their accounts for 1911. The contingency account now stood at £21,013. Regarding the credit side of the balance-sheet, it would be observed that they had written off capital for depreciation £4807, and had added £4567 for expenditure on new mains, meters, and extension of coal-stores, which latter work was already completed. The result was the total capital expenditure now stood at £540,719, or £240 less than last year. In noting the differences in the items as to stocks, he mentioned that the stock of gas-fittings now amounted to £6341, which was a decrease of £153. The former figure was well represented by the stock, as they had disposed of all obsolete fittings by auction, and would move into the new offices and show-rooms with nothing but the latest and most artistic articles on view. The stock of residuals showed an increase of £768. Owing to the increased sale of gas, a larger quantity of coal was carbonized, and more coke was made and sold. But as coal was selling at low prices during the year, owing to competition among the local merchants, this, in some degree, militated against the price of coke; and some of their customers used coal instead. This competition, however, ceased in January last. The selling price of coal was raised; and their stock of coke was reduced at the end of

March to as low as 6 tons. As, however, the season of heavier make was now upon them, they would no doubt be able to supply the demand for this increasingly popular fuel. Other items in the balance-sheet came under review; and then turning to the revenue account, he said the income from the gas department showed an increase of £565, which, though small, was satisfactory, considering that the reduced price was being charged for gas over the whole of the twelve months as compared with only five months in the previous year. It was worthy of remark that, if they had received for the increased amount of gas sold in the seven months January to July, 1909, the same price as ruled in the same period of 1908, there would have been an increased revenue of £8937; and if the sales had not increased, the reduction in the price of gas would have meant a loss of revenue over the twelve months of £13,025. The increase in the consumption had, however, not only enabled them to maintain the revenue of 1908, but had given an increased profit of £565 in the gas department. From these figures, the shareholders would be able to judge that the policy of cheap gas was having a beneficial effect on their sales. A good increase in consumption had to be recorded from cookers, engines, and industrial purposes, for all of which gas was sold at a specially low rate. They could not perhaps expect to continue to increase their gas business at this rate; but he thought they might look forward to steady improvement in the future. Having referred to the dock and workshops department, and the revenue therefrom, he said that the cost of manufacture and expenses at Monte Video showed a decrease of £3634. They had to carbonize a much larger quantity of coal to meet the increased sales of gas, and this also necessitated a considerable increase in wages for manufacture and distribution, and the purchase of a larger quantity of materials for purification, and for upkeep. As to the profit and loss account, he mentioned that the items of bad and doubtful debts were £131 less, and the total was only £367. This reflected great credit on the management in Monte Video. The amount brought into the account from 1908 was £11,929; and with this the final result was a balance of £30,946, out of which the dividend would be paid, leaving £11,979 to be carried forward.

Mr. CHARLES HUNT seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. ROBERT MORTON, a dividend for the second half of the year of 8s. per share was declared, less income-tax.

Moved by the CHAIRMAN, and seconded by Mr. JOHN MEWS, Mr. Robert Morton was returned to his seat at the Board; and proposed by Mr. HUNT, seconded by Mr. MEWS, the Chairman was also re-elected.

The Auditors (Messrs. G. Sneath and L. E. Halsey) were next re-appointed.

The thanks of the shareholders were conveyed to the officers and staff, both at home and abroad, on the motion of the CHAIRMAN, seconded by Mr. MORTON; and a similar compliment was paid to the Chairman and Directors on the proposition of Mr. THOMAS WILKINS seconded by Mr. CONSTABLE.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The accounts of the Dundee Corporation Gas Department for the year which ended on April 30 have been made up. The total quantity of gas sold was 824,319,450 cubic feet, and this, after allowing £3140 for discount and £103 for bad debts, realized £91,099. The price of gas to ordinary consumers was 2s. 3d. per 1000 cubic feet, and to prepayment meter consumers 2s. 7d. A year ago a reduction of 1d. per 1000 cubic feet was made. The revenue then reported was £91,128. During the past year, the quantity of gas consumed at the works was 6,733,000 cubic feet, and the gas unaccounted for, 48,549,558 cubic feet, representing 5.519 per cent. of the total make, which was 879,602,000 cubic feet. There was a revenue from coke of £18,691, as compared with £20,776; from sulphate of ammonia, of £9938, as compared with £9368; and from tar, of £4466, as compared with £3624. The total income was £125,400, as compared with £126,172. The cost of manufacturing gas was £74,881, as compared with £79,167. Distribution cost £12,892, as compared with £10,881. Rents, rates, and taxes required £6853, as compared with £6438. Administration cost £4434, as compared with £3983. The total expenditure amounted to £99,062, as compared with £100,470. The balance carried to net revenue account was £26,338, as compared with £25,702. Out of this sum there have been paid: Annuities, £6132; interest, £8354; sinking fund, £10,700; and contingent fund, £1000; leaving £2277 to be carried forward, as compared with £2191. The quantity of coal carbonized was 89,194 tons. There were employed, besides, 56,870 gallons of carburetted water gas oil; and 62,982 gallons of benzol were used for enrichment. The coal gas made amounted to 865,338,000 cubic feet, and the carburetted water gas to 14,374,000 cubic feet. The quantity of gas made per ton of coal carbonized was 9701 cubic feet; the yield of coke was 53,426 tons—equal to 11.98 cwt. per ton of coal, exclusive of that used for firing retorts; the yield of coal tar was 947,503 gallons, of carburetted water gas tar 15,710 gallons, and of sulphate of ammonia 1089 tons. The cost of coal was £51,281, and of benzol £1652, which gives a cost of production of 1s. 0.23d. per 1000 cubic feet of gas. In the case of carburetted water gas, the cost of production was 1s. 3.33d. per 1000 cubic feet. The cost per 1000 cubic feet for both coal and carburetted water gas was 1s. 4.20d. The estimates for the current year are based on the same charges for gas as last year; the increase in the price of coal rendering it inadvisable to make any reduction. The quantity of coal estimated to be required is 92,637 tons, from which, at 9800 cubic feet per ton, the yield of gas will be 907,840,000 cubic feet. The make of carburetted water gas is put down at 20 million cubic feet, giving a total production of gas of 927,840,000 cubic feet. The cost of coal is expected to be £55,582, as compared with £51,281 for 89,194 tons. Benzol is expected to cost £1000, carburetted water gas £1500, and carbonizing charges £5596; making a total of £63,678, which, with other charges, will bring up the total cost of manufacture to £77,948. Distribution is

entered at £11,950; rents, rates, and taxes at £7310; administration at £4650; and annuities, interest, sinking fund, and contingent fund, including £430 to meet contingencies and emergencies, at £28,612—making a total estimated expenditure of £130,470. Sales of gas are estimated to realize £94,333, and of residual products £34,786; and the revenue from other sources is expected to bring up the revenue to balance the expenditure.

During the past fortnight, rapid progress has been made with the gas-works extensions at Inverkeithing. Fully half-an-acre of a pasture meadow which adjoins the works has been taken in, and the work of excavation for the gasholder tank has been begun. A new retort-house, engine-house, and governor-house are being erected. Messrs. Henry Balfour and Co., Limited, of Leven, Fife, are the Contractors for the gasholder and condensers, and also for the girder work and iron roofing. The Engineer to the scheme is Mr. H. O'Connor, F.R.S.E., of Edinburgh, who has also prepared the plans for the buildings.

Mr. J. W. Napier, the Gas Engineer to the Corporation of Alloa, has been engaged by the Town Council of Grangemouth to consider the subject of altering and extending the gas-works, including the retorts and purifiers, and to report to the Corporation what he would recommend them to do.

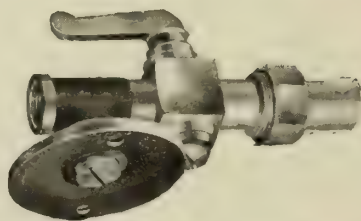
On Wednesday evening, the Corporation of Falkirk appointed Mr. John Wilson, of Glasgow, Assistant Gas Manager, in place of Mr. H. Rule, now Gas Manager at Kelty.

The Buckie Gaslight Company, Limited, have paid a dividend at the rate of 7½ per cent.

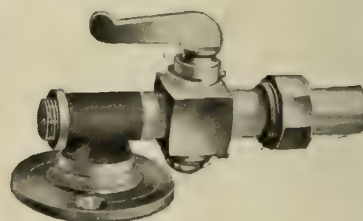
The Parliamentary Bills Committee of the Glasgow Town Council remitted to a Sub-Committee a resolution adopted by the Corporation, to the effect that whereas in Glasgow the underground pipes and underground works of the Corporation are assessed on one-fourth part only of the annual valuation thereof, and whereas the same classes of subjects are assessed in the county area immediately adjoining Glasgow on the full annual value thereof, and whereas if these works in Glasgow were assessed on the full value, the same as is done in the county, it would mean a payment from the water, gas, electricity, and tramways departments of the Corporation of a sum of about £35,000, or a reduction of about 2d. in the pound off the municipal assessments in the city; and whereas at the recent interview with the Secretary for Scotland on the subject of the assessment of these works it did not appear to be the intention of the Government to deal with the matter in the meantime, therefore that it be remitted to the Parliamentary Bills Committee to consider and report upon the whole subject, and as to whether the Corporation should make application to Parliament to have the law altered. The Sub-Committee have agreed to adhere to their former decision—that it is not desirable to make application to Parliament to have the law altered so as to provide for the underground pipes and underground works of the Corporation within the city being assessed on their full annual value; and to recommend to the Parliamentary Bills Committee to remit to a Sub-Committee to take joint action with corporations and others interested, on the lines of endeavouring to get the Government or a Member of Parliament to introduce a Bill amending the law as to the method of the valuation of gas, water, tramways,

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and electric light undertakings, and giving effect to the recommendations of the Royal Commission which reported in 1902—viz., that in rural areas underground gas and water piping, and underground works connected with such undertakings, should only be assessed on one-fourth of the annual value thereof; and, further, that tramway lines and the underground works of electric light undertakings be similarly treated—and to endeavour to get legislation passed in regard to the matter.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, May 28.

In the early part of the week improved prices were paid in order to cover urgent orders. Later, however, the market became easier, and the closing quotations are £11 15s. to £11 16s. 3d. per ton f.o.b. Hull, £11 17s. 6d. per ton f.o.b. Liverpool, and £11 17s. 6d. to £11 18s. 9d. per ton f.o.b. Leith. Apart from any orders which may have been taken speculatively abroad, there has not been much business done in the forward position; makers not being inclined to sell at a discount on prompt prices unless for autumn months, and there being no keen buyers in any position.

Nitrate of Soda.

This article continues quietly steady at 9s. 6d. per cwt. for ordinary quality and 9s. 9d. for refined, on spot.

Tar Products.

LONDON, May 30.

The markets for tar products have remained firm during the past week. Pitch is still very firm, and improved prices are reported to have been paid in some quarters. The inquiry from abroad is certainly very good. Creosote is steady, and distillers are very firm in their ideas of price for delivery over the summer. There is a very good demand for 90 per cent. benzol, and makers are firm in their ideas of price. The position remains about the same in crude carbolic acid. Solvent naphthas are steady.

The average values during the week were: Tar, 18s. 3d. to 22s. 3d., ex works. Pitch, London, 41s. to 41s. 6d.; east coast, 39s. 6d. to 40s. 6d.; west coast, 38s. 6d. to 39s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 8d. to 8½d.; North, 8d.; 50-90 per cent., casks included, London and North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market remains quiet, but there has been no lowering of price. To-day actual Beckton is quoted at £12, and outside makes on Beckton terms £11 12s. 6d. to £11 13s. 9d. In Hull, £11 15s. to £11 17s. 6d. is asked; and in Liverpool, £11 16s. 3d. to £11 17s. 6d. In Leith, the price is £11 18s. 9d.; and in Middlesbrough, £11 17s. 6d.

Malta and Mediterranean Gas Company, Limited.—The Directors' report for the year ended March 31 states that the balance of the general revenue account is £6084. The Directors recommend the payment of the usual dividends on the first and second preference capital, and 4 per cent., free of income-tax, on the ordinary capital, making with the interim dividend paid in December, 6 per cent. for the year, and leaving a balance of £1182 to be carried forward.

Sales of Stocks and Shares.—There was a very keen demand for two new issues of capital offered by Messrs. A. & W. Richards at the Mart, Tokenhouse Yard, E.C., last Tuesday, under instructions from Directors. They consisted of £2200 of "D" stock of the Barnet District Gas and Water Company, ranking for a maximum dividend of 7 per cent., but entitled to 5½ per cent. as from to-morrow; and £4000 of 5 per cent. perpetual debenture stock of the Dorking Gas Company. The former fetched £121 to £125 per £100 of stock; and £3800 of the latter, sold at £108 to £111 10s. per £100, produced the required quantity of capital. Last Thursday, Mr. F. W. Baker (Messrs. Sadler and Baker) sold at Camberley 600 additional ordinary £10 shares in the Frimley and Farnborough District Water Company, at an average price of £15 5s. each; the total amount realized being £9151.

A Question of Books at Carlisle.—Mr. Eggleston called the attention of the Carlisle Town Council to accounts for books for the Gas and Electricity Departments, and moved that they be referred back to the Committees, and that a full and detailed account be presented to the Council. He objected to the vagueness of the minutes, and wished to be assured of the necessity and utility of the books in question. In the course of a lengthy speech, he said that in the Gas Department books had been put into the hands of workmen who were quite unaccustomed to this kind of work. A great amount of friction and trouble had arisen through the introduction of these new books. There were men at the gas-works who had served the Council faithfully and well for several years, and who were being subjected to such insults as he ventured to say "no educated Britisher would submit a gang of Kaffirs to." The amendment was withdrawn, after the Chairman of the Gas Committee (Mr. Buck) had asserted that the charges made were untrue, and that the books were required to record information with regard to costs in the different sections of the works. Mr. King then gave notice that he would move at the next meeting that the Gas and Electricity Committees be requested to report upon the grave charges that had been brought against them.

What about the Hot Baths?

This question always arises when a Gas Cooker
is installed and a satisfactory reply is—

USE A

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Hot Water can be obtained instantly without any previous preparation and *without any expense for Gas* except when actually being drawn.

Do your Consumers know this? If not, may we send you a supply of Booklets describing our many Water Heating Appliances.

THE PARKINSON STOVE CO., LTD.

(INCORPORATING MAUGHAN'S PATENT GEYSER CO.),

STOUR STREET, SPRING HILL, BIRMINGHAM, and 129, HIGH HOLBORN, LONDON.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade of the North is more active; and the settlement of many contracts has rather steadied the prices. In the steam coal trade, best Northumbrians are from 11s. 4½d. to 11s. 6d. per ton f.o.b. Second-class steams are from 9s. 9d. to 10s. 3d.; and steam smalls are from 5s. 9d. to 7s. There is a rather better demand for steam coals for export, and the output is now normal, so that the shipments are better than they have been. In the gas coal trade, prices are steadier. Durham gas coals vary according to quality—the usual kinds being from 9s. 6d. to 10s. 4½d. per ton f.o.b., and "Wear specials" up to 10s. 9d. Many of the long contracts have now been arranged. Those of the Newcastle and Gateshead Gas Company have been completed for a year—the quantity being a little over 300,000 tons. The contracts have been renewed at prices ranging from 9s. 6d. to nearly 10s. per ton at the works—prices which show an average advance on those of the past year of about 10d. or 10½d. per ton. It will be seen that the advance is just about the same as that under the contracts for the large London Companies. The contracts for Devonport are also closed at somewhat similar prices; and those for Christiania are said to be concluded for "special" gas coals at about 10s. 7d. per ton f.o.b., but this depends on the allowance for freight. In the coke trade, the market is quiet; and gas coke—though in lessened output—is from 13s. 3d. to 13s. 9d. per ton f.o.b.

Scotch Coal Trade.

Trade continues to be quiet; but the demand for shipping is slightly better. Steam coal shows no improvement in demand. Washed stuffs and dross are in good request. The prices now quoted are: Ell, 9s. 3d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. to 10s. 3d.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 286,239 tons—a decrease of 14,614 tons upon the preceding week, and of 29,920 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,949,237 tons—an increase of 664,284 tons upon the corresponding period.

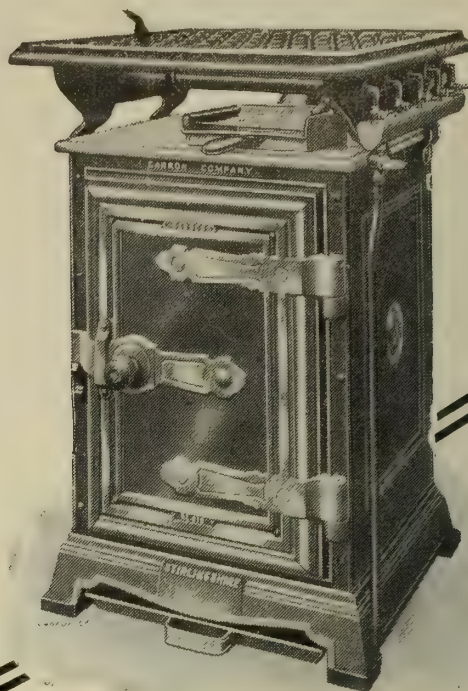
Shrewsbury and the Burner Bill.

When moving at a meeting of the Shrewsbury Town Council that a further petition be presented to Parliament in opposition to the Gas Companies Standard Burner (No. 2) Bill, Alderman Deakin said that it would be remembered the Council passed a resolution some time ago authorizing the presentation of a petition in Parliament against a Bill promoted by the Shrewsbury and other Gas Companies. Shrewsbury and other towns were accordingly represented by Counsel; and their case was laid before the Committee of the House of Lords. He regretted to state, however, that they were not successful in obtaining the protection in the interests of the gas consumers which they thought desirable. The substitution of a different method of testing would be equivalent to reducing the illuminating power of the gas; and they tried, therefore, to get a clause introduced laying it down that, notwithstanding the different method of testing, the illuminating power of the gas should remain as hitherto. It had been decided to take no further action before the Committee of the House of Lords, but to reserve the right to oppose the Bill in another place. It was with this object that he submitted the motion before them. He reminded them that they were the authority for testing the gas; and it was their duty to see that the consumers obtained good value for their money. Their position was that, if the quality of the gas was reduced, there must be an equivalent reduction in the price. The motion was carried.

Coal Carbonizing Company, Limited.

Among the files of new joint-stock companies which are available for inspection at Somerset House is that of the Coal Carbonizing Company, Limited, of Friars House, New Broad Street, E.C., which was registered on the 23rd inst., with a capital of £25,000 in £1 shares. Under the Articles of Association, power is taken to, among other things, carry on the business of coal and coke merchants, colliery proprietors, and dealers in machinery and apparatus for increasing and improving the illuminating or heating power of gas, spirit, oil, and other heat-producing agents; to enter into an agreement with Fuel Limited; and to act as electricians and manufacturers and suppliers of gas, fuel, and electricity, for the purpose of light, heat, or power. According to the prospectus, however, the Company has been formed primarily with the object of testing the value of certain patented processes for the manufacture of smokeless fuel and briquettes from small coal. There are two distinct types of plant; and one of these, which is a machine designed for use in an ordinary gas-retort, is said to enable a gas undertaking to produce a good, flaming, smokeless fuel with little or no alteration of the existing plant. The Directors contemplate continuing experiments in respect of the second type which have been already initiated at a gas-works near London, and, on completion, entering into an agreement to take over several benches of retorts and fit them up—the gas obtained to be sold to the Gas Company, while the tar, fuel, and ammonia would be retained by the Coal Carbonizing Company. The Directors are John Chapman (Coaling and Chartering Agent), George V. Craggs (Shipbroker), Richard S. Richards (Engineer), and William Slyvers (a Director of the Anglo-Californian Oil Syndicate). Two of the patents taken over by the Company were abstracted in the "JOURNAL" for the 3rd inst. (p. 320).

Birmingham Boundaries Extension.—The Local Government Board have issued a draft Provisional Order dealing with the extension of the Birmingham city boundaries, which was the subject of a lengthy local inquiry some months ago. The main lines of the scheme are that the boundary of the existing city shall be altered so as to include in addition to that area Aston Manor borough, the Erdington district, the Handsworth district, the added part of King's Norton and Northfield, and the Yardley district. The excluded part of King's Norton is to be made a separate parish, and called Wythall.



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WORKS: CARRON, STIRLINGSHERE.

SHOW-ROOMS: — LONDON (City) — 15, Upper Thames Street, E.C.; (West End) — 23, Princes Street, Cavendish Square, W.; LIVERPOOL — 23 to 30, Red Cross Street; GLASGOW — 125, Buchanan Street; EDINBURGH — 114, George Street; MANCHESTER — 24, Brazennose Street; BRISTOL — 10, Victoria Street; NEWCASTLE-ON-TYNE — 13, Prudhoe Street; BIRMINGHAM — 218, 220, 222, Corporation Street; DUBLIN — 44, Grafton Street.



Cookery Lectures at Cardiff.—The course of cookery demonstrations at the new and commodious show-rooms of the Cardiff Gaslight and Coke Company which were recently inspected by the members of the Wales and Monmouthshire Institution was inaugurated by Miss Lillie Miles last Thursday, and proved a great success. In fact, the applications for tickets were so numerous that Mr. George Clarry, the Manager and Secretary of the Company, had to have the lecture and reception repeated on the day following. This week, he is arranging special lectures on artisan cookery; and the wives of the Company's co-partners are going to attend a special lecture, for which Miss Miles, with her usual ability, has been providing a very attractive programme. It is also proposed to assist the young idea by inviting to the cookery demonstrations on special occasions the elder girls from the Cardiff Elementary Schools. With so much excellent propagation work, it will be surprising if the Company do not reap a substantial advantage in an increased output of gas for cooking purposes.

Extension of the Ashburton Gas-Works.—An inquiry was held at Ashburton, Devon, on Wednesday week, by Mr. W. M. E. Meade-King, respecting an application by the District Council for the sanction of the Local Government Board to a loan of £800 for alterations and additions to the gas-works. Mr. J. A. Gray, of Teignmouth, who had prepared plans of the alterations, explained that at times in the winter the storage was not sufficient, and there had been complaints as to the quality of the gas. The present works were capable of producing 30,000 cubic feet of gas per day; and the maximum consumption was 15,000 cubic feet. The present holder was defective, with the result that its working capacity was only about three-fourths of its nominal storage; and a new holder was to be provided which would contain 15,000 cubic feet. Seven tenders had been received for the work, varying from £780 to £520; but the lowest did not comply with the specification. Objection was raised by a ratepayer to the proposed addition, on the ground that the site of the works is too small to admit of extensions.

Reduction in Price at Bingley.—The report of the working in the past twelve months was submitted at the May meeting of the Bingley Urban District Council by Mr. Rushforth, the Chairman of the Gas Committee, who stated that there was a net profit for the year of £860. He said the Committee proposed that the price should be reduced 3d. per 1000 cubic feet, and this would take a sum of £1120. Pointing out how such a large reduction was possible, he said that there would be £600 less to pay in the next twelve months for interest and sinking fund; while during the past twelve months there had been extra expenditure which was not likely to recur, amounting altogether to £900. In the coming year it was also expected there would be savings in other items of expenditure. He proposed that the reduction in price be sanctioned. As an amendment, Mr. Brigg moved that a reduction of 1d. per 1000 cubic feet only be made, and that a sum equal to 2d. per 1000 cubic feet be devoted to the relief of the rates; but on a vote the amendment was lost—three members only voting for it. The original motion was afterwards agreed to.

The South Staffordshire Mond Gas (Power and Heating) Company, of Dudley Port, are about to have erected six "Bennis" stokers and self-cleaning compressed-air furnaces for their 9-feet boilers.

The Directors of the Continental Union Gas Company, Limited, have resolved to pay an interim dividend of 2 per cent., free of tax, for the past half year, on the ordinary stock (being at the rate of 4 per cent. per annum), together with the half-yearly dividend of 3½ per cent. on the preference stock; the latter being less income-tax.

At the annual meeting of the Staffordshire Potteries Water-Works Company, the report was adopted, and the shareholders sanctioned the payment of a dividend at the rate of 10 per cent. per annum on the consolidated ordinary stock, and of 7 per cent. on the consolidated new ordinary stock. The Chairman (Mr. J. Maddock) explained the present position with regard to the Bill now before Parliament to give the Company further powers, and referred to the threatened opposition of the new Federated Council.

The Gas Committee have reported to the Bridgnorth Town Council that the question of the desirability of the Gas Department undertaking the maintenance, for a small quarterly charge, of incandescent gas-lights, including monthly inspection and cleaning of burners, and the renewal of mantles and chimneys, was now under consideration. The Committee were issuing to gas consumers details of the proposal, and asking for replies for their guidance at an early date. Alderman Whitefoot said that when complaints of bad incandescent lights were investigated, they were generally found to be due to want of attention on the part of the consumer. In places where this matter had been taken up by the gas authorities, it had proved satisfactory to the customers.

APPLICATIONS FOR LETTERS PATENT.

- 12,135.—GRATH, J., and DREXLER, H., "Closing gas-taps." May 17.
 12,160.—SCHODT, P. G. DE, "Mantle lighting." May 17.
 12,191.—PROSSER, H. R., "Burner screw coupling." May 18.
 12,209.—KELLER-KURZ, F., "Carburetting gas." May 18.
 12,210.—GREAVES, W., "Retort materials." May 18.
 12,241.—YATES, H. J., "Gas-fires." May 18.
 12,296.—SCOTT, J. B., "Gas-purifiers." May 19.
 12,297.—WRIGHT, A. C., and HANSFORD, J., "Gas-meters." May 19.
 12,304.—ROSTIN, H. P., "Expansion tap." May 19.
 12,340.—ADAMSON, R. A., "Cleaning water-mains." May 19.
 12,353.—STILL, W. M., and SONS, LTD., and SAWYER, R., "Lighting and extinguishing lamps." May 19.
 12,380.—O'NEIL, H. A., "Pipe-joint." May 21.
 12,394.—LOVETT, L., "Mantle fork." May 21.
 12,397.—EASTHOPE, E., JUN., "Gas-engines." May 21.
 12,404.—HUNT, W., "Exhauster or compressor." May 21.
 12,438.—ANDERSON, D., "Gas-lamps." May 21.
 12,439.—ANDERSON, D., "Gas-controllers." May 21.
 12,440.—ROCKWELL, A. F., "Carbonizing processes." May 21.

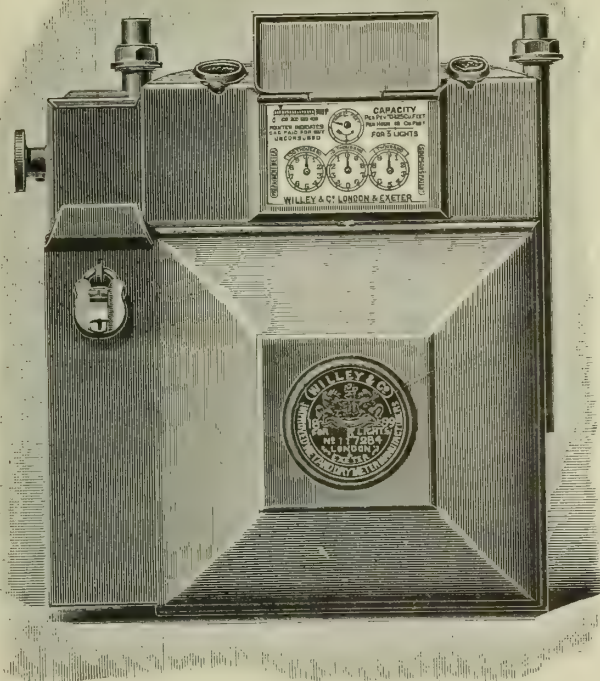
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



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DEVONPORT: 93, Fore Street.

AGENTS FOR SCOTLAND:

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The Morecambe Gas Committee report to the Town Council that they have resolved that all consumers of gas by ordinary meter desiring to have their supply by a slot-meter may do so on payment of 5s.; being the cost of transfer—provided the ratable value of the house is not over £18.

When a boy was summoned at the Sheffield Children's Court for smashing a gas-lamp, it was stated on behalf of the Chief Constable that the practice of breaking street-lamps had assumed a most serious aspect in the city. A statement had been drawn up by the police showing the amount of money expended on repairing lamps that had been broken by having had stones or other missiles thrown at them. For the period extending from March 26, 1909, to March 25, 1910, a sum of no less than £400 had been paid by the ratepayers in repairing lamps that had been so smashed.

The Newcastle-upon-Tyne and Gateshead Gas Company have placed a contract with Messrs. Ashmore, Benson, Pease, and Co., for six luteless purifiers, consisting of two twin boxes 68 feet by 34 feet and two single boxes 34 feet square, fitted with 24 steel covers and a 24-inch Weck centre valve and connections. The contract also includes a steel-frame purifier-house 126 feet long and 93 feet span, with elevated floor and cast-iron deck plates and steel roof; and it has to be completed by the 30th of September next. The whole of the plant has been designed by, and will be carried out under the supervision of, the Company's Engineer, Mr. T. Hardie.

In resigning his seat on the Matlock Bath Council, Mr. D. P. Pearson wrote a letter in the course of which he said: "As Chairman of the Gas Committee, I was surprised to learn from the Auditor that the Local Government Board had written to the Council protesting against transfers of profit from the Gas Department to assist the general district rate, while at the same time the accounts due to creditors were not paid. This letter I never saw; and the Gas Department Secretary positively states he never saw it. As the matter contained in the letter affected the Gas Department, I protest as a councillor, and more especially as Chairman of the Gas Committee, that such an important communication should be suppressed and dealt with in a secret manner by members of the Council."

Early last Tuesday morning a 12-inch main belonging to the South Staffordshire Water Company, situated near Hill Crest, Heath Hayes, burst with a tremendous explosion. The footpath in many places was washed away; and considerable damage was done to the roadway. When the water was shut off, it was discovered that there was a large rent in the main about 4 feet long. It was stated that the breakage was due to mining subsidences.

The Economical Gas Apparatus Construction Company, Limited, has been registered with a capital of £15,000, in £1 shares, to take over as a going concern the business now carried on by the Economical Gas Apparatus Construction Company, Limited, and to carry on the business of gas engineers and contractors, &c. The signatories are Messrs. J. T. Westcott, E. J. Davison, B. B. Waller, and E. C. Mingel, who are the first Directors. The registered office is at No. 19, Abingdon Street, Westminster, S.W.

The Ilford Education Committee had under consideration at their last meeting estimates from the Electrical Engineer for installing electric light at two schools. The School Management Committee reported that it was inopportune to consider the suggested scheme at present, owing to financial reasons. In the course of the discussion which ensued, Mr. Philpot said that, as the electric light undertaking was the property of the town, suggestions for the lighting of the Council schools from it should be sympathetically considered. The schools should be lighted with electricity for the sake also of the children. He moved that the paragraph be referred back to the Committee. Mr. Church contended that the question ought to be gone into from the ratepayers' point of view, as to whether gas or electricity was the cheaper, and also as to which was the best light. One member failed to see why, because the electric lighting undertaking belonged to the town, the Committee should waste money in making the suggested change, and expressed the opinion that incandescent gas light was better than the electric light. Another speaker thought that the schools were already lighted in a way that gave satisfaction. In the result, the amendment to refer the matter back to the Committee was negatived, and the Committee's recommendation that the matter be deferred until at least the end of the present financial year was carried.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

CHIEF CLERK. Cheltenham Gas-Works.
DRAUGHTSMAN. C. & W. Walker, Limited, Donnington.
REPRESENTATIVES (LIGHTING ENGINEERS). No. 524b.
METER INSPECTOR. No. 1244.
AGENTS (MANTLES). H. J. 6780, care of Neyroud and Sons, Queen Victoria Street, E.C.

Situation Wanted.

LEADURNER. Elliott, Shepherd's Bush, W.

Plant, &c. (Second Hand), for Sale.

PIPES, BENDS, &c. Chesterton Gas Works.

Plant, &c. (Second-Hand), Wanted.

GASHOLDER. No. 5245.

Patent Licences.

WASHING AND COOLING GAS. Cruikshank and Fairweather, Chancery Lane, W.C.

Meetings.

INSTITUTION OF GAS ENGINEERS. Institution of Mechanical Engineers. June 14-16.
MALTA AND MEDITERRANEAN GAS COMPANY. London Offices. June 14. Twelve o'clock.

Stocks and Shares.

ASCOT GAS AND ELECTRICITY COMPANY. June 14.
BRENTWOOD GAS COMPANY. June 14.
EAST GRINSTEAD GAS AND WATER COMPANY. June 14.
FELIXSTOWE GASLIGHT COMPANY. June 10.
GUILDFORD GAS COMPANY. June 14.
NEWPORT (MON.) GAS COMPANY. June 7.

TENDERS FOR

Benzol.

LEIGH GAS AND WATER DEPARTMENT. Tenders by June 11.

Coal and Cannel.

BARNSEY GAS COMPANY. Tenders by June 7.
BOLTON GAS DEPARTMENT. Tenders by June 3.
BRIDGNORTH GAS DEPARTMENT. Tenders by June 18.
BRISTOL GAS COMPANY. Tenders by June 8.
CHESTER GAS COMPANY. Tenders by June 6.
CIRENCESTER GAS COMPANY. Tenders by June 2.
DEWSBURY GAS DEPARTMENT. Tenders by June 9.
GLOSSOP GAS COMPANY. Tenders by June 11.
HAVERHILL GAS DEPARTMENT. Tenders by June 8.
LEIGH GAS AND WATER DEPARTMENT. Tenders by June 11.
NEWPORT (MON.) GAS COMPANY. Tenders by June 15.
OLDBURY GAS DEPARTMENT. Tenders by June 18.
PETERBOROUGH GAS COMPANY. Tenders by June 11.
SALISBURY GASLIGHT COMPANY. Tenders by June 9.
SLOUGH GAS COMPANY. Tenders by June 7.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 6.
TAUNTON GASLIGHT COMPANY. Tenders by June 6.

Coke.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. (FOR SALE.) Tenders by June 6.
JOSEPH BOAM, LIMITED, KING'S LYNN. (WANTED.)

Furnace Slag, Fettingling, Mill Scale, Tarpaulin Cuttings, &c.

GREAT WESTERN RAILWAY. Tenders by June 7.

General Stores (Lead Piping, Vitriol, Lime, &c.).

LEIGH GAS AND WATER DEPARTMENT. Tenders by June 11.
LOUGHBOROUGH GAS DEPARTMENT.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 6.

Meters.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 6.

Pipes, &c.

LEIGH GAS AND WATER DEPARTMENT. Tenders by June 11.

Steam Hoist and Gantrys.

MIDDLETON GAS DEPARTMENT. Tenders by June 18.

Tar and Liquor.

ACCRINGTON GAS AND WATER BOARD. Tenders by June 6.
BARNSEY GAS COMPANY. Tenders by June 7.
BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by June 20.
GREAT WESTERN RAILWAY. Tenders by June 7.
LOUGHBOROUGH GAS DEPARTMENT. Tenders by June 10.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 6.

Retort Settings.

SPALDING GAS DEPARTMENT. Tenders by June 18.

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LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

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OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE OF EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRIOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 588.

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SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

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SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD.

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SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.

See Advertisement, May 10, p. 11, of Centre.

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5118 WESTMINSTER.

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THE very best Patent Grids for Holding

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See Illustrated Advertisement, April 5, p. 8.

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Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORKS.

GAS WORKS requiring Extensions

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A. LOWCOCK, Limited, SHREWSBURY.

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MEADE-KING, ROBINSON, & CO.

Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

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Purification Plant.

Results Guaranteed. No Working Costs.

JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

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phate of Ammonia, Leadwork Repairs, &c., Cheap, with Plant. Workmanship Guaranteed. Sixteen Years' References. Worked at Beckton, Sheffield, Dublin, &c.

Address ELLIOTT, 118, Galloway Road, SHEPHERD'S BUSH, W.

WANTED, a Chief Clerk for the Central

Gas Offices. Age not exceeding 35. Commencing Salary, £230.

Apply, by letter, stating Age, Experience, and full Particulars, to R. O. PATTERSON, Manager, Gas-Works, CHELTENHAM.

DRAUGHTSMAN Wanted, Experienced

in Gas-Works Plant, with knowledge of Retort Work Preferred.

Full Particulars, stating Salary required, to C. & W. WALKER, LIMITED, Midland Iron Works, Donnington, SHROPSHIRE.

TWO Representatives wanted by a

well-known House of Lighting Engineers, one with a knowledge of London District, and the other for Eastern Counties and South Coast. Only First-Class Men need Apply.

Address No. 5246, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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REQUIRED, an Inspector thoroughly

acquainted with the Testing of Meters, Taking Illuminating Power Tests, and the Ordinary Work of Meter Taking. Wages, 35s. per Week.

Copies only of Three recent Testimonials to be forwarded to No. 5244, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AGENTS WANTED—A First-Class

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Respectable and very active Firms versed in the Light Business for Home Trade and Export, please address "H.J. 6780," care of NERROUD AND SONS' ADVERTISING OFFICES, 14/18, Queen Victoria Street, LONDON, E.C.

GASHOLDER Wanted (Capacity 20,000

to 30,000 Cubic Feet) erected Complete. Second-Hand not objected to, but must be in Good Condition.

Send full Particulars and Price, to No. 5245, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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QUOTE Lowest Price on Truck to

JOSEPH BOAM, LIMITED, Coke Factors, KING'S LYNN.

FOR SALE—about Five Tons of 12-inch

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State Requirements to the MANAGER, Gas-Works, CHESTERTON, STAFFORDSHIRE.

GASHOLDERS—Splendid 45 feet dia-

meter and New STEEL TANK, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale.

FIRTH BLAKELEYS, Thornhill, DEWSBURY.

COAL.

THE Salisbury Gaslight and Coke Com-

pany invite TENDERS for 1000 to 4000 Tons of GAS COAL, delivered f.o.r. Salisbury, as required over the next Twelve Months.

Tenders to be sent on or before June 9, to Mr. N. H. HUMPHREYS, Gas Engineer, SALISBURY.

GREAT WESTERN RAILWAY.

THE Directors of this Company are prepared to receive TENDERS for the Purchase of—

GAS TAR AND AMMONIACAL LIQUOR.
FURNACE SLAG, FETTLING, AND MILL SCALE.

TARPAULIN CUTTINGS AND SHEET TIES.

Forms of Tender (upon which alone Tenders will be received) may be obtained on Application to the undersigned, by whom Tenders, marked outside "Tender for Residuals," will be received up to Ten a.m. on Tuesday, the 7th of June.

The Directors do not bind themselves to accept the highest or any Tender.

G. K. MILLS,
Secretary.

Paddington Station,
London, May 19, 1910.

THE Directors of the Glossop Gas Company invite TENDERS for the Supply, during the Year commencing Aug. 1, 1910, of 6000 Tons of Good GAS COAL and 500 Tons of CANNEL, which must be delivered, carriage paid, at the Great Central Railway Station, Glossop.

Forms of Tender may be obtained at the Company's Office.

Sealed Tenders, Specifying the Description of the Coal and the Pit from which it is to be raised, must be sent to the Chairman of the Company not later than Saturday, the 11th of June next.

The Directors do not bind themselves to accept the lowest or any Tender.

J. SIDEBOTTOM,
Secretary.

Gas Offices, Glossop,
May 26, 1910.

THE Corporation of Middleton are prepared to receive TENDERS for the Erection of a STEAM HOIST and GANTRY in place of their present Coke-Handling Plant.

Specification, &c., and Form of Tender, which will contain a Fair Wages Clause, may be obtained from Mr. C. F. Broadhead, Gas Engineer, Gas-Works, Middleton.

Tenders, addressed to the Chairman of the Gas Committee and endorsed "Steam Hoist," must be delivered at my Office not later than June 18 next.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
May 26, 1910.

SLOUGH GAS AND COKE COMPANY.

THE Directors are prepared to receive TENDERS for the Supply of 5500 Tons of Best GAS COAL, Screened, Unscreened, or Screened Nuts, to be delivered at the Company's Siding on the Great Western Railway at Slough in the usual Monthly Quantities as may be required during the period of One Year from the 1st of July, 1910.

Tenders should state Description of Coal and Colliery from where Coal is obtained.

Payment for Coal on or before the 20th of the following Month after delivery.

Tenders to be delivered to the undersigned, endorsed "Tender for Gas Coal," on or before Tuesday, the 7th prox.

ARTHUR THOMAS,
Secretary.

High Street, Slough,
May 25, 1910.

URBAN DISTRICT COUNCIL OF OLDBURY.

(GAS DEPARTMENT.)

THE Gas Committee of the above Council are prepared to receive TENDERS for the Supply of 12,000 Tons of Best Screened GAS COAL for delivery during the Year ending July 31, 1911, in such Quantities and at such times as ordered.

Further Particulars and Tender Forms may be obtained from the undersigned.

Sealed Tenders endorsed "Tender for Gas Coal," to be addressed to the Chairman of the Gas Committee and delivered to the undersigned not later than Saturday, the 18th day of June, 1910.

The Gas Committee do not bind themselves to accept the lowest Tender, and reserve to themselves the right to apportion the whole or any quantity thereof as they may think fit.

By order,
A. COOKE,
General Manager.

Gas-Works, Oldbury,
May 25, 1910.

BOROUGH OF LEIGH.

(GAS AND WATER DEPARTMENTS)

THE Gas and Water Committee of the above Corporation are prepared to receive TENDERS for the Supply of the following GOODS:

- (1) 14,000 Tons of Screened and Unscreened GAS COAL, NUTS, and SLACK.
- (2) LEAD PIPING (Gas and Water.)
- (3) VITRIOL.
- (4) LIME.
- (5) BENZOL.

Forms of Tender may be had on Application from the undersigned, to whom all enquiries must be addressed; and all Offers must be made on the Official Forms, or they will not be considered.

Sealed and endorsed Tenders must be delivered to Mr. Stanley Wilson, Town Clerk, Town Hall, Leigh, Lancashire, on or before Twelve o'clock noon on Saturday, the 11th day of June, 1910.

The Corporation do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide any Tender.

JAMES GIBSON,
Engineer and Manager.
Gas and Water Offices, Leigh,
Lancashire, May 24, 1910.

BRIDGEWATER COLLIERIES COKE-WORKS.

(THE EARL OF ELLESMERE.)

TENDERS are invited for the Tar pro-duced at the above Works for a period of Six or Twelve Months from the 1st of July, 1910, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding, Little Hulton Mineral Branch of the London and North-Western Railway.

The estimated quantity is about 2600 Tons per Annum.

Tenders, endorsed "Tender for Tar," to be addressed to Mr. THOMAS M. BROWN, Bridgewater Coal Offices, 4, Chapel Walks, MANCHESTER, not later than the 20th of June.

Manchester, May 31, 1910.

BOROUGH OF DEWSBURY.

THE Gas Committee are prepared to re-ceive TENDERS for the Supply and Delivery, at the Gas-Works Siding, Savile Town, Dewsbury, of the following Quantities of Screened GAS COAL, during the period of One, Two, or Three Years commencing on the 1st day of July next.

| | Tons. | Tons. |
|-----------------------|-------------------|--------------|
| First Year | 32,000 Black Coal | 1000 Cannel. |
| Second Year | 22,000 " | 1000 " |
| Third Year | 22,000 " | 1000 " |

Tenders must Specify Prices for Delivery by Rail, and be made on Forms to be had on Application to Mr. Geo. Wm. Fligg, Savile Town Gas-Works, Dewsbury, from whom any further Information may be obtained.

Sealed Tenders, endorsed "Tender for Gas Coal," to be sent to me not later than Thursday, the 9th day of June next.

The Committee do not bind themselves to accept the lowest or any Tender.

H. ELLIS,
Town Clerk.

Town Hall, Dewsbury.

LOUGHBOROUGH CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the Lough-borough Corporation invite TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months from July 1, 1910, to June 30, 1911.

Estimated amount of Tar, 600 Tons; Liquor, 1000 Tons.

The Contractor to state Price for Liquor at 5° Twaddell, and per Ton extra for every ½° above 5°.

The Corporation to deliver both Tar and Liquor into Contractor's Boats at the Derby Road Wharf, Loughborough.

Tenders to be endorsed "Tenders for Tar and Liquor," and addressed and delivered to H. Perkins, Esq., Town Clerk, Town Hall, Loughborough, not later than Friday, the 10th of June.

The Committee do not bind themselves to accept the highest or any Tender.

EDWARD ONIONS,
Engineer and Manager.

May 23, 1910.

LOUGHBOROUGH CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR LIME.

THE Gas Committee of the Lough-borough Corporation invite TENDERS for the Supply of 800 Tons (more or less) of Best Hand-Picked LIME for Purifying purposes, to be delivered at Loughborough Station during the Twelve Months ending June 30, 1911.

Further Particulars may be obtained from the undersigned.

E. ONIONS,
Engineer and Manager.

May 23, 1910.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL AND LIME.

TENDERS FOR COKE, TAR, AND AMMONIACAL LIQUOR.

TENDERS FOR GAS METERS.

THE Gas Committee of the above

Council are prepared to receive TENDERS for the Supply of 5500 Tons of well Screened GAS COAL, to be free from Shale and Pyrites, and to be delivered at the Town Stations, (Midland or Great Northern Railways), Sutton-in-Ashfield, in such Quantities as the Manager shall from time to time direct between July 1, 1910, and June 30, 1911.

Tenders for Coal to state Price per Ton of 20 cwt. delivered here.

LIME.

Also for the Supply of about 300 Tons of Best Hand-Picked LIME, to be delivered at either of the above Railway Stations, and in such Quantities as the Manager shall from time to time direct between July 1, 1910, and June 30, 1911, and to be free from Stone and other Refuse.

COKE, TAR, AND AMMONIACAL LIQUOR.

Tenders are also invited for the Surplus COKE, TAR, and AMMONIACAL LIQUOR, produced at these Works from July 1, 1910, to June 30, 1911, to be delivered in Purchaser's Tank-Waggons at the Midland or Great Northern Stations, Sutton-in-Ashfield.

GAS-METERS.

The above Council are also prepared to receive TENDERS for the Supply of New Dry, Ordinary, and Automatic METERS to meet their requirements for the ensuing Twelve Months, all Meters to be delivered here Carriage Paid and Guaranteed for Five Years.

No Tender Forms provided.

The Committee do not bind themselves to accept the lowest or any Tender.

Tenders, endorsed, must arrive here not later than the 6th day of June, 1910.

For any further Particulars, Apply to Mr. T. ROBINSON, Gas-Works Manager, SUTTON-IN-ASHFIELD.

SPALDING URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to re-ceive TENDERS for the Erection in existing Arches of Two Beds of REGENERATOR RETORT SETTINGS.

Full Particulars and other Information can be obtained from the undersigned.

Tenders, endorsed "Retort Settings," to be delivered to me on or before Saturday, the 18th day of June, 1910.

H. R. WIMHURST,
Engineer and Manager.

Gas-Works, Spalding,
May 27, 1910.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THIS Board invites Tenders for the

Surplus TAR and AMMONIACAL LIQUOR which may be produced at the Accrington and Great Harwood Gas-Works of the Board, during the Year from the 1st of July next to the 30th of June, 1911.

The Estimated Quantity of Tar is 2000 Tons, and of Liquor 6000 Tons.

Sealed Tenders, endorsed "Tar and Liquor" addressed to the Chairman of the Board, must be in my hands on or before Monday, the 6th of June.

Forms of Tender may be obtained on Application.

By order,
CHARLES HARRISON,
General Manager.

General Offices, Accrington,
May 19, 1910.

HAVERHILL URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE Haverhill Urban District Council

invite TENDERS for the Supply of 600, 1200, or 1800 Tons of Best GAS COAL (Screened or Unscreened), to be delivered free at the Haverhill (Great Eastern Railway) Station in such Quantities and at such periods as may be ordered from time to time between the 1st day of July next and the 30th day of June, 1911.

No Form of Tender is provided, nor will be supplied. The Council reserve the right to divide the Contract as they think fit and do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Gas," to be delivered to me on or before the 8th of June, 1910.

THOMAS BATES,
Clerk.

Haverhill, May 28, 1910.

BARNSELY GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company are prepared to receive TENDERS for the Supply of about 16,000 Tons of Screened and Unscreened GAS COAL or NUTS for One Year from the 1st day of July next, in such Quantities as may be required by the Company.

Tenders to state price delivered at the Sidings belonging to the Gas Company at Old Mill and Pontefract Road (both Great Central Railway), also at the Railway Goods Yards, Barnsley.

For Forms of Tender and any other Particulars, Apply to the undersigned.

Sealed Tenders, endorsed "Tender for Coal," to be addressed to the Chairman, and delivered to the undersigned not later than Tuesday, the 7th day of June, 1910.

The Directors reserve to themselves the right to accept the whole or any Portion of any Quantity offered, and do not bind themselves to accept the lowest or any Tender.

W. W. HUTCHINSON,
Engineer and Manager.

Gas Office, Pontefract Road,
Barnsley, May 25, 1910.

BARNSELY GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the above Company

invite TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR to be produced at their works during a term of One Year commencing July 1 next. Probable Quantities and any other Particulars on Application to the undersigned.

Sealed Tenders, duly endorsed, addressed to the Chairman, to be delivered to me not later than Tuesday, the 7th day of June prox.

The Directors do not bind themselves to accept the highest or any Tender.

W. W. HUTCHINSON,
Engineer and Manager.

Gas Offices, Barnsley,
May 25, 1910.

BRIDGNORTH CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.
THE Gas Committee are prepared to

receive sealed TENDERS for the Supply of Screened GAS COAL or Washed GAS NUTS, including Carriage to the Bridgnorth Railway Station, for One Year from, or soon after, the end of July next.

Evidence as to quality of Coal must accompany each Tender.

The Coal or Nuts must be well Screened or Washed, free from Bats, Binds, and other Refuse, and be freshly got at the time for delivery.

Quantity required, about 2600 tons in proportionate deliveries as directed—say 70 per cent. during Winter months, and 30 per cent. during Summer months.

Sealed and marked Tenders must be sent to the undersigned not later than Saturday, the 18th of June.

The Committee reserve to themselves the right to divide the Quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Official Forms for Tender are not furnished.

By order,
J. H. COOKSEY,
Town Clerk,
Secretary.

Bridgnorth, May 27, 1910.

CIRENCESTER GAS COMPANY, LIMITED.

THE Directors are prepared to receive TENDERS for the Supply of 4000 to 5000 Tons of GAS COAL to be delivered free to their Siding at the Watermoor Station of the Midland and South Western Junction Railway Company during the Twelve Months commencing July 1, 1910, at such times and in such Quantities as may be required by their Manager.

Tenders to be sent in by June 2 next, Forms for which can be obtained from

J. P. BEECHAM,
Secretary.

12, Silver Street, Cirencester,
May 9, 1910.

COUNTY BOROUGH OF BOLTON.

(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas and Lighting Committee invite TENDERS from Colliery Proprietors only, for the Supply of Screened and Unscreened GAS COAL, COBBLES, and NUTS, required during the Year ending June 30, 1911.

Specifications and Forms of Tender may be obtained on Application to the Superintendent, Gas-Offices, Bolton.

Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the above Committee, to be delivered at the Gas Offices, Bolton, not later than Nine a.m., on Friday, June 3, 1910.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton,
May 18, 1910.

PETERBOROUGH GAS COMPANY.**TENDERS FOR BEST SILKSTONE GAS COAL.**

THE Directors of the above Company invite TENDERS for One Year's Supply of Best Screened Silkstone NUTS. Delivery to commence July 1, 1910.

The Tenders must state Price per Ton in Waggon at Pit, Railway Rate to Peterborough, Waggon Hire to Peterborough.

Tenders must be sent in by June 11 next, endorsed "Coal," and addressed to the Chairman of the Company, Gas-Works, Peterborough.

The Directors do not bind themselves to accept the lowest or any Tender.

Please note: Special Tender Forms are not provided.

JOHN BARTON,
Secretary and Manager.

Peterborough, May 10, 1910.

CHESTER UNITED GAS COMPANY.**TENDERS FOR GAS COAL.**

THE Directors of the above Company invite TENDERS for the Supply of about 23,000 Tons of GAS COAL for One, Two or Three Years from the 1st day of July next, in such Monthly Quantities as may be required by the Company.

Special Conditions and Forms of Tender can be obtained from, and sealed Tenders endorsed "Tender for Coal," must be addressed to the undersigned, not later than Monday, the 6th of June prox.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
FRED. A. PYE,
Secretary and General Manager.

Gas Offices, Cuppin Street,
Chester, May 19, 1910.

NEWPORT (MONMOUTHSHIRE) GAS COMPANY.**TENDERS FOR COAL.**

THE Directors invite Tenders for the Supply of about 30,000 Tons of Best GAS COALS, for Twelve Months, commencing the 1st of July, 1910, to be delivered on the Company's Sidings at their Mill Street or Crindau Works, in such Quantities and at such times as may be directed by the Company's Engineer, from whom further Information may be obtained.

Tenders will be received for the whole or part of the above Quantity.

Tenders, endorsed "Coals," to be delivered at the Offices of the Company not later than the 15th of June, 1910.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
T. H. HAZELL,
Secretary.

Newport, Mon.,
May 19, 1910.

TAUNTON GASLIGHT AND COKE COMPANY.**TENDERS FOR COAL.**

THE Directors are prepared to receive TENDERS for COAL for Delivery over One Year from the 1st of July next.

Particulars may be obtained from the Manager, to whom Tenders, sealed and endorsed, should be sent before June 6 next.

A. EDWARDS,
Secretary and Manager.

May 23, 1910.

THE Proprietor of Letters Patent

No. 12,751 of 1907, relating to "Apparatus for Washing and Cooling Gas," desires to DISPOSE of the Patent, or to Grant LICENCES to interested Parties on Reasonable Terms, with a view to the adequate Working of the Patent in this Country.

Enquiries to be addressed to GREIKSHANK AND FAIRWEATHER, LIMITED, International Patent Agency, 62-66, Chancery Lane, LONDON, W.C.

THE Institution OF Gas Engineers.

THE ANNUAL GENERAL MEETING

WILL BE HELD ON

TUESDAY, JUNE 14 (10.30 a.m.),

WEDNESDAY, JUNE 15 (10 a.m.),

AND

THURSDAY, JUNE 16 (10 a.m.),

AT THE

INSTITUTION OF MECHANICAL ENGINEERS,

STOREY'S GATE, ST. JAMES' PARK,
WESTMINSTER,

By kind permission of the Council of that body.

The Chair will be taken by the President,
JAMES W. HELPS, Esq., M.Inst.C.E.

In connection with the Meeting, a Visit of Inspection to the Croydon Gas-Works will take place on Friday, June 17.

WALTER T. DUNN,
Secretary.

THE BENEVOLENT FUND.

The Annual General Meeting of the Contributors to the Benevolent Fund will be held at the Institution of Mechanical Engineers on Wednesday, the 15th of June, at Ten a.m.

39, Victoria Street, Westminster, S.W.,
May 23, 1910.

THE BRISTOL GAS COMPANY.**TENDERS FOR GAS COAL.**

THE Directors of the above Company are prepared to receive TENDERS for the Supply of their requirements of GAS COAL during the period ending June 30, 1911.

Particulars and Forms of Tender may be obtained upon Application to the undersigned, to whom also Tenders, sealed and endorsed "Tender for Coal," must be delivered not later than Ten a.m. on Wednesday, the 8th day of June, 1910.

JOHN PHILLIPS,
Secretary.

Chief Offices, Colston Street,
Bristol, May 27, 1910.

NEWPORT (MONMOUTHSHIRE) GAS COMPANY.

SALE BY TENDER OF £16,000 CONSOLIDATED (5 PER CENT.) STOCK.

(MINIMUM PRICE, £112 PER £100 STOCK.)

THE Directors invite Tenders for the Purchase of the above-mentioned CONSOLIDATED STOCK of the Company, in Lots of £100 each, to be paid up in full on or before June 30, 1910.

The Stock bears a Maximum Dividend of £5 per Cent. per Annum.

Full Maximum Dividends have been paid by the Company for upwards of Fifty Years.

Sealed Tenders must be delivered not later than Ten o'clock a.m. on Friday, the 17th of June, 1910, to the undersigned, from whom Particulars and Conditions of Sale may be obtained.

By order,
T. H. HAZELL,
Secretary.

Gas Offices, Newport, Mon.,
May 19, 1910.

FELIXSTOWE GASLIGHT COMPANY.

(INCORPORATED BY ACT OF PARLIAMENT, 1904.)

ISSUE OF £2000 ADDITIONAL ORDINARY STOCK.

RANKING for a Standard Dividend of

7 per cent., subject to the Sliding Scale equally with the existing similar Stock, in lots of
£5 EACH OR MULTIPLES OF £5

Dividend Payable Half-Yearly on March 1 and September 1.

The Directors of the Company invite TENDERS for the above, to be addressed to the Secretary, and delivered at the Office, Hamilton Road, Felixstowe, not later than Noon, on Friday, June 10, 1910, in envelopes endorsed, "Tender for Additional Ordinary Stock."

Tenders must be upon Special Forms, which may be had upon Application to the Secretary, from whom also full Particulars of the issue may be obtained.

The Directors do not bind themselves to accept the highest or any Tender.

The issue will be subject to a reserved price, and in accordance with the Provisions of the Company's Act of Parliament.

F. M. PATERNOSTER,
Secretary.

Hamilton Road, Felixstowe,
May 23, 1910.

Last day for receiving Tenders, June 10, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL, GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ASCOT DISTRICT GAS AND ELECTRICITY COMPANY.

NEW ISSUE OF 350 £10 NEW ORDINARY SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 14, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BRENTWOOD GAS COMPANY.

NEW ISSUE OF £3000 ADDITIONAL STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 14, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GUILDFORD GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK, AND

£2500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 14, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
EAST GRINSTEAD GAS AND WATER COMPANY.

NEW ISSUE OF 400 £10 "C" SHARES, AND

£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 14, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCK and BONDS, WILL BE CLOSED at Four o'clock p.m., on Friday, the 10th prox., for the Half Year ending on the 30th prox., and WILL BE RE-OPENED on the Morning of Saturday, the 11th prox.

The Interest for the Half Year will be payable on the 1st of July next to the Proprietors registered on the closing of the Books.

By order,
HENRY RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., May 27, 1910.

MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED.**TO THE SHAREHOLDERS.**

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices, 59 & 60, Gracechurch Street, London, E.C., on Tuesday, the 14th of June, 1910, at Twelve o'clock Noon, for the purpose of receiving the Report of the Directors and the Accounts for the Year ended the 31st of March, 1910, and for the Transaction of the General Business of the Company.

One of the Directors, Mr. Stephenson Robert Clarke, retires from Office, and offers himself for Re-election. The Auditors, Mr. Robert Hesketh Jones and Mr. Thomas Guyatt, retire, and offer themselves for Re-election.

The TRANSFER BOOKS WILL BE CLOSED from the 31st of May until the day of the Meeting, both days inclusive.

By order of the Board,
A. W. COOPER,
Secretary.

59 & 60, Gracechurch Street, E.C.,
May 24, 1910.

**THOMAS DUXBURY & CO.,
16, DEANS GATE, MANCHESTER.**

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & CO.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

MIRFIELD GAS COAL.
UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,
STOURBRIDGE,

Manufacturers of

FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,

And every description of Fire-Clay Goods.

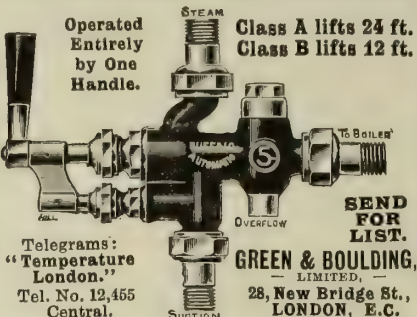
RETORTS CAREFULLY PACKED
FOR SHIPMENT.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

'BUFFALO' INJECTOR



HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

LUX'S
Gas Purifying Material

is now used in many Gas-
Works throughout Scotland
with gratifying success.

FRIEDRICH LUX
Ludwigshafen-am-Rhein

Sole Agent for Scotland:

DANIEL MACFIE

1, North Saint Andrew Street, EDINBURGH

Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.

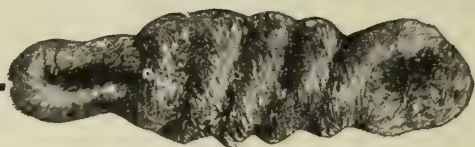
THOMAS TURTON
AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:

90 CANNON STREET E.C.



LEAD WOOL

Is sent out in Skeins all ready for use.
Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way
through.

Lead Wool requires no melting and can be used in
water without risk.

Lead Wool Joints are Twice as Strong as Cast Lead
Joints and cost 33 1/3 per cent. less.

THE LEAD WOOL CO., LTD., SNODLAND, KENT.

Telegrams: "STRENGTH, SNODLAND." Telephone 199 SNODLAND.

EVERITT'S Patent
TAR-FOG EXTRACTOR
AND
NAPHTHALENE REMOVER.

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ROSE MOUNT IRON-WORKS, LTD.,

ELLAND, Yorks.



HARRIS & PEARSON,
STOURBRIDGE, ENGLAND
MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.



THE WIGAN COAL & IRON CO., LIM^{TD.}

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES,
Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known
Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

MIDLAND AND WEST OF
ENGLAND DISTRICT OFFICE: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

Telegraphic Address: "WIGAN, BIRMINGHAM."

Telephone: No. 200.

LONDON
DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

Telegraphic Address:
PARKER, LONDON."

GRAETZIN LIGHT

Important Improvements.



BURNERS.

- 1. 20-Candle Power more light without increase in the consumption of gas.
- 2. Patent Gas Adjuster; cannot get out of order.
- 3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
- 4. Accurate Regulation of the Air Supply.
- 5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
- 6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

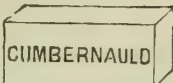
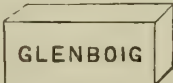
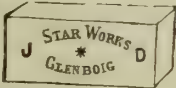
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE
MARKS.



The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undenoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.



Works: GLENBOIG, LANARKSHIRE.

Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas
of Honour.

Highest Award wherever exhibited.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET,
LONDON, E.C., September 21st, 1909.

DEAR SIR,
I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

| | Raw. | Fired. |
|--------------------------------|-------|--------|
| Silica, free | 3.03 | 3.49 |
| Silica, combined | 43.20 | 49.77 |
| Alumina | 36.55 | 42.10 |
| Ferric oxide | 1.80 | 2.08 |
| Titanic oxide | 1.30 | 1.50 |
| Lime | trace | trace |
| Magnesia | trace | trace |
| Alkaline oxides | trace | trace |
| Sulphates as trioxides | 0.92 | 1.06 |
| Loss on Ignition | 13.20 | .. |

100.00 100.00

PHYSICAL RESULTS.

| | |
|-------------------------------------|-----------------------------|
| Density | 2.65 |
| Volume weight | 1.90 |
| Porosity | 15.4 % |
| Linear shrinkage at 100° C. | 3.70 % |
| " " " 1050° C. | 4.76 % |
| " " " Total | 8.46 % |
| Volume shrinkage at 100° C. | 10.7 % |
| " " " 1050° C. | 12.6 % |
| " " " Total | 23.3 % |
| Plasticity | 20.0 % |
| Fire Stability | 1850° C. equiv. to 3362° F. |

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,
JOHN T. NORMAN.

METROPOLITAN GAS METERS, LIMITED,

SOLE MAKERS AND LICENSEES OF THE

"Simplex" AUTOMATIC GAS LIGHTER AND EXTINGUISHER.

Some of its Special Advantages are:

1. It is instantaneous in Lighting and Extinguishing without shock to Mantle, and can be set to its pre-determined times in a few seconds.
2. The Mechanism will act correctly, even though the Lamp-post and Controller be out of the perpendicular.
3. **THE VALVE.**—As this never leaves its seat, and the gasways being away from the seating, no impurities can collect between the valve and the seating, and by simply removing

a small cap, the gasways can be freed of Naphthalene or any other matter.

4. The leakage of gas into the Clock Mechanism and its resultant troubles are entirely done away with.
5. Vibration of any description will not cause the Mechanism to operate prematurely.
6. The "Simplex" Clock also has the advantage of a Lever Escapement.

PRICES AND PARTICULARS ON APPLICATION.

OFFICES AND WORKS AT

Hyson Green, Nottingham.

Telegraphic Address:
"Gasometer Nottingham."

Telephone:
204X Nottingham.

LONDON DEPOT:

Malt Street, Old Kent Road, S.E.

Telegraphic Address:
"Gasometer London."

Telephone:
2044 Hop.

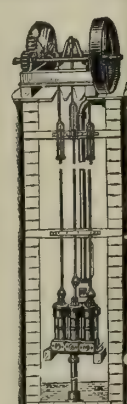
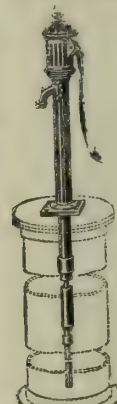
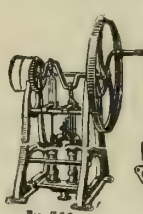
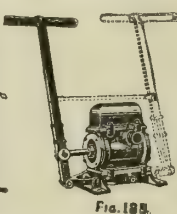
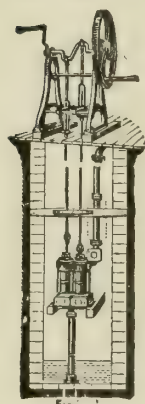
JOSEPH EVANS & SONS, (WOLVERHAMPTON) LTD.

CULWEL WORKS,
WOLVERHAMPTON.

London Address:
Salisbury House, London Wall, London, E.C.

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FOR CATALOGUE No. 8.

Telegrams:
"EVANS, WOLVERHAMPTON,"
National Telephone No. 39.



See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

NEWTON, CHAMBERS, & CO., LIMITED.

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

LONDON OFFICE: Brook House, 10-12, Walbrook, LONDON, E.C.

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON." National Telephone No. 2200.

GAS ENGINEERS, IRONFOUNDERS, and CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.

RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.

IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.

CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.

STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.

GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (special quality) for Engine Cylinders. * **GAS COAL** famous for its Unrivalled excellence.

Established 1793.

Welsbach

LIGHT

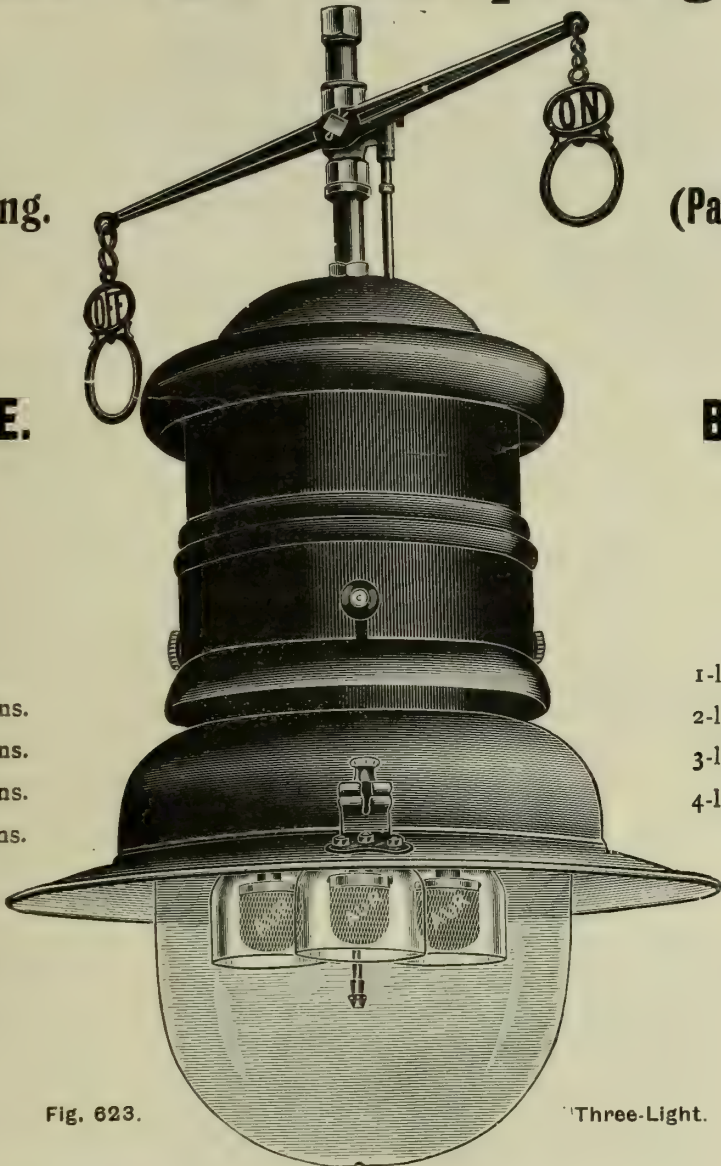
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

- 1-light . . . 1 ft. 8 ins.
- 2-light . . . 2 ft. 4 ins.
- 3-light . . . 2 ft. 4 ins.
- 4-light . . . 2 ft. 7 ins.

Width over all.

- 1-light . . . 1 ft. 1 in.
- 2-light . . . 1 ft. 5 ins.
- 3-light . . . 1 ft. 5 ins.
- 4-light . . . 1 ft. 8 ins.

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

| | Gas per hour. | C.P. | Steel. | Copper Case. | | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
| 2-light | 8 feet | 260 | 47/6 | 6/- extra. | 4-light | 16 feet | 550 | 72/6 | 9/- extra. |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

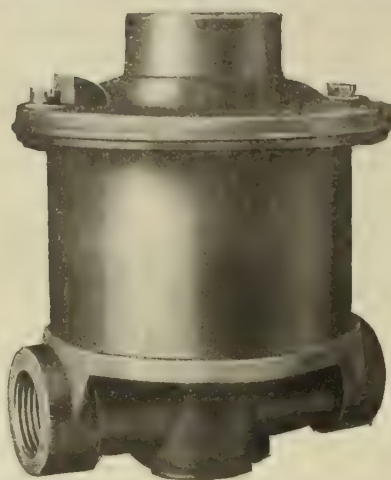
Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

| | 1-Light. | 2-Light. | 3-Light. | 4-Light. | | 1-Light. | 2-Light. | 3-Light. | 4-Light. |
|---------------------------------|----------|----------|----------|----------|----------------------------|----------|----------|-------------------|--------------|
| Clear Glass Globes, each | 2/3 | 5/9 | 5/9 | 9/- | Wired Globes, extra | each | 2/- | 2/- | 2/9 3/6 |
| " " " " In Case lots per dozen. | 19/6 | 57/9 | 57/9 | 93/- | Parabolic Reflector, extra | " | 3/6 | 6/- | 7/6 Not made |
| Case contains | 80 | 18 | 18 | 12 | Welsbach Mantles, each | | 6d. | subject as usual. | |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.
Telegrams and Cables: "WELSBACH LONDON."
Telephone 2410 NORTH.

HIGH PRESSURE SERVICE GOVERNORS.



High Pressure Mercurial Governor.

**Large Gas Ways Balanced Valves, also High-
Pressure Diaphragm Governors.**

PEEBLES & CO., LTD.,

Tay Works, Bonnington,

Telegrams: "TANGENT EDINBURGH,"
Telephone: No. 244 LEITH,

EDINBURGH.

SIMMANCE-ABADY PATENT GAS CALORIMETER.

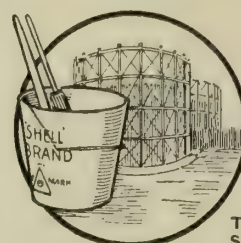
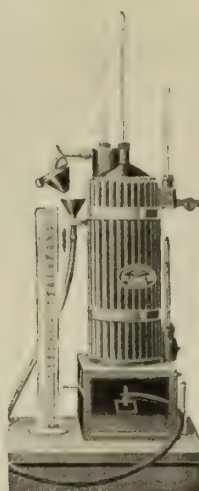
HUNDREDS IN USE.

MODERATE IN PRICE.

As verified by the National Physical
Laboratory.

SOLE MAKERS:

**ALEXANDER WRIGHT & CO.,
LTD.,
WESTMINSTER.**



IN PAINTING

THE GASHOLDERS AND OTHER OUT-
SIDE PLANT IT IS FALSE ECONOMY
TO USE A CHEAP PAINT WHICH LOSES
COLOUR AND DOES NOT PROTECT THE
IRON FROM CHEMICAL FUMES.

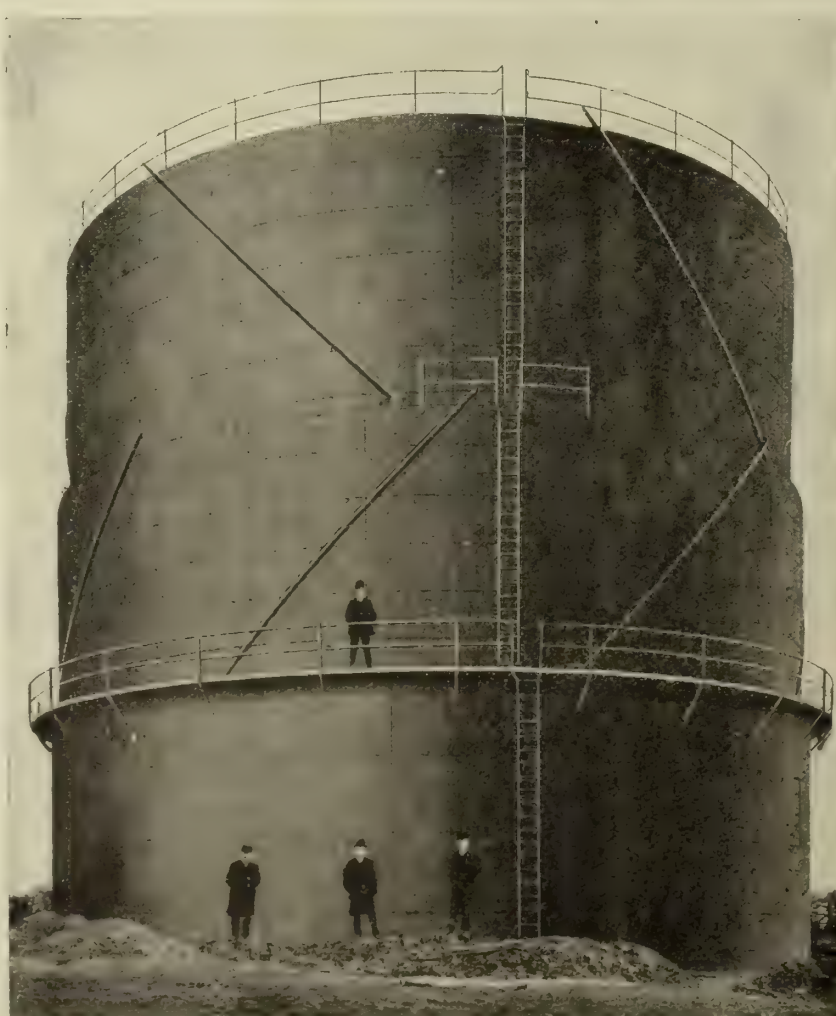
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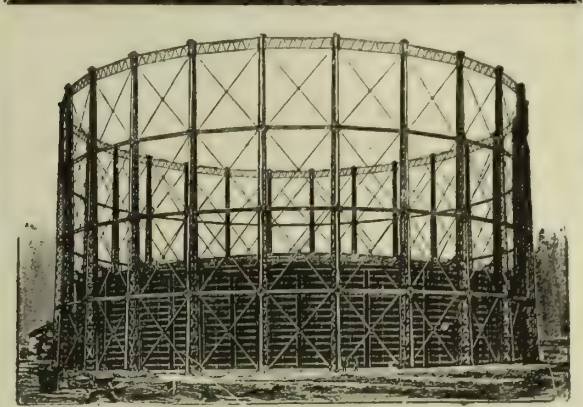
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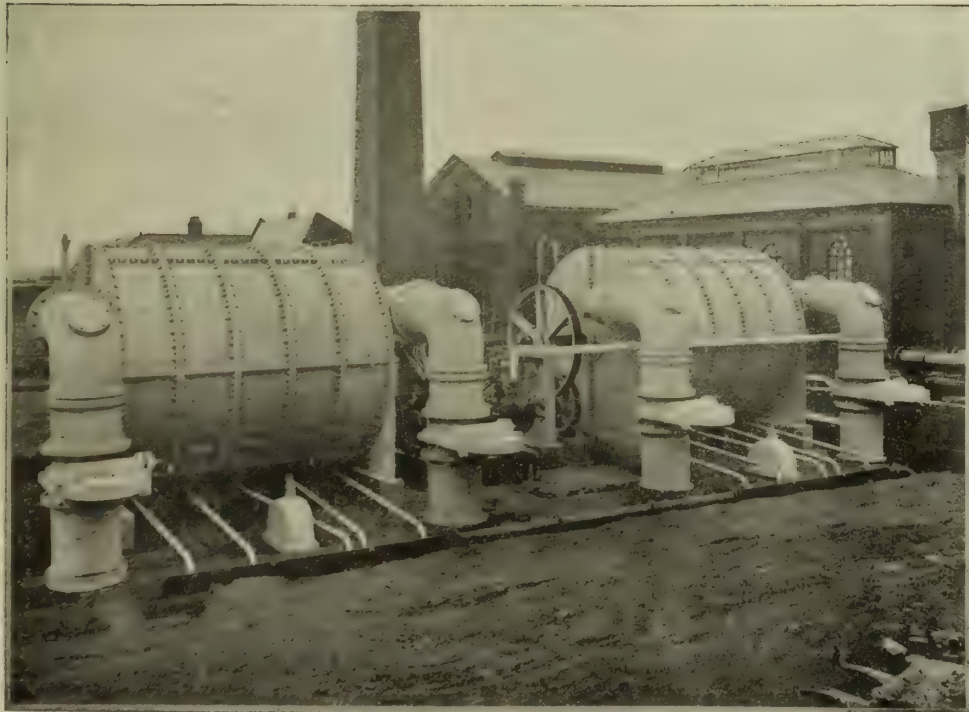
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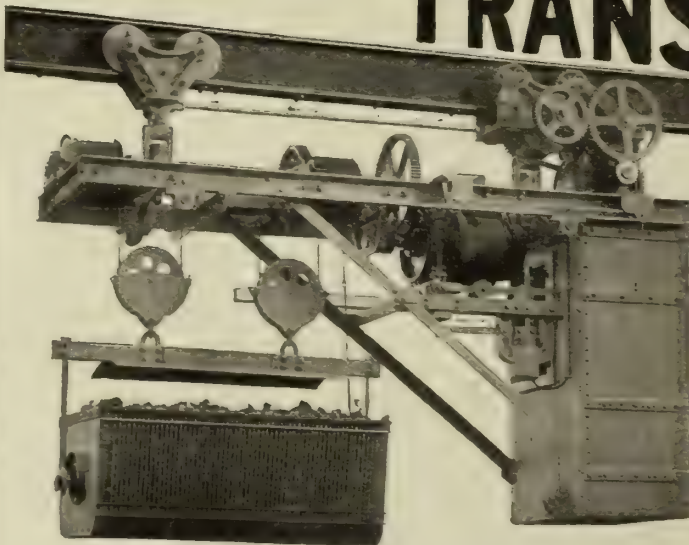
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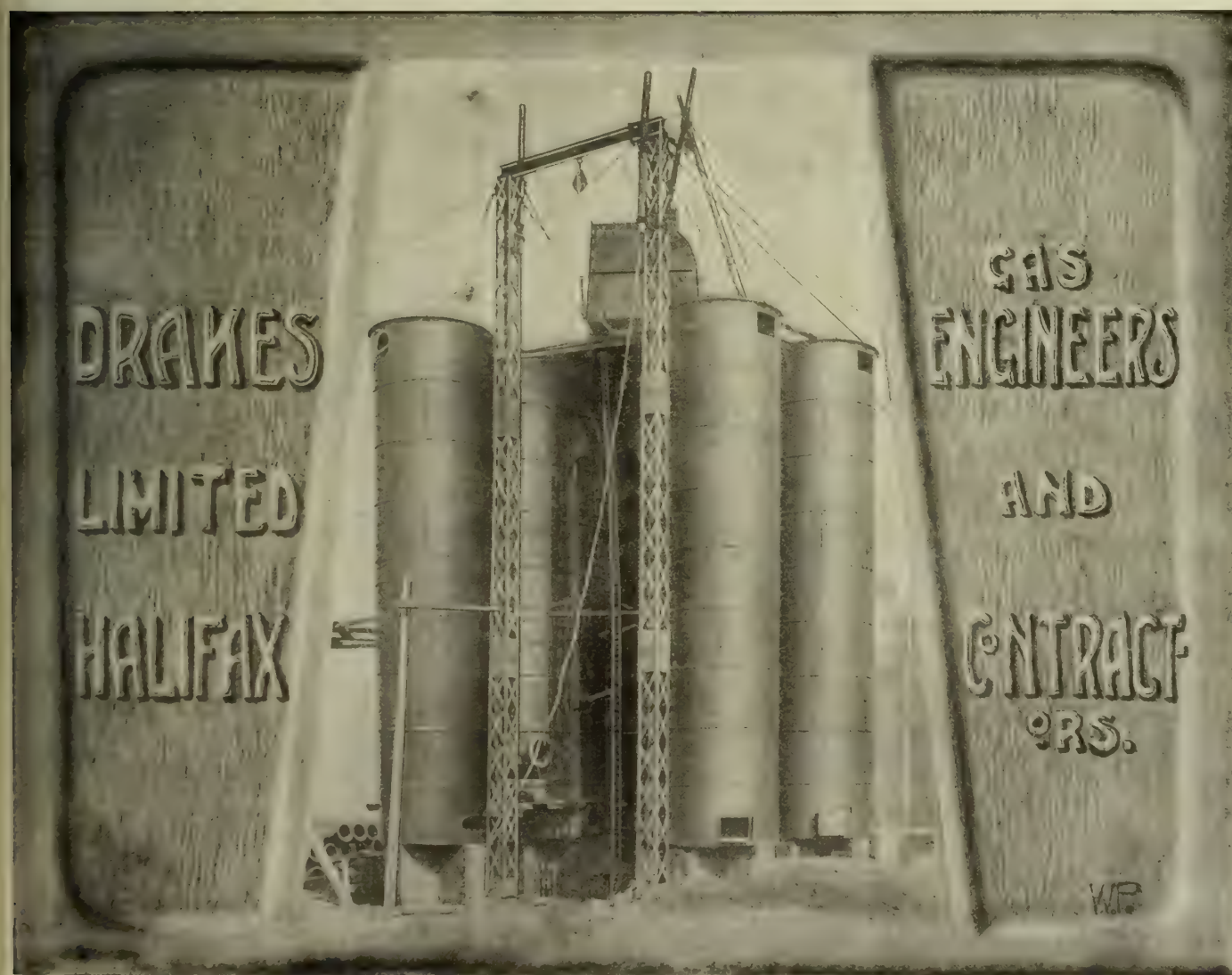
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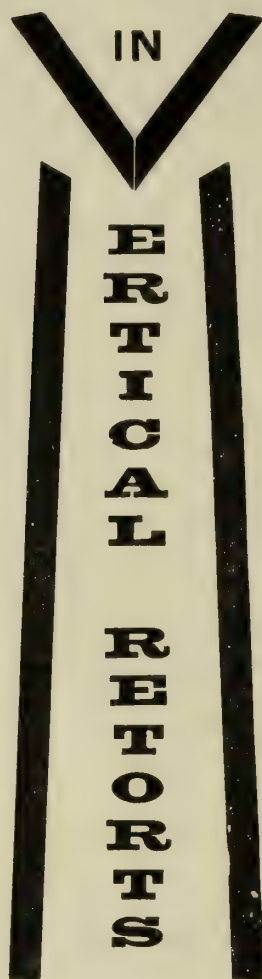
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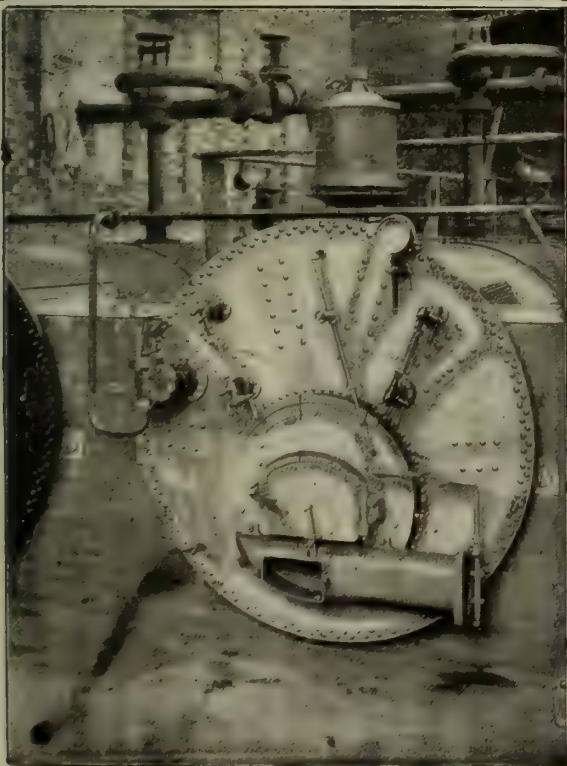
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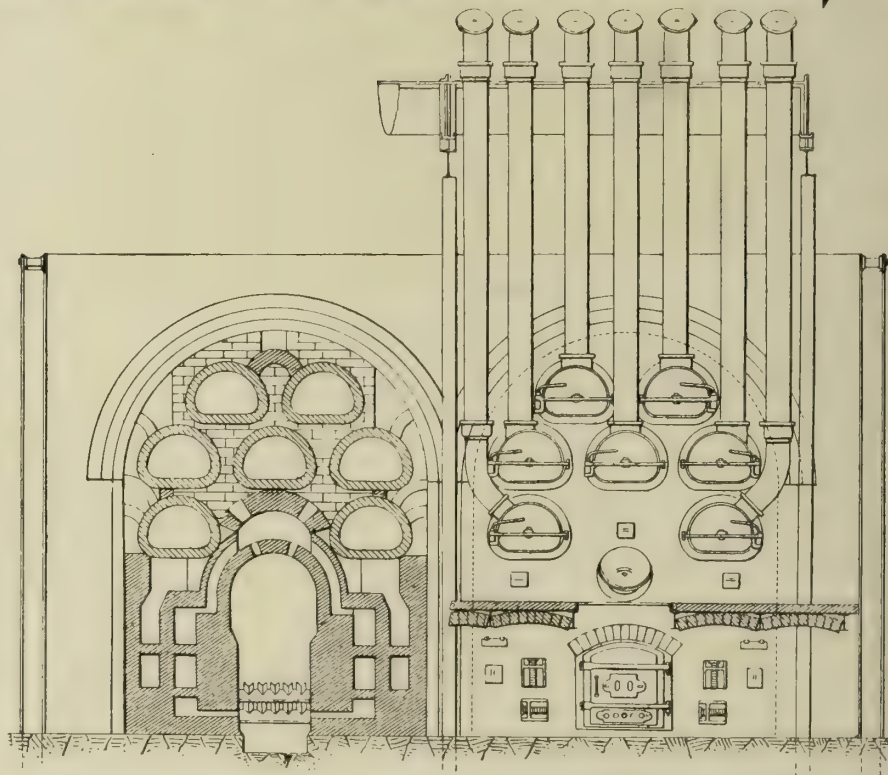
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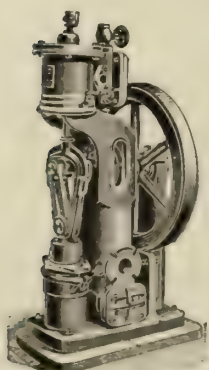


Fig. 709. "SINGLE RAM" STEAM-PUMP.

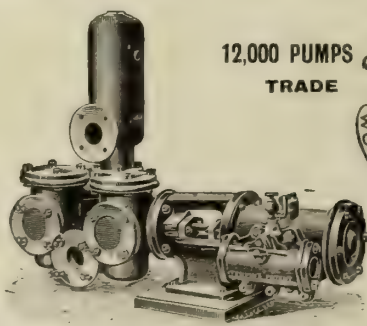


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

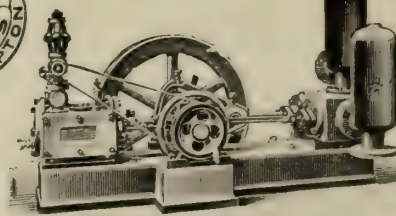


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

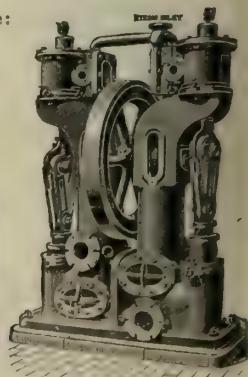


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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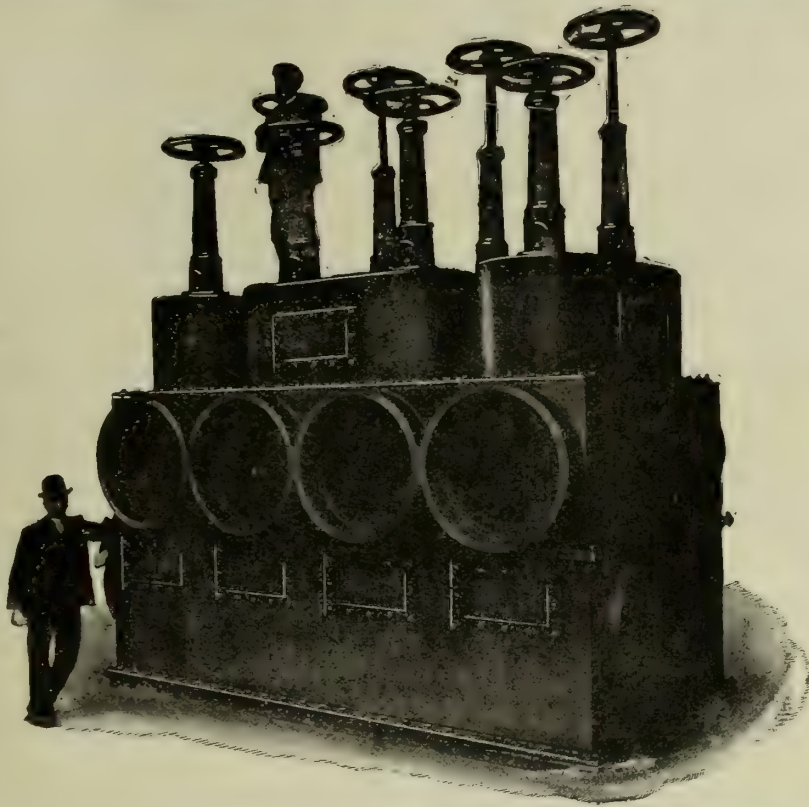
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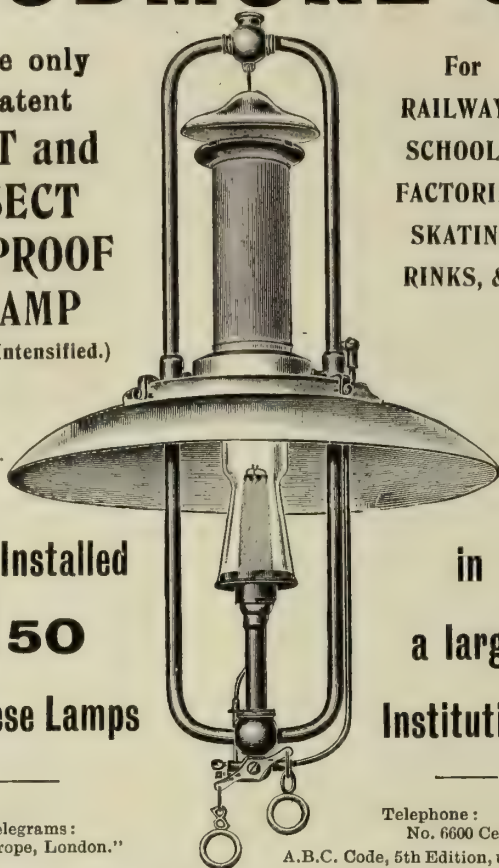
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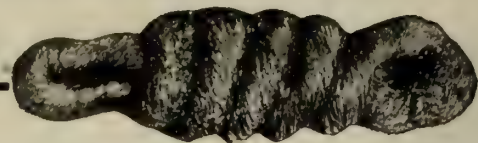
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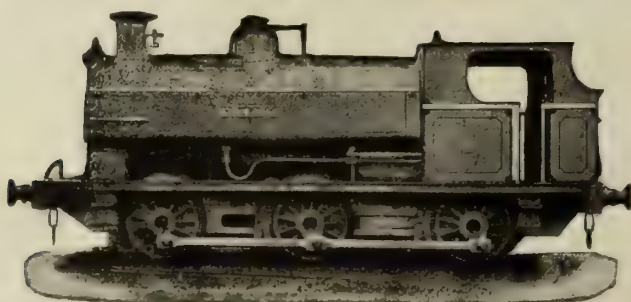
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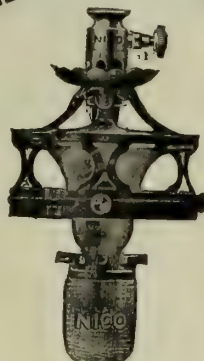
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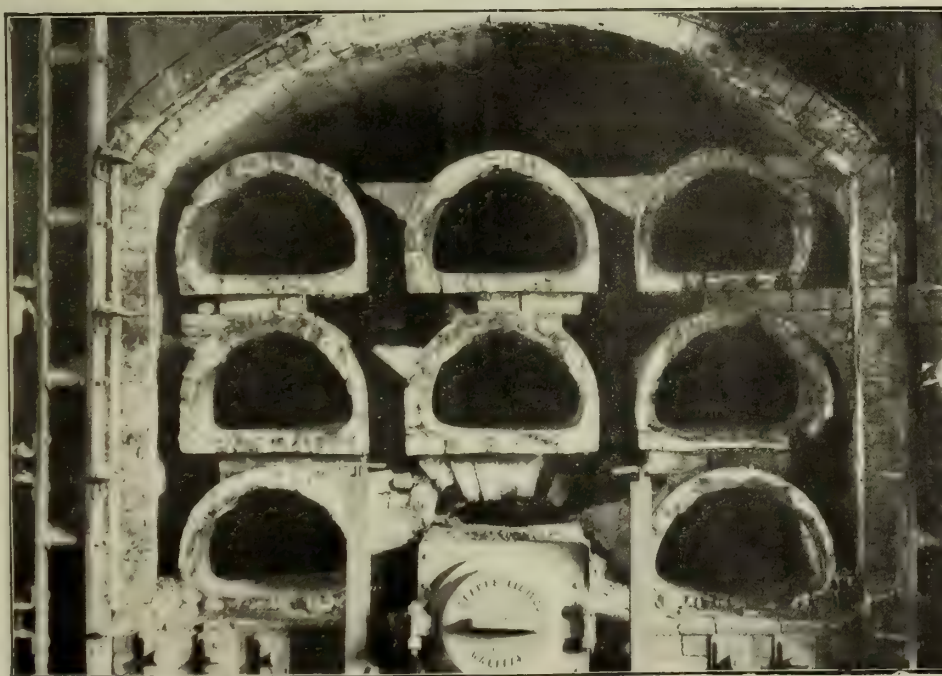
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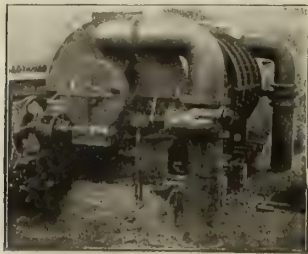
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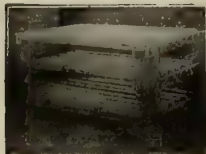


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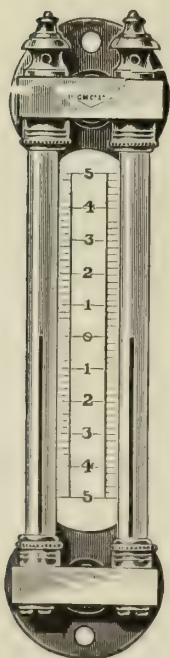
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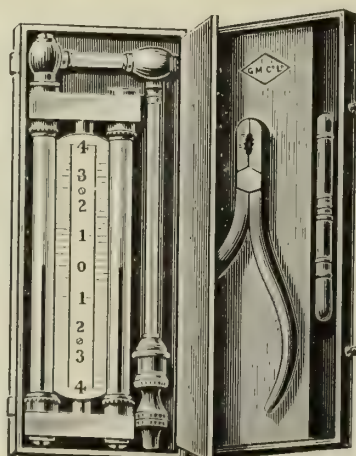
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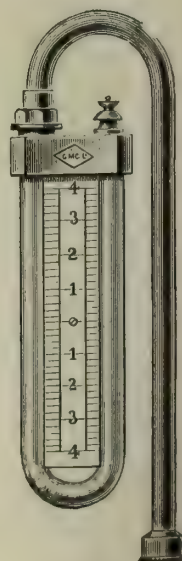
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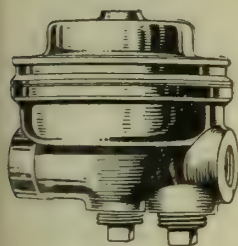
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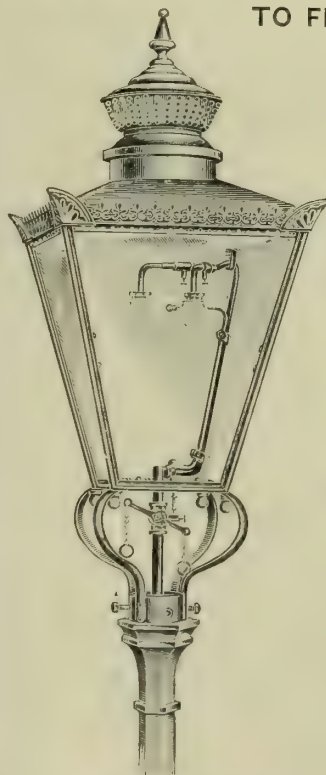
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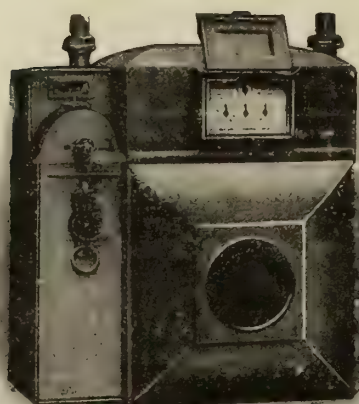
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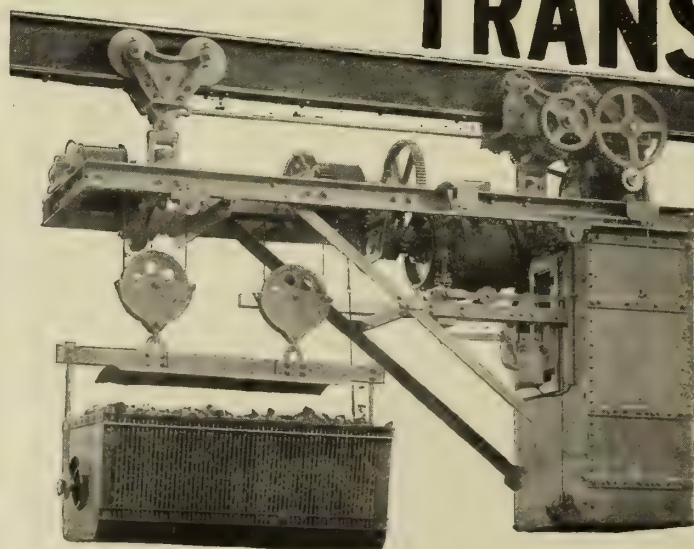
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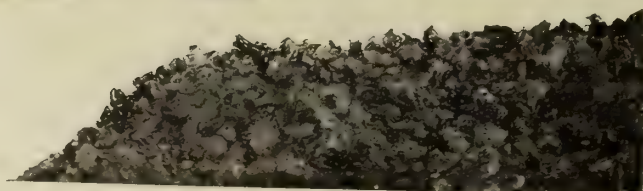
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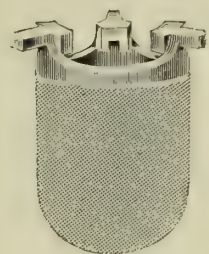
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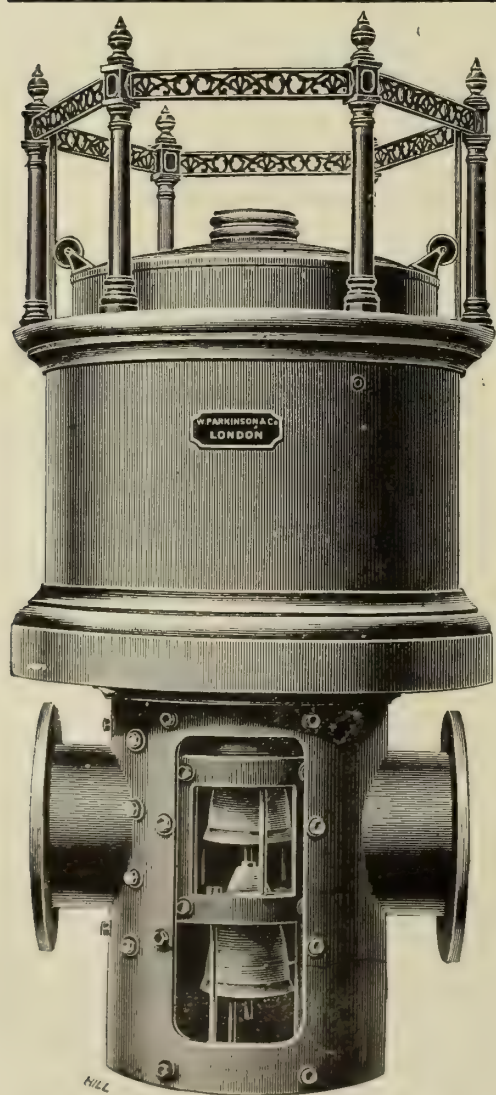
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VOL. CX., No. 2456.—TUESDAY, JUNE 7, 1910.

EDITORIAL NOTES—GAS, &c.

Report of the Institution Council.

THE report of the Council of the Institution of Gas Engineers (published in our last issue) has been before the general body of members for upwards of a week; and there has been ample opportunity for forming a judgment upon it. We think it will be agreed by them that the document accentuates the line taken in commenting last week upon the programme for the forthcoming meeting. For an Institution constituting the chief organization of the gas industry, the report does not delineate, apart from the proceedings at the annual meeting, any conspicuous amount of solid work for the industry. In the forefront, there is fittingly a sketch of the year's happenings in which the Institution are concerned. But there is not any item (save the one that on balance there is an increase in the membership of four, and the one regarding the honours for papers read at the last meeting) that really imparts news to the gas profession. Verily, if it were not for the information as to the work in hand through the aid of the Special Purposes Fund, the report would have possessed the characteristic of absolute baldness. It is a true certificate to the inadequacy of the machinery and operating power of the Institution to-day; and it shows as conclusively as anything can do, that a central organization representative only in its membership of the technical interests of the industry is insufficient and inefficient as a representative and effective body for a great industry such as that of gas supply, and that it is insufficient to the needs of the present times.

Take the work referred to as being in hand under the power conferred by the Special Purposes Fund; and it bears the marks of stunted ability and opportunity, willing and eager though the President and Council are to prosecute research and other matters thoroughly and vigorously. Really the only valuable fruit that is issuing at the present time from the available funds is that from the gas-heating research; and when we look for the reason for this, it is partly found by making comparison with the fruit of the work of the Carbonization Committee. In their work, the Gas-Heating Research Committee have the aid of qualified assistance; but the limitations imposed by the fund will not permit the Carbonization Committee the services of a competent man who could devote his time to assimilating information, and making investigations and inspections. The fault is not with the Committee; the fault lies in the scanty financial opportunity that is accorded by an unappreciative industry—an industry that largely, in its administrative sphere, lives for to-day, but takes precious little thought for the morrow. The Committee dealing with Refractory Materials are also working to a good end; but much of the valuable information they are bringing together would not be available to them or to the industry, if it were not that they had an opportunity of obtaining the services of a competent assistant who could visit gas-works and, on uniform lines, make tests of temperatures and ascertain conditions of furnace and setting material under the special circumstances of life and working. A Committee for such purposes as these, when that Committee is composed of men holding responsible official position, and therefore with limited freedom in the matter of time, is of little good, excepting as an advisory and supervisory body. They must to accomplish anything of practical value have sufficient means placed at their disposal to command the unfettered services of a qualified man, to whom a more substantial reward than a vote of thanks must be given. That is an essential to comprehensive and really useful research. In saying this, we are sorry that an at present uncontrollable crippling cause should make the technical research work of the Institution yield such comparatively meagre results, and render the prosecution of work in more fields an impossibility. There

is no reflection here upon the Council of the Institution, nor on those to whom they delegate the work. They are to be pitied—not blamed. A great amount of time, thought, and vigour are expended upon the work of the Institution by the President, the Honorary Secretary, and the Council. There is perpetually real anxiety on their part to see the Institution bring to a close some effective and useful work in the larger affairs of the industry, and so to be in a position to come before the members with a record of accomplished good. But year by year the President and his colleagues have to feel—and that acutely—the deepest regrets; and yet have to put the best possible face on the lean product of a year's endeavour—endeavour that meets with the blank wall of impecuniosity at almost every turn.

On this occasion, the Carbonizing Committee would have had nothing worth presenting, if one of their number—Mr. Bell, of Derby—had not come forward with the results of work supplementary to the paper that he read last year. This appendix could also just as well have been presented as a paper on this occasion; but then the Committee would have had to come before the members with nothing but a blank announcement. Two years ago they kept an active side in view by the aid of Mr. A. E. Broadberry and Dr. Colman's investigation in Germany into the Dessau retort system; and last year they were saved from utter destitution by the eleventh-hour aid of Dr. Lessing. This is not the fault of the Committee; it is that of the machinery and the means for adequate operation. We know of the disappointment of the Committee in the matter of the making of parallel tests of the working of the three prominent systems of vertical retorts. It is not astonishing, however, that under present competitive circumstances, and individual claims, that the owners of the systems prefer not to have the future of their plants jeopardized by the results of any short trial, which might be adversely influenced by some temporary imperfection in one direction or another. However, there has been much published during the year on the subject of carbonization, of which a digest, with a record of relative results, would have been valuable. But who would have undertaken such work—work that would have required an immense expenditure of time and energy? Could the Committee have commanded proper assistance, the work could have been done. But the services of a qualified man is not to be obtained at the price of a gas-works yard labourer; and had the Committee engaged the services of such a man as they really require, it would have made the balance of the Special Purposes Fund in hand at the end of December last dangerously small. As it was, it was then only £483, compared with £550 at the end of 1908, and £808 at the close of 1907; while subscriptions from gas companies and gas corporations do not show any signs of a widening of enthusiasm and liberality. In 1907, the subscriptions only amounted to £446; in 1908, to £390; and in 1909, to £404—a few shillings per statutory undertaking in the kingdom! The expenditure in all three years, with restricted work, exceeded the income—in 1907, by £65; in 1908, by £258; and in 1909, by £67. How under such circumstances dare the Council increase their present liabilities? They do not know from one day to another what imperative claim will be made upon them to take up some matter that cannot be delayed; and therefore, with the uncertainty of subscriptions before them, it would not do to completely denude the fund year by year. The report does contain some serviceable information on the subject of income-tax and depreciation. But the report on the "Unification of Gas Threads" is word for word that made at the last annual meeting, and included in the "Transactions" for 1909; and its only right to republication is that the conference of the Commission with which it deals did not occur in time to be included in the report the Council presented at the last meeting.

We have dealt with the Council's report in this way as it is really the only point of view from which any useful

comment can be made; and the use we hope it will have is in the direction of helping to send the members to the annual meeting next week with (as suggested in our last issue) the feeling that something has to be done, and done thoroughly, to remedy the insufficiency and inefficiency of the Institution as representative of the industry, and not merely (and that badly through lack of funds) of a technical profession. The Institution must be made the vehicle for greater, and more widespread, good than work that is but little higher placed—if that—than the work of our best District Associations. The remedy for the existing conditions may be—we do not say will be—found in the broadening of the base of the Institution. The channels through which funds must come will always be obstructed while those who hold the industry's purse strings are not brought into more intimate association with the work, the objects, and the aspirations of those who have the best interests of the central organization at heart, nor until there has been inculcated among them a better appreciation of the present-day needs of the industry.

Local Lecture Schemes and the Leeds University.

FROM the report, and the result of the discussion thereon, of the Manchester District Institution of Gas Engineers on the lecture scheme of the Manchester Junior Gas Association in collaboration with the Manchester University (*ante*, p. 558), it will have been seen that the project is now in a fair way to be consummated; and while heartily congratulating all concerned, we may wish the movement the utmost success. The decision arrived at, however, gives us the opportunity for making a few observations, which appear, from information direct and otherwise, to be desirable at the present time; and it is hoped there will not be occasion to revert to the matter. In the report of the Manchester Institution, it is stated that "there is no question of rivalry 'with Leeds in the matter.'" We are glad these words were included—and included deliberately—in the report. It has, we know, been felt by a few, who obviously do not adequately appreciate the matter, that, in connection with the Livesey Memorial Fund, the Leeds University has been unduly favoured. But, in considering this matter, it must not be forgotten that the Leeds University itself took the primary step in making the proposition in regard to specially devoting to research work and University education a department of Gas Engineering and Fuel—lectures appertaining to the science and art of gas manufacture and distribution being merely appendant to the main work of the department, the conveniences of which impart to the lectures especial appropriateness and usefulness. Therefore the University of Leeds had first claim to consideration. There are, however, those who have thought the financial favour conferred by the Livesey Memorial Fund might have been distributed among Universities devoting themselves to technical education and scientific work and pursuits that tend to industrial progress and economy. The practical and intrinsic value of the fund would have been absolutely spoilt if the proceeds of its investment had been thus split. So that, while there may be envious eyes directed to what has been done in connection with the Leeds University, there are very good reasons why the financial proceeds of the capital sum representing the fund should have gone to one University. No substantial knowledge-elevating benefit would, by taking any other course, have accrued to the industry such as may now be looked for.

There is another consideration. Certainly the largest subscribers to the fund—the Gas Companies, who contributed £7102, as compared with £540 by Corporation Gas Committees—had a right to a considerable voice in the matter of the selection of a University. Notwithstanding this, if we regarded the relative accessibility to the Leeds University of the Gas Companies and Local Authority undertakings, the former stand in a very poor position. The counties that have best access to Leeds are almost monopolized in gas supply by local authority concerns; and therefore the assistants engaged at these municipal gas-works have the most favourable opportunity for taking advantage of the educational facilities offered by Leeds. These undertakings contributed scantily to the fund. On the other hand, the Companies who contributed the largest aggregate amount of any section of the country are situated in the South of England; and their technical assistants and pupils are absolutely debarred, by distance and time, from having any direct personal share in the educational facilities

offered by the Leeds University. But the Leeds University department aims at something higher than series of lectures. Its aims are research work for the benefit of the whole industry, and a specialized University education for all—preferably prior to, or succeeding (if personal notion so favours), works practical training—aspiring to technical positions in the industry who can afford the necessary time and expense. The series of lectures, we repeat, are merely additional, and arranged for those who can avail themselves of them, but are not in a position to take advantage of the special University course. Consideration must be given to what has been done from the broadest point of view, in which stands out prominently the greatest good for the industry as a whole.

These facts, suggestions, and reasonings (whatever one chooses to call them) are pointed to for the one purpose of putting an end, once for all, to any territorial envy. The best possible has been done; and the Leeds University and the gas industry are now bound together by common interests. Even so, it is open for all interested in the gas industry in any part of the country to take steps to provide their own local lectures for gas-works' assistants in precisely the same way that the Leeds University has done; and all schemes carried into effect in this way for the advantage of the future of the gas industry will have cordial approval and the best of wishes for success, just as the Manchester lecture scheme has met with the approval and best wishes for success from the Council of the Institution of Gas Engineers, and all who look upon such educational projects in the proper light. The report that was submitted at the meeting of the Manchester Institution of Gas Engineers shows that there is no intention to run counter to the Leeds University. It is entirely a question of meeting locally a condition that it is impossible for Leeds to legislate for, just as the Welsh Association are considering what can be done in the same way for the juniors in their area, and just as probably other District Associations will be looking around, with the lead before them, to ascertain if they are in a position to make similar provision in their own particular territory.

There is one point in the report of the Manchester Institution on the subject that is worthy of further consideration, and that is as to whether the winter months, when gas undertakings are at the height of their work, are the best time, in the matter of general convenience, for lectures of the kind, or whether it would not be better to have them in the autumn and the latter part of spring—that is, during the weeks that separate (before and after) winter from summer. That is a matter that has a bearing on the question of numerical success, and so should be considered. The passing of the report, we take it, ensures the consummation of the lecture scheme for the Manchester district; and thereby will be realized the desires of the Manchester Junior Association.

Our Industrial Development.

RELiance can always be placed on Herr E. Körting for interest when he discourses on matters relating to the gas industry. From his high official position as the Chief Engineer and General Manager in Berlin of the Imperial Continental Gas Association, he makes, as duty claims, critical examination and analysis of all affairs that bear in any way upon the question of the fortunes of the gas industry; and he has the faculty of applying to the work not only his own experience but the experiences of others. An examination of technical and commercial gas matters on these lines is an unfailing source of interest; and it supplies the material for forming judgments for which sound reasoning can be adduced. Herr Körting, as will be seen from an article elsewhere in this issue, has been considering some of the phases of the development of the gas industry; and the verdict of the data and facts that he presents is highly satisfactory.

No matter which way he glances, Herr Körting finds gas in the ascendant. That is good. Nevertheless its protection must be effected not only by its own good qualities, but by the activity of those engaged in its commercial branches. The proof of statistics is that gas is more general and more popular than electricity. It is true that in Greater Berlin there are 618,000 gas meters and only 49,000 electric-meters; it is equally true that in more than one borough in London in which there is municipal ownership of the electricity supply, the cry has gone up as to the difficulty of obtaining for electric lighting anything more than a comparatively small proportion of the householders. But with all the progress

and prosperity of gas supply, the 49,000 electric meters in Greater Berlin and the electricity consumers in London boroughs, represent ground actually lost to the gas industry. The disproportion of electric connections to those of gas is a stimulus to the electricians to make every possible endeavour to lessen the difference. To retain the business we have, therefore necessitates an active commercial propaganda, as much as does the extension of business. Loss of business, unless it be compensated from another quarter, is opposed to economic interests; while to extend business is to the advantage of the latter. Our friends in Germany recognize this; and they have their gas promotion centre. In this they are ahead of the gas industry of this country, as they are generally in co-operative work for the advancement of the industry. Agreed that here we have a larger consumption of gas per head of the population than can be boasted of by Germany. But at that we must not rest satisfied. The larger this particular property, the more valuable is it, and the greater reason is there that it should be adequately safeguarded.

Looking with Herr Körting in other directions, there is also great satisfaction with the economic progress that has been made in works operations, which has strengthened the backbone of the industry, and has been of considerable advantage to consumers and in the competition. The highest success in this direction serves as the limiting-point in price at which the gas industry can afford to accept outside aid, such as coke-oven gas. Perhaps the "highest success" is hardly that, as corresponding to the use made of supplies from an auxiliary source will the cost be higher on the production that the gas undertaking must itself provide; and, moreover, there are also the capital charges on the producing plant that must stand by for security. Judged by the sale of coke-oven gas at 10½d. per 1000 cubic feet to the gas distributors at Essen and at 1s. 0½d. to the gas distributors at Mulheim, Herr Körting does not, in the light of modern gas-works achievement, think much of these transactions as economic propositions; but he looks more kindly upon the 7d. per 1000 cubic feet of the Little Hulton scheme, in the present session of our home Parliament. However great the use made of coke-oven gas by a statutory concern, it must always, in face of its obligations, insure against any stoppage of supply by the provision of plant to meet any emergency producing failure in connection with the coke-oven gas, and that is economically a distinct disadvantage. Insurance of the kind has been provided for in the Little Hulton scheme. The price-limiting point, therefore, at which aid can be accepted from external gas sources is really constituted of more than the single consideration of producing cost. And in regard to manufacturing costs per unit of output, the industry has made splendid headway, though it is to be regretted that the external uncontrollable expenses of gas supply—such as material costs and rates and taxes—place considerable resistances in the path to the largest direct benefit being conferred by the economic development upon which we have Herr Körting writing so brightly.

Important!—The Standard Burner Bills.

We earnestly ask the serious attention of the chief officials of all gas companies to a matter that requires to be immediately dealt with. The Standard Burner Bills are down for second reading on the House of Commons reassembling this week; and for reasons that will be stated presently, we would urge all chief officials of gas companies (whether or not participating in the promotion) with Members of Parliament as shareholders in their concerns to at once communicate with them, requesting that they support the second reading of the Bills in order that they may go before a Committee, and the promoters be heard in the ordinary way. If our information is correct, the opposition are, through the instigators of the joint opposition, taking steps to destroy the Bills on a side-issue. It will be remembered that it was submitted by the opponents in the Lords that a joint promotion such as this was contrary to custom and to precedent and an abuse of the privileges of Parliament. But there were the Sulphur Compounds Bills as precedents; and the authorities of the Houses and the Lords Committee saw no objection to the joint promotions for a common purpose. We understand now that, having failed in the Lords to discredit the promoters and their object, communications to local authorities have been scattered far and wide, urging active opposition to the principle of joint promotion as being injurious to the interests of local authorities, in that, if

the present Bills succeed, they will pave the way to all sorts of combinations for parliamentary powers against the interests of local government. It is monstrous that this attempt should now be made to destroy a Bill, not on its merits, but by a side-issue of this sort. It discloses the feeling of the opposing local authorities regarding the prospects of the Bill, if they cannot destroy it before the merits of the promoters' and the opposing cases come up for the judgment of a House of Commons Committee. The promoters of the Bill have combined for a single and simple purpose; and the opposing local authorities themselves showed their appreciation of combination by themselves compacting for hostility in the Lords, and by preparing to do so in the Commons. In the Lords, they had every opportunity for dealing not only with the general question, but with matters special to individual cases, just as they will have opportunity again for so doing in the Commons. The local authorities fearing the result of contesting the Bills fairly, are prepared to descend to other means for disposing of them. Therefore we ask that, *without delay*, members of Parliament who are gas shareholders be asked by the Companies in which they are interested to vote for the second reading, and to exercise their influence to prevent the measures being burked in the discreditable manner contemplated.

A Fresh Coalite Offer.

Several gas engineers and managers have no doubt been astonished to receive from the address of the Coalite Company a circular-letter (signed by Mr. F. H. Smith) making an offer to supply a 50-ton carbonizing plant, and giving to gas companies and committees accepting the offer the gas produced free of cost, on certain terms. If there is one thing the technical men of a serious commercial industry like the gas industry cannot stand it is the introduction into it of the trading methods and sops of the quack; and the first thing that will make technical advisers of gas undertakings look carefully beneath the surface of the superficially pleasing offer is the headline of the circular-letter: "Free Supply of Rich Gas (700-725 B.Th.U., 18 22 candle power." The line intended to attract and to impress the munificence of the offer is the very one to arouse suspicion. The Coalite people, through Mr. Smith, think that gas companies and committees will jump at the offer. We think they will not, and that they would rather be free from the trouble of the working and maintenance of the coalite plant, the sale of the coalite, and the loading of the other residual products on rail. Nevertheless the proposal is interesting. The 50-ton battery that is offered free of cost has a value attached to it of £6000, which is equal to £120 per ton of coal carbonized. But what does the ton of coal represent to the gas maker? One of the up-to-date systems of continuous carbonizing in vertical retorts costs about £125 per ton of carbonizing capacity, which ton yields something like 12,500 cubic feet of gas, as compared with 4000 cubic feet with the 50-ton (approximately 200,000 cubic feet) battery. Now, what are the gas suppliers to do in consideration for the supply of the free battery and free gas?

The Conditions.

Land for the battery is to be supplied free; and the gas suppliers are to undertake the maintenance of the battery free. Knowledge as to the reconstruction and other work at Plymouth and Hythe will not be a great encouragement to take on the maintenance of the plant. This is not in the conditions; but it is obvious that the company or committee (as the case may be) will have to keep gas-producing plant of their own as a stand-by—representing during the idle time unproductive capital—to meet any stoppage of the battery. Then in the proposed agreement, the gas suppliers bind themselves, under the words "will dispose of," to sell the coalite produced. But there has apparently been a little subsequent reconsideration of this, as in a special explanatory letter received by us from Mr. Smith he gives an alternative proposal, whereby the Coalite Company will themselves arrange for the sale of the smokeless fuel; and then the gas suppliers will have to pay for the labour on the battery. Under the condition of the gas suppliers selling the coalite, they may, according to the original circular, deduct from the revenue from the coalite the cost of labour on the battery and of the fuel used ("labour" and "coal used" are the words in the proposed agreement, though coal is not generally employed for fuel in carbonizing). Does the labour on the battery include that required for handling the

quantity of coal in excess of that needed to produce the same quantity of gas by the ordinary process? The gas suppliers are also to undertake to put the tar and liquor into the Coalite Company's waggons for despatch to their distilleries. In Mr. Smith's letter to us, he speaks of "tar and sulphate." Are the gas suppliers to make the sulphate at their own expense; or is this a mistake? The general conclusion will be that, on the whole, there is not much in the offer; and most managers will prefer the unfettered liberty obtained by keeping to their present course of procedure, and not being tied in any manner to the Coalite Company. Anyway, reading original letter, circular, and Mr. Smith's special letter, there are matters that will require further explanation before the offer of a "free" supply of rich gas is entertained. The Plymouth Gas Company do not appear to be so enamoured of the coalite plant that they are having extensions made to it; and the Hythe plant, it is understood, is to be, or has been, shut down for the summer months, so as to avoid nuisance to the visitors.

Inverted Burner Victories in London.

The Gaslight and Coke Company have been accused by their electrical friends of, in the matter of their public lighting policy, going headlong to financial destruction. Unabashed and undaunted—heedless of the not disinterested monitions—the Company continue to deliberately pursue the course they have marked out for themselves; and with the increased efficiencies permitted by the inverted gas-burner, yet with lower costs, they have booked two new contracts with Metropolitan Borough Councils for the next five years, and during that period there can be no more conversions to electric lighting in Bethnal Green and Hackney. The Borough Councils have felt, after careful investigation by Committees, that they could not afford to ignore the Company's tender. In both cases, all the upright incandescent burners are to be converted to those of the inverted type. The details of the contracts are set out in our news columns; but the total effect in the case of Bethnal Green is that the aggregate illuminating power will be increased from 85,000 candles to 125,000 candles, while the annual cost will come down from £3631 to £3315. Added to the Westminster victory, these additional ones will stimulate among other local authorities an interest in the inverted gas-burner for street-lighting purposes. Meanwhile, it is noticed that progress continues to be made in the area of the South Metropolitan Gas Company in the conversion from uprights to inverteds.

Want of Harmony at Salford.

The Gas Committee of the Salford Corporation appear to be out of harmony with the Council at the present time; but there must be a little sympathy with the Committee in the difficulties of their position. Money is sought from the gas undertaking in aid of the rates; but the Council are opposed to the methods proposed by the Committee for producing what is required. In a measure, an expression of respect for the Council cannot be repressed, as any sympathy there is on our part with the Gas Committee ends at the desire to pander to those who wish for gas profits in aid of the rates. If the proposals of the Committee had for their end and aim the benefit of the gas undertaking and the consumers, there would be hearty concurrence in them. But reading the report of the discussion that took place at the meeting of the Council last Wednesday, there is no doubt that certain of the conditions of the gas undertaking require revision. We cannot, for instance, understand why the Gas Committee's hands should be so tied that they cannot enter into negotiations over their coal contracts; and in this way lose (as in this instance, according to Alderman Phillips, the Chairman of the Committee, they have done) something like £7200. We have heard of the machinations of coalowners in regard to price understandings; and such restriction as the Gas Committee suffer from is a great help in the maintenance of such agreements. Acceptance of the lowest tender would be right enough if there were not understandings of the kind, and if one could be sure that the lowest tender really represented rock-bottom price, which it appears was not the case in this instance. Why, too, a corporation gas undertaking should not be at liberty to negotiate the same as a gas company is not clear. Some modification of condition is certainly needed here. In another respect modification is required, and that could be effected by ratifying the proposal of the Committee that meter-rents should be imposed. We say this on the ground alone that times have changed; and, with the change, a number

of gas-meters are now used merely as stand-byes to electricity. There is not the least reason why the capital represented by such meters and service-pipes should remain even intermittently unproductive. It is much more equitable to have meter-rents, and with the proceeds make a *pro rata* reduction in the charge for gas. Following this, the Committee were proposing to raise the price of gas to the prepayment consumer, by reducing the quantity given for 1d. from 35 to 27 cubic feet; but to the large manufacturing customer it was proposed to lower prices according to quantity. Both propositions were rejected. We do not think the proposal as to the prepayment consumers would have been a popular move. All round, however, the Gas Committee, at the meeting on Wednesday, seem to have been out of sympathy with the prevailing view in the Council. And yet the Committee are looking about them to see where they can get more money for aiding the rates. That is where we are out of sympathy with the Committee.

Recognition of Ability at Nottingham.

The Nottingham Gas Committee, in a report which has just been prepared, embodying some striking particulars as to the successful management of the undertaking, have paid Mr. J. H. Brown, the Engineer and General Manager, the well-merited tribute of recommending that his emolument should be increased by £200 annually, bringing the total salary to £1200. While the matter naturally possesses especial local interest, it is not without general significance as indicating the extent to which difficulties inseparable from professional work may be overcome. At one time there was much unnecessary bitterness, the outcome of partisan feeling, underlying the criticism of affairs relating to the administration of Nottingham's principal corporate trading concern. But happily to-day a very different feeling prevails; and the proposal of the Gas Committee, which meets with general acceptance, comes as a fitting corollary to Mr. Brown's eminently successful work, which, as evidenced by the report which appears elsewhere, in a period of diminished consumption, has, through greater economy in methods of working, enabled even larger profits than in any previous year to be devoted to the relief of the rates—the contribution on this occasion amounting to no less than £35,000. Only one condition is attached to the projected increase, which is that Mr. Brown shall enter into an agreement to remain at Nottingham for at least three years—a condition which must cause searchings of heart among some formerly in the Council who were in a violent hurry to dispense with his services because he had the courage to decline to submit to dragooning methods.

Municipal Gas-Works Results.

Among the further instalment of municipal gas-works results which will be found among the miscellaneous news in the present issue, it will be noticed that a small increase is reported at Lancaster, where another point is the low figure at which the unaccounted-for gas stands—viz., 2.69 per cent. The disposal of the profits includes a contribution of £3000 in aid of the rates. The net balance, after providing for interest and sinking fund, is £4613; and to this, it is pointed out, should be added £1654, the value of the gas supplied for public lamps free of charge. In reference to the illuminating power of the gas—which under the Lancaster Act is fixed at 14 candles, though a higher figure is actually maintained—remarks made in the Town Council seem to foreshadow that at some future time the Gas Committee may take steps to secure a reduction. The borough fund has benefited to the extent of £500 at Mossley; and at the same time the consumers have enjoyed a substantial concession, through the price of gas having been reduced 3d. per 1000 cubic feet in March of last year. The decrease in the receipts caused by this reduction, and by the offering of better terms to large consumers, have, it is gratifying to learn, been to some extent compensated for by the larger quantity of gas sold. The make per ton was 11,691 cubic feet, against 10,666 feet in the previous year. The Nottingham Gas Committee in their annual report recommend that the sum of £35,000 should be handed over to the Finance Committee in aid of the general district rate, which leaves a balance of £19,000 to be divided among the depreciation, reserve, and renewals accounts. And here, again, it is the desire of the Committee that their customers also should share in benefiting from the excellent position of the undertaking; and they propose to make a reduction in the price charged for gas supplied

to the ordinary consumers. The sale of gas has been well maintained; while the carbonizing results once more show record figures. The make of coal gas per ton—11,196 cubic feet—is 73 cubic feet more than the preceding year, which was the previous highest amount; while the gas sold per ton of coal, at 10,692 cubic feet, is, Mr. J. H. Brown, the Engineer, states "by far the highest in the history of the undertaking, and 1546 cubic feet more than the quantity of gas sold per ton of coal carbonized for the year 1902." The increase in make, and a decrease in the percentage of gas unaccounted for, are, the Committee say, mainly responsible for the increased profit, which is the largest on record. The proportion of prepayment meters compared to ordinary consumers rose to 46 per cent. last year, against 43.73 per cent. in the preceding year, and 27.56 per cent. in 1902. At Oldbury, £600 has been transferred to the general district rate.

Educating the Gas-Fitter.

The Committee of the Manchester District Institution of Gas Engineers make useful propositions in the report on this subject as published in the "JOURNAL" last week; and when Manchester and Salford are under promise, as a result of the Committee's efforts, to make a start in this direction, there is the first-fruit to the good of an active move in the matter. The knowledge necessary for the prosecution of the gas-fitter's craft had not but a few years ago shot out into many of the places that are vital and important to the gas industry to-day; and the gas-fitter must be well-grounded in all modern requirements if he is to serve his clients or his masters properly and well, and be worthy of his pay. The Committee think that the plain deficiencies of the gas-fitter who has not been specially trained to meet modern requirement, and who still works according to the custom of generations, can be filled by educational co-operation between technical schools, the Plumbers' Association, and the various Gas Associations, and by proficiency certificates, which would be the fitter's passport to good work and to the favour of gas undertakings. In their own interests, the time has come when gas undertakings ought not to employ any but the most reliable fitters—fitters who will not do such silly things as running a gas-pipe over an electric wire, leave untested new joints, and leave pipe-ends uncapped when they connect-up a meter, and who can show a consumer how to get the best efficiency from his appliances. If gas managements would resolve outside their own selected staff not to patronize any gas-fitters or give employment to new hands who could not show a proficiency certificate, there would soon be a weeding-out of the incompetents to the benefit of gas undertakings and consumers alike. In their own interests, there would—if gas undertakings advised consumers against employing any but fitters who were recommended as having passed a test of practical skill and knowledge, and would themselves employ only such men—be quite an anxiety on the part of gas-fitters to obtain the testimony in black and white to their possession of the requisite knowledge and ability for the claims of modern fitting work and efficiency.

Resignation of Mr. W. R. Herring.

It will not come as a surprise to the intimates of Mr. W. R. Herring, M.Inst.C.E., though it will do so to others who had not knowledge of his feelings and plans, that he has officially intimated his intention to resign his appointment as Chief Engineer and General Manager to the Edinburgh and Leith Gas Commissioners; and we know that it will be with great regret in the Commission and the Corporations, as well as generally in the city and district of supply, that the intelligence will be received of the imminent severance. It is probable, however, he will be prevailed upon to continue his connection with the works of which he is the technical founder as supervising consultant, without adding to the present staff. Before the matter became public, there was, we believe, a private attempt to induce Mr. Herring to reconsider his decision; but his mind was irrevocably set on prosecuting his long-considered plans for the future. Mr. Herring's technical and commercial ambitions were always of the constructive order; and, from the technical standpoint, he has come to the conclusion that Edinburgh holds out no more useful constructive work for him for some long while to come. The time is therefore opportune for a change; and he has resolved to develop his work as a consulting engineer, making his offices and headquarters at Palace Chambers, Westminster. On Mr. Herring's work at Edinburgh, success is written large. The history of the work is well known; and Edinburgh, Leith, and the surrounding district have benefited from it. Many will be his well-wishers; and their hope will be that an equal, if not a larger, measure of success will follow this forward move in a professional career that has been (to say the least of it) brilliant.

GAS STOCK AND SHARE MARKET.

THE Stock Exchange has not had an agreeable week. Business was very quiet; and the counter-attractions of Epsom did not conduce to stimulate activity. But a seriously disquieting factor was the total upset of the American Railway Market, owing to the plain declaration of war against the lines delivered by the U.S.A. Government. The immediate result was a large fall in prices, and the inducement of a dull feeling in sympathetic quarters. The opening day was not promising, being heavy and inclined to droop. Nothing was very bad, but nothing was any better except Consols, which were very firm. On Tuesday, quietness prevailed; markets seeming quite unable to quicken up. Americans, too, began to show ominous symptoms. Their great fall came on Wednesday, and with it many markets were uneasy and uneven. But Railways at home were more cheerful. On Thursday, the leading departments were more courageous; but Americans, after a slight check, became worse. On Friday, the markets were thinly attended, and business generally was quiet. Where things moved at all, they moved irregularly. On Saturday, there was no strength at all in any department. Consols fell $\frac{1}{4}$; Railways felt the effect of realizations; the fashionable speculations were dull; and there was more weakness in Americans. In the Money Market, there was a good demand for short loans. Discount became easier until the Bank of England rate was lowered on Thursday to $3\frac{1}{2}$ per cent., after which rates steadied. Business in the Gas Market was on a fair average scale taken altogether, but it ran in few lines. Great activity still continued in Primitivas, which last week quite rivalled the premier Company in the number of transactions. There was hardly any change in quotations. In Gaslight and Coke issues, the ordinary was very firm; all transactions being within the close limits of 103 $\frac{1}{2}$ and 104. In the secured issues, the maximum was done at from 88 $\frac{3}{4}$ to 89 $\frac{3}{4}$, the preference at from 105 to 106, and the debenture at from 81 $\frac{3}{4}$ to 82 $\frac{1}{4}$. South Metropolitan was very quiet at from 121 to 122, with one deal at 120 free. The debenture realized from 80 to 81 $\frac{1}{2}$. One bargain in the 4 per cent. at 106 $\frac{1}{2}$ was all the business in Commercial. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 83 and 83 $\frac{1}{2}$, British at from 44 to 44 $\frac{1}{2}$, Brentford new at 190, Hastings 3 $\frac{1}{2}$ per cent. at 93 $\frac{1}{2}$, and South Suburban at 121. In the Continental companies, Imperial was firm at from 177 $\frac{1}{2}$ to 179, ditto debenture realized 95, Union preference 138 $\frac{1}{2}$ and 139, and European fully-paid 24 $\frac{3}{8}$ and 25 $\frac{5}{8}$. Among the undertakings of the remoter world, Cape Town preference was done at from 5 $\frac{3}{8}$ to 5 $\frac{1}{4}$ (a fall of $\frac{1}{8}$), ditto debenture at 87 (afterwards rising 2), Monte Video at 12 $\frac{5}{8}$, Primitiva at from 7 $\frac{1}{4}$ to 7 $\frac{1}{2}$, ditto preference at from 5 $\frac{1}{8}$ to 5 $\frac{3}{8}$ (a rise of $\frac{1}{8}$), and ditto debenture at 97 $\frac{1}{4}$ and 98 $\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA:

The Low-Price Power Unit and the High-Price Lighting Unit—Fair Play (?) by an Electrician—Electric Cooking Appliances.

A WELL-REASONED argument has appeared in the "Electrical Review" from the pen of a contributor, writing under the initials "A. K.," on the subject of the great disparity that exists to-day between the prices of power and lighting units. He examines the question from the point of view of the lighting consumer, and bearing in mind the condition that, through the metallic filament lamp and the severity of the competition of modern incandescent gas-lamps, the volume of lighting business with dear units is descending, and the volume of power business with cheap units is ascending. The thread of his argument travels along on common-sense lines. He is of the opinion that we have held for years, that the argument for cheap power units and dear lighting units is based on fallacious reasoning, and that there is no justification for the extraordinary gulf that exists between the charges to the power and the lighting consumer. Take the power unit at 1d. and the lighting unit at 4d., the consumer at the latter price is paying 300 per cent. more than the former. Such an unconscionable difference requires more eloquence and subtlety than the electrical engineer can command to convince the ordinary hard-headed man of business that it is a sensible and profitable one, and one that is justified. The electrical reply is that the layman does not understand the position, that he has no comprehension of load factors and the benefit of daylight consumption, and of the several other considerations that go to complete the defensive argument. There is another thing the lighting consumer cannot understand—as to why he should be made the beast of burden of both the capital and standing charges, while the manufacturer, who takes care that the profit he makes on his wares embraces his expenses and charges and something over, gets the benefit. We cannot find in this the element of commercial justice. The old argument is also still brought out that, if there were not a single motor connected with the distribution cables, the capital charges would have to be paid all the same." That is an obvious truth; and there was not at one time much argument to be advanced against it, excepting that of justice. But the evolution of things electrical is producing the condition in some places of the output of power units exceeding in volume that of the lighting units. The

changed state seriously imperils the old argument. "A. K.," in his article, makes reference to the point in these words: "One is emphatically reminded, in these days of diminishing [lighting] revenue, that the same capital charges would have to be paid if the sale of lighting units became of negligible proportions with respect to power sales." While the ancient argument persists, the lighting consumer will clearly never have that fair consideration to which his value to the undertaking entitles him.

The course of events will, in some centres, have the effect of showing the electricity management where argument and practice in the matter of the big disparity between the prices for the two purposes have been unsound. Yet a manager will be faced with the certainty that, if he raises his price for power, private gas-driven generating plants will spring up around him; and, on the other hand, if he enlarges the margin between the power and lighting price by raising the latter to meet capital and certain other charges, he will assuredly lose to gas a number of his lighting consumers. "A. K.," however, would take the bull by the horns. He would have the lighting consumer dealt with justly. He would rely on a lower price for lighting bringing in business in this line to such an extent that profit would be recouped, and greater fairness would be meted out to the lighting consumers, without whom many an undertaking with a large power supply at low prices would soon be in a state of bankruptcy. Signs are not wanting that the limits in lighting business getting at existing prices have been reached; and that the silver-tongued canvasser's claims of convenience, cleanliness, and adaptability to all decorative schemes, have no longer very much effect. That this is so is proved by the unrest there is in the electrical industry to try to get new lighting business. In almost every town, there is talk in electrical circles of publicity and canvassing departments, of free wiring, of subsidies to wiring contractors, and of numerous other devices for tempting new business; and a great deal is now being done in applying such schemes. There is also the General Publicity Committee now at work. All this is confirmation of the felt necessity for greater activity to obtain new business. It shows that business cannot be secured at the ordinary rates; and rather than reduce those ordinary rates, some managers prefer to attempt to wheedle householders and others by some such system as that of the so-called "telephone" tariff—so much per annum or per quarter according to maximum demand, and, in addition, so much (a low figure) per unit of electricity used. The idea is a cunning one, which does not mean so much to the consumer as would a respectable reduction of the ordinary price. He finds the service costing him just as much at the end of the year, as it would do under a reasonable flat-rate. To those who are able to afford to pay a lump sum down, the plan is seductive; but when the total cost is counted, it is found by the consumer that the advantage it was expected to yield is nothing but a chimera. "A. K." advocates a substantial reduction of price per unit to the lighting consumer, whose custom gives the financial backbone to the electricity undertaking. And he rubs in his contention with the inquiry, Is it any wonder that the ever-ready gas manager with his simple and moderate bills which anybody can understand, and which anybody can afford to pay, is still, after nearly thirty years of electric lighting, picking up more than 90 per cent. of the new business? This statement as to what the gas manager is doing strongly supports the argument of "A. K." But while we are having a dig at the policy of a wide difference between lighting and power prices, perhaps silence would be better, as the high-priced electric lighting unit is to the advantage of the gas industry.

The "Kentish Observer" has, in recent issues, been referring to the subject of the successes of gas lighting in fair open competition for public lighting; and, in doing so, it has reproduced statements that have appeared in our own columns. A correspondent of our contemporary, signing himself "Fair Play" has been moved, by the publication of the information referred to, to write and make certain bald denials, and incidentally to attempt to slur the veracity of the "JOURNAL." Our contemporary happens to mention that "Fair Play" is an Electrical Engineer; and as we are not particularly thin-skinned, there is no occasion to take notice of his depreciatory references to the facts published in our pages. But in regard to other parts of his letter, the correspondent belies the *nom de plume* he has adopted, and does not play fair. He makes certain random statements, but does not substantiate them by hard figures; and his omissions in other directions are inexcusable. Among other things, he says that "the City of London has for many years experimented with high-pressure gas-lamps; but the fact remains that nearly all the important streets are still lighted with electric arc lamps." The last report of the City Engineer (Mr. Frank Sumner, M.Inst.C.E.) states that the number of incandescent gas-lamps in use is 2730; while the total number of electric lamps is 450. The report of the deputation of the City Council who travelled abroad to study public lighting methods was in favour of inverted gas-lamps being adopted, and only electric lamps where, under the conditions specified, inverted gas-lamps could not be used. But the resources of the gas industry are such that it will not admit that in street lighting, under the conditions named, there are any places where inverted gas-lamps cannot be used. So much for the correspondent's notion as to fair play in regard to the lighting of the streets of the City of London.

Then "Fair Play" states that in Marylebone, Hammersmith, Hampstead, Croydon, Barnes, and Fulham, the gas-lamps in the streets have been, or are being rapidly replaced by electric lamps.

It would be interesting if "Fair Play" would quote a few districts where the gas and electricity supplies are both in the hands of companies and where rapid conversion is taking place, seeing that, in the districts he quotes, the electricity supply is owned by the municipal authorities, whose modern policy is to give the interests of their electricity undertakings precedence over those of the ratepayers. True, the Marylebone Council are converting all the gas-lamps in their district to electricity; true, too, that twice the London County Council refused the loan necessary for the purpose, and ultimately only under protest—the Finance Committee "reluctantly" recommending the granting of the loan, as they were not convinced that the proposition was a sound or an economic one. We have not at immediate hand the information as to the other boroughs mentioned. But as to Hampstead, the Lighting Committee of the Borough Council run the electricity undertaking, consider the Gas Company's tenders, and then submit tenders of their own, and recommend that they shall be adopted! Enough said as to Hampstead. Regarding Croydon, the last issued Board of Trade gas returns inform the inquirer that there are in use there 3097 public gas-lamps; the last issued "Electrician" returns state that there are 420 electric arc lamps in use, and 264 metallic filament lamps. The further we examine the statements in his letter, the less the appreciation of the electrical correspondent's notion of fair play.

The correspondent next deals with the new gas-lighting contract for the City of Westminster; and, following our electrical contemporaries, he does not make allowance for the fact that the Gaslight Company are using the latest forms of economical high-pressure and inverted gas-lamps under this contract, the efficiency of the former of which is double that of the older types of high-pressure burners. Ignoring this important point has produced quite a big harvest of erroneous electrical assumption. "Fair Play" essays to belittle the 70 electric arc lamps that the Gas Company have captured. Piccadilly, Regent Street, Pall Mall, St. James's Street, and Coventry Street (where those lamps are situated) are the choicest of West-end thoroughfares, and are not unimportant. He says the arc lamps there do not represent 5 per cent. of the electric lamps in the Westminster area. That raises a point of interest. No less than 962 electric lamps in the Westminster area are in the district of St. George's, where ten years ago a contract was entered into by the then expiring Vestry—it was a wicked affair this—for 31 years! And do not the City Council to-day regret that piece of administrative blundering? Mark carefully what Alderman Everitt said about it in the Westminster City Council the other week, when the new gas lighting contracts were under discussion: "He wished to make it perfectly clear that he was in favour of gas instead of electric lighting for the streets. He was not always so, because electric lighting was introduced into the streets by the St. George's Vestry, on his casting vote as Chairman. Since then the Gas Company had awakened. If they had started to make improvements before, the streets of St. George's would never have been lighted by electricity. There was no comparison now between the two illuminants; gas was unquestionably the better and the cheaper." What has "Fair Play" to say to this? The Westminster City Council does not own an electricity undertaking to prejudice them in the matter of the public lighting contracts. They get the best value for money; and with it in gas lighting they realize what should be an indispensable condition in street lighting—reliability.

The electrical papers are not saying much this season about electric cooking apparatus—just the time of the year when these things, if they have any practical and competitive value, should be pushed forward, lauded, and boomed. Two or three references to cooking appliances have appeared in the "Installation Topics" of the "Electrical Times." There is the same old lament as to high initial cost, lack of hiring schemes, a public dead to conviction, and so forth; but nothing whatever is said on the point of efficiency. There was a great splutter some time ago as to some West-end caterers putting electric cooking to a practical test; but there has been nothing of worth forthcoming as to the practical results of their trials. And if advertisement there was to be got out of the trials, that advertisement would have been made with all the eloquent force and picturesque embroidery at the command of our electrical friends. But silence as to results has reigned; and we have not heard whether the caterers who carried out the trials have made any extension of the installations. If they had, think readers that they would not have heard of it? A new electric cooking outfit is now introduced under the title of "Wilkinson's 'Economic' Electric Oven;" and it is called cheap. Its price is 39s. 6d., less the usual trade discounts; and this for an oven measuring internally 12 inches square by 14 inches high! Useful thing this for a family! This little oven takes a unit of electricity to raise it to 500° Fahr. In an earlier article, something is said about switches for cooking apparatus; and in the course of it, we read: "If other makers would give more attention to the switch control of their devices, fewer complaints would be heard; and if electric cooking is to become popular, the control must be simple, absolutely trustworthy, and foolproof, for the apparatus will be at the mercy of servants and others who have not the faintest mechanical knowledge or electrical instinct. Neatness in appearance appears to be striven for rather than a sound electrical and mechanical proposition; but if durability and satisfaction are to be secured, appearance must be quite a secondary consideration." It seems that the writer has some doubts as to electric cooking becoming popular.

FUNERAL OF MR. ALFRED COLSON.

LAST Wednesday the remains of the late Mr. Alfred Colson were interred at the Welford Road Cemetery, Leicester, amid impressive manifestations of the esteem, public and personal, in which he was held. In accordance with his wishes, the body was cremated at the Gilroes Cemetery, and the ashes, enclosed in a casket of fumed oak, with bronze mountings and an inscription, were afterwards conveyed to the Great Meeting Chapel, Bond Street, of which deceased was a member, where they rested prior to the funeral service, the first part of which was held there. The mourners were Mrs. Colson and members of the family; and among those present were the Mayor (Mr. G. Chitham) and Corporation, the principal municipal officers, officials of the Gas and Electric Lighting Departments, deputations of workmen, and a large number of personal and professional friends. The latter included Mr. J. H. Brown, Gas Engineer to the Nottingham Corporation, representing the Midland Association of Gas Managers; Mr. Charles Carpenter, Chairman of the South Metropolitan Gas Company; and Mr. Charles Hunt, with whom Mr. Colson was associated at the outset of his career. The casket was surrounded by a large number of beautiful floral tributes. The first part of the service was conducted by the Rev. Edgar I. Fripp, B.A., the Minister of the chapel; and the address and closing prayers were offered by the Rev. H. Gow, B.A., a predecessor in this office. In the course of his remarks, he said no man ever loved his work and lived for his work more faithfully than their friend Mr. Colson. He was one of the most loyal servants Leicester ever had. All his great scientific knowledge, all his energy, all his thought and care were given to the service of the town. He was one of the most distinguished men of his time in the line of work which he had made his own. They were all proud of him, and grateful to him, not only for the work he did, but for his faithfulness, his trustworthiness, and his strong and noble character. Leicester had never had a better citizen—one who was more eminent in his own department of knowledge, and who united with that knowledge such zeal and tireless energy, untainted by any mean ambition. But even more than his knowledge and energy, they who knew him best admired his character—quiet, strong, simple, and true. He was essentially a modest and retiring man. He did not make claims for himself, but devoted himself with all his heart to the work which had been given him. At the close of the service, the Organist (Dr. E. Lewis Lilley) played Chopin's Funeral March. At the grave side, the last rites were performed by the Rev. E. I. Fripp. Here a large number of the employees at the gas-works were present to pay a last mark of respect to their late Chief.

OBITUARY.

The "Journal für Gasbeleuchtung" reports that Herr KARL KLOSE, the Manager of the Corporation gas, water, and electricity works at Solingen, died on the 22nd ult., at the age of 57. He had been in the service of the Corporation for eighteen years.

The papers last week reported the death from coal-gas poisoning, in a building at Old Queen Street, Westminster, of a Mr. FRANK WRIGHT, whose body was discovered on Friday morning by a charwoman—the room being full of gas. Results of inquiries point to the fact that the deceased was the Mr. Frank Wright who was formerly connected with Messrs. Alexander Wright and Co., but who has had nothing to do with that business since it was acquired by Messrs. J. F. Simmance and Jacques Abady. Mr. Wright was also at one time connected with the Frank Wright Prepayment Meter Company, who afterwards disposed of their property to Metropolitan Gas-Meters, Limited.

PERSONAL.

Mr. JOHN O'GRADY has been appointed Manager of the Rathdowney (Queen's County) Gas-Works.

We learn that Mr. BERNARD F. BARNES will be leaving Buenos Ayres for Europe about the middle of next month.

Mr. A. CANNING WILLIAMS, F.C.I.S., the Secretary and Accountant of the Reading Gas Company, having, as already announced, been appointed Treasurer to the Edinburgh and Leith Gas Commissioners, the Directors of the Company at their last meeting took into consideration the question of filling the vacancy thus caused; and they decided to appoint Mr. ARTHUR B. STEDMAN (the Assistant Secretary and Accountant) as Provisional Secretary and Accountant until the annual meeting of the Company to be held in February next.

Mr. A. KELLOCK, the Assistant-Manager at the Alloa Corporation Gas-Works, has been elected Manager of the Pontefract Corporation Gas-Works. There were 104 applicants for the position. Mr. Kellock has been in the employ of the Alloa Gas Commissioners for the past eleven years, serving under Mr. Alexander Yuill, now of Dundee, and under the present Manager, Mr. J. W. Napier. At the outset of his career Mr. Kellock studied gas manufacture, chemistry, and building construction at the Technical classes at the Town Hall and Academy School in connec-

tion with the Alloa Burgh School Board Evening Continuation Classes. He holds a first-class honours certificate from the City and Guilds of London Institute for gas manufacture, a Board of Education certificate in Chemistry and Building Construction, and he has also had prizes in the latter subjects. Mr. Kellock has always taken an active interest in the Scottish Junior Gas Association (Western District) since its inception in 1904; and last April the members showed their appreciation of his services by unanimously electing him Vice-President for the ensuing year. Mr. Kellock, who is the eldest son of Mr. William Kellock, now Gas Manager at Kilsyth, is expected to enter upon his duties on the 20th inst.

GERMAN GAS AND WATER ASSOCIATION.

Programme of the Annual General Meeting.

THE Fifty-First Annual General Meeting of the Association will be held, as already announced in the "JOURNAL," from the 20th to the 24th inst., at Königsberg, the capital of the province of East Prussia. The meeting will open with a reception by the Local Committee in the banqueting hall of the Tiergarten, on the evening of Monday, the 20th. Business proceedings will commence at 9 o'clock on the Tuesday morning with an address by Herr H. Prenger, the President of the Association, and Manager of the Cologne Gas, Water, and Electricity Works.

The technical proceedings will occupy the mornings of the 21st, 22nd, and 23rd; and, subject to any re-arrangement which the Chairman may find necessary, the communications to be presented will be taken as follows: On Tuesday, the 21st—"Retorts and Gas-Meters," by Herr Kobbert, Manager of the Königsberg Gas-Works; "Reflections on the Writing-off and Redemption of Capital, and on the Renewal and Extension Funds of Municipal Gas-Works," by Herr F. Kordt, Manager of the Gas, Water, and Electricity Works of Düsseldorf; "The Economical Importance of the Gas Industry in Germany," by Herr F. Schäfer, Chief Engineer of the Dessau works of the German Continental Gas Company; "The Application of Gas to Industrial Purposes," by Dr. E. Schilling, of Munich; and the "Question of Central Stations for the Utilization of Gas," by Herr Lempelius, of Berlin. On Wednesday, the 22nd—"Pros and Cons of the Divining-Rod," by Herr Bieske, of the Town Council of Königsberg; "The Subsoil of East Prussia," by Dr. Tornquist, Professor and Director of the Geological Institute of the University of Königsberg; "Construction and Working of the Magdeburg Experimental Wells on the Fläming," by Dr. G. Thiem, a Civil Engineer, of Leipzig; "Investigations on the Clarification of the Königsberg Drinking Water," by Herr Denk, of Königsberg; "Report of the Committee of the Association on the Working of Water Undertakings," presented by the Chairman, Herr Reese, of Dortmund; and the "Report of the Committee on Return Electric Currents," by the Chairman, Mr. W. H. Lindley, of Frankfurt-on-the-Main. On Thursday, the 23rd—"A New Process for Washing Coal Gas for the Removal of both Ammonia and Sulphuretted Hydrogen," by Dr. Hurdelbrink, of Königsberg; "The Development of Purification of Gas," by Dr. H. Wolfram, of Hamburg; "The Valuation of Gas according to its Calorific Power," by Dr. Max Mayer, of Berlin; and the Reports of the Committees of the Association on the following subjects, presented by their respective Chairmen: "Instructional and Experimental Gas-Works, dealing with Investigations on Gas Coals," by Dr. K. Bunte, of Karlsruhe; "Photometry," by Dr. Leybold, of Hamburg; "Heating," by Dr. E. Schilling, of Munich; "Technical Training," by Dr. W. von Oechelhaeuser, General Manager of the German Continental Gas Company; and "Gas-Meters," by Herr C. Kohn, Manager of the works of the Frankfurt Gas Company. The report of the Council of the Association and the statement of accounts for the past year will also be taken on this day; and officers and members of the various Committees will be elected for the ensuing year.

On the afternoon of Tuesday, those attending the meeting may visit the Corporation gas-works on the Holsteiner Damm and the Corporation electricity works and tramway dépôt, or the Corporation water-works at Hardershof, or the gas-meter works of Messrs. Liessmann and Ebeling. In the evening, there will be a garden party. For the Wednesday afternoon, an excursion to Cranz, a bathing resort on the Baltic, has been arranged. For the Thursday afternoon, alternatives are offered of visits to the water-works at Hardershof or the sewage works, or a coach works and a grain stores. In the evening, there will be the customary banquet, which will be followed by a concert. The Friday will be devoted to a whole-day excursion to the coast extending from Warnicken to Rauschen on the Baltic Sea. A special programme has been arranged for ladies accompanying the members for the hours when the technical business is being transacted.

We have received from Mr. W. Geddes, of Granton, the Hon. Secretary of the Scottish Junior Gas Association (Western District), the reports, reprinted from the "JOURNAL," of the proceedings at the meetings held in the session 1909-10, under the presidency of Mr. Henry Rule, formerly of Falkirk, and now Manager of the Kely Gas Company, Limited.

HOW TO OBTAIN A FREE SUPPLY OF RICH GAS (?)

A CORRESPONDENT is good enough to forward a typewritten letter he has received, and which (he remarks) is "affectingly ingenuous" in the "beautiful simplicity of the terms offered and the method of arriving at a mutually (?) advantageous agreement." The communication does not, on the face of it, emanate from the "Coalite" people; but it is fair to remark that the writer of it, Mr. F. H. Smith, uses letter-paper headed No. 3, London Wall Buildings, London, E.C.—the address of "Coalite Limited," and the "British Coalite Company, Limited." With that preface, we give the communication and enclosure, and append an explanatory letter received from Mr. Smith in reply to inquiries made by us.

3, London Wall Buildings, E.C., May 31, 1910.
Re Free Supply of Rich Gas (700/750 B.T.U.'s)
18/22 Candle Power.

Dear Sir,—Probably the above will be of interest to you, especially as there will be undoubtedly a large demand in your district for a "Smokeless Fuel" giving twice the radiant heat of coal, which will practically render your neighbourhood clear of the smoke and dirt now resultant on the use of coal in its present crude form.

However, to enable us to thoroughly satisfy a few of our gas supply companies on the matter, I am prepared to deliver and erect a limited number of batteries on the following special terms, viz. :—

- (1) To install *free of cost* at your works, on your suitable foundations and site (60 feet by 40 feet) one of our £6000 batteries, of a capacity of 50 tons of coal per day (distillation), giving approximately 200,000 cubic feet of rich gas and 35 tons of smokeless fuel.

- (2) You will take charge of the sales of the "smokeless fuel," and deduct from same the cost of labour and fuel for battery.

The whole of the above gas, of about 20-candle power, will be given to you free of charge, and which should be invaluable to you for enriching purposes.

This special offer is simply to enable you to thoroughly satisfy yourself, without incurring any capital outlay, of the advantages of this process; and thus we hope to be favoured with your kindly recommendation for further orders.

Hoping to have your early instructions.

(Signed) F. H. SMITH, M.I.M.E.

"Instruction Form" Enclosed.

Address _____

Date _____

F. H. Smith, Esq., M.I.M.E.,
3, London Wall Buildings, London, E.C.

Dear Sir,—Kindly arrange to erect at _____ one of your 50 tons per day batteries, free of cost, on the following conditions :—

- (1) That no cost to us is incurred in connection with the erection of the above battery.
- (2) That you hand over to us the whole supply of gas produced free of charge.

In consideration of the above, we give you the necessary ground and prepared foundations for your battery, and will dispose of the "Smokeless Fuel" to consumers in our district, deducting from the sales the cost of labour on battery and coal used. The tar and liquor we will put into your waggons for despatch.

We will keep the battery in good working condition, and will faithfully carry out all reasonable instructions in connection with the working of same.

Yours truly,

Mr. Smith Explains.

In reply to inquiries made by us towards the end of last week, Mr. Smith on Saturday wrote :—

I cannot understand why there should not be a feeling of mutual interest between our friends interested in the high temperature process of gas manufacture or the destructive distillation of coal, and the low temperature process, which gives a smaller percentage of gas and a fuel eminently suitable for domestic use, quite apart from the resultant bye-product, amounting to over 20 gallons per ton of coal distilled, having a specific gravity practically equal to that of water.

I quite appreciate that it is not in every case the object of our gas-supply friends to manufacture high candle-power gas; but the deriching of high candle-power gas surely would not be a serious objection when the bye-products resultant on such distillation are easily double in value those obtained under present conditions.

Under these circumstances, and feeling that perhaps there should be an opportunity given (as it has been suggested by several gas engineers and managers) of personally testing and working a coalite battery, distilling (say) 50 tons of coal per day, with an output of 200,000 cubic feet of 20-candle power gas, the offer referred to has been placed definitely before them. In other words :—

- (1) The gas company provides a suitable site and foundations.
- (2) We erect one of our batteries free of cost.
- (3) We give them the whole of the gas *ex* this battery.
- (4) We ask the gas company whether they would prefer :—
 - (a) To sell the smokeless fuel, and we pay for the battery, labour, and coal,
 - (b) We arrange for the sale of the smokeless fuel, and pay for the coal, and the gas company pay for the labour on the battery.
- (5) Light tar and sulphate f.o.r. for dispatch to our distilleries.

This is surely as straightforward an offer as can be made; and every information in our power will be willingly given to any friends interested.

If the offer of 200,000 cubic feet of gas per day, and the placing of a £6000 battery at their disposal, is of no interest, there is no desire on our part to pursue the matter further; but otherwise we are prepared to thoroughly satisfy any *bona fide* requests from gas companies of satisfactory standing with one of our latest modern up-to-date plants.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Visit to Edinburgh.

MEMBERS of the Yorkshire Junior Association are accustomed to avail themselves of the organization for educational and professional purposes by arranging a summer meeting devoted almost entirely to relaxation. This year a departure from precedent was made, and a more ambitious scheme formulated. Taking advantage of an invitation privately extended by Mr. W. R. Herring, Engineer and Manager to the Edinburgh and Leith Gas Commissioners, when he addressed the Association at their last annual meeting, a trip to Edinburgh and an inspection of the Granton Gas-Works was planned. Though it involved travelling during two nights, with a strenuous day between, the attraction of so exceptional an opportunity drew a very large company together, about 50 members, exclusive of ladies, making the journey.

The day's proceedings opened with a visit to Messrs. Alder and Mackay's gas-meter works, which proved of great interest, exhibiting so much that was novel and attention-arresting. The members then drove to Granton, where, in the unavoidable absence of Mr. Herring, they were received and welcomed in his name by Mr. Alexander Masterton, the Station Manager. Divided into parties of convenient size, they then made the tour of the works under the guidance of Mr. Masterton, Messrs. D. Bisset, J. G. Scott and E. Scott (Chemists), Mr. B. Stanway (Draughtsman), and Mr. J. McGillivray, General Foreman. By this time the Granton works are so well known by description or by actual inspection to practically everyone in gas circles that nothing fresh can well be said of them, and the old things need not be repeated.

Ample provision had been made for the visitors' comfort and profit. Everything here, as with the rest of the proceedings, passed off without a hitch; and the memory of the visit is not likely to fade from the minds of those who were able to take part in the day's excursion. Refreshments were kindly provided by Mr. Herring; and after these had been partaken of, a cordial vote of thanks to him and his staff was accorded by the guests, on the proposition of the President (Mr. S. W. Shepherd), seconded by Mr. Demain. Mr. Masterton suitably replied, and spoke of the pleasure it had given them all to meet their English colleagues and friends.

From Granton most of the visitors journeyed to Queensferry, to inspect the Forth Bridge, before returning to Edinburgh.

Illumination of Interiors.

We have received the syllabus of three special lectures on the above-named subject which are to be delivered at the East London College, Mile End Road, on the evenings of the 8th, 15th, and 22nd of the present month, at eight o'clock, by Professors J. T. Morris, M.I.E.E., and C. A. M. Smith, B.Sc. The former will deal with "Daylight Illumination" and "Artificial Illumination by Gas and Electricity," and the latter with "Illumination by Petrol-Air Gas." Professor Morris's second lecture (on the 15th) is the one in which our readers are specially interested. He will describe ordinary, incandescent, and high-pressure gas-burners, and show how efficient lighting depends on the calorific power of gas. Carbon and metal filament electric lamps, arc and inverted arc lamps, and the Moore vacuum tube light will be explained. The lecturer will show the candle power per square inch of various sources of light; deal with shades, globes, reflectors, and fittings; and point out that suitable illumination is largely dependent upon the use to which a room is to be put. Professor Smith will open his lecture with a few historical notes, and then pass on to consider the theory of the absorption of volatile liquids by air and indicate the difficulties occurring in practice. The three general systems of supply—direct petrol, saturated air, and "safety" gas—will be described; and the relative cost of air gas and other gases will be discussed on both the heat and light bases. Application for tickets for the lectures should be sent to the Registrar (Mr. T. C. Hodson) at the College.

A meeting (the ninety-fourth) of the Waverley Association of Gas Managers is called for next Friday, in Edinburgh, under the chairmanship of Mr. Henry Rutherford, of Aberlady. There will be a discussion on "Oxide Purification," and the proposal to form a Benevolent Fund will be considered. After the appointment of officers for the ensuing twelve months, the members will dine together, and there will be a presentation to Mr. Rutherford, on his retiring from the presidency of the Association. In the afternoon a visit will be paid to the Marine Gardens at Portobello.

GAS AT THE JAPAN-BRITISH EXHIBITION.

The Gas Companies' Joint Display.



A Distant View of the Buildings of the Gas Exhibit.

(Note the Antique Gas Lantern between the Buildings.)



The General Show-Room, forming Part of the Exhibit.

IN the "JOURNAL" for May 24, an article appeared describing the excellent gas exhibit that has been arranged at the Japan-British Exhibition, jointly by the enterprise of a number of Gas Companies, who believe in the uses of gas being advertised as prominently as possible, and in the most attractively demonstrative manner. This week, through the courtesy of the Chairman (Mr. D. Milne Watson) and members of the Committee and the Hon. Secretary (Mr. F. W. Goodenough), we are able to illustrate partially what has been done in presenting, in popular manner, the utilitarian and decorative features of gas, and its efficiency for domestic purposes generally to which it is applicable. The photographs are very good; and they are the work of Mr. A. E. Walsham, Photographer, of No. 60, Doughty Street, W.C. The views pictorially concentrate what we have previously described more extensively by words, to which there is no necessity to add on the present occasion, beyond saying that the pictures show the completeness of the exhibition in a manner that could not be so well expressed by other means. We hope that this photographic testimony to what has been done will excite the interest of a number of the managements of gas undertakings who have not already contributed to the expenses incurred, and induce them to send to Mr. Goodenough, at Horseferry Road, a suitable

subscription. Of this those who subscribe may be certain, that the money has been well and wisely spent, and the running costs will have the same careful consideration. A letter appears today in our "Correspondence" columns, for which attention is specially desired.

PUBLIC LIGHTING—COMPETITION AND CHARGE.

A RETROSPECT AND A FORECAST.

[COMMUNICATED.]

[ALL RIGHTS OF REPUBLICATION RESERVED.]

THE question of public lighting and the charges for the same have always been matters of interest to those concerned, whether to the company supplying or the purchaser—viz., the authority charged with the duty of lighting the public thoroughfares.

Many and various have been the systems of charge for lighting the thoroughfares of the Metropolis since the introduction of gas in 1807; and in view of recent developments in the methods of

GAS AT THE JAPAN-BRITISH EXHIBITION.

The Gas Companies' Joint Display.



The Front Room of the Building (In Georgian Style), Artistically Lighted and Heated by Gas.



The Kitchen, illustrating Gas Cooking, Hot-Water Heating, &c.



The Bath-Room, with its Several Gas-Heated Accessories.

follows: I. Charge per burner per hour. II. Average meter system. III. By governed burner at hourly rate. IV. By pressure. V. By illuminating power.

I.—Charge per Burner per Hour.

In the early days considerable controversy ranged round this question, from the time when a Provisional Committee met at the "Crown and Anchor Tavern," Strand,* on July 24, 1807, and decided that £20,000 should be invested by deed in a Committee for lighting a street in London or Westminster "for the grand object of obtaining a Charter of Corporation to render this important discovery more generally beneficial both to the Government and the Nation."

Before a Parliamentary Committee in May, 1809, a calculation for lighting the parish of St. James', Westminster, was considered. The parish was to be lighted with 800 lamps, fitted with three "Cockspur" burners, each 70 feet apart, on alternate sides of the street; the existing oil-lamps being from 30 to 40 feet apart. The capital charge included lamps, burners, service-pipes, lamp irons, 14 miles of 3-inch cast-iron mains at 3s. per foot, excavating and making good the pavement, and six stations, each containing six stoves for the manufacture of gas, and was, according to

* "The Introduction of Gas Lighting." By Charles Hunt, M.Inst.C.E.

charging for lighting of this character, it is both interesting and instructive to peruse the different means that have obtained in times gone by—to follow the various stages that have led up to the practice in vogue to-day, and endeavour to obtain some idea or forecast of the method of charge of to-morrow.

The systems of charge from the commencement have been as

Mr. Joseph Kaye, Surveyor in the Parish of St. James', £26,546. So much for the capital expenditure. The cost for the 800 lamps was to be the price of 730 chaldrons of coals, being two chaldrons per night for the production of gas for the lamps in question, *plus* the cost of labour in manufacture. The illuminating value of the gas, according to Accum, was to be three times that of a tallow candle; the "Cockspur" burner used for lighting in Pall Mall being at least equal to 18 parish lamps—the size of the parish lamp being stated to be about that of a small pea.

"The charge or 'rental' for lights in the early days was by contract to pay for burning a limited time by means of certain-sized burners; the system of charging being by the year, half year, or quarter."* The burners in use at that time were the "Ratali," the "Cockspur," the "Cockscomb," the "Batswing," and the "Argand"; the "Cockspur" consuming 3½ cubic feet per hour and the "Batswing" 5 cubic feet. This form of charge for public lights continued for some years.

II.—AVERAGE METER SYSTEM CHARGE.

The public lamps in the central area were lighted by two Gas Companies—viz., the City of London Gaslight and Coke Company and the Chartered Gas Company. During these years, the area was partitioned between these two Companies, who alone gave the supply for public lighting. The boundary line of the two Companies was well defined; the Chartered Gas Company taking the north-east portion and the City of London Gas Company taking the south-western portion. No attempt at infringement was made at any time by either of the Companies, for competition between these Companies was a thing unknown, and between them and other Companies impossible, as the latter were carefully prevented from opening pavements and laying down pipes within the municipal jurisdiction. Although public advertisements were annually made inviting tenders for lighting the public lamps, competition there could not be, as the other Companies were outside its pale; and those between whom the area was partitioned only tendered for the lighting of their respective districts.

At first sight nothing would appear to have been gained by this annual form. In effect, however, it was this—that it brought periodically the Companies before the Authorities, who, being aware of the reductions in the price of gas that unrestricted competition secured in other parts of the Metropolis, together with the enlarged consumption of gas, were enabled to submit such facts to the Companies, and require what appeared from time to time to be a commensurate reduction in the price of the supply to the public lamps, with the result that between the years 1823 and 1849 the gas was reduced by the two Companies from 15s. to 5s. per 1000 cubic feet, and the batswing burners of the public lamps from £5 5s. to £4 4s. per light per annum, and the "Cockspur" (a three-hole burner) from £3 3s. to £2 14s. per light per annum. The system of annual tendering was therefore of advantage, by producing reduction in price to such an extent that the evil of disturbance of the pavements was counterbalanced.

The entrance of a third Company, having the whole area of the City of London for its district—the Great Central Gas Company, started by the ratepayers in 1849, and having its works at Bow Common—brought about competition other than the competition of comparison. One reason of this competition coming about was the promise of the new Company to reduce the charge, to supply the public with a "brighter" gas, to supply the street-lamps with a better gas at lower rates, and to agree to the gas being tested from time to time by eminent professors, under heavy pecuniary fines on the contractors. The Directors adopted 9½ sperm candles as the illuminating value of the gas, as recommended by "Clegg;" but the authorities fixed 12 wax candles in the Bill, which was higher than 9½ sperm candles.

Its incorporation was the root of a long impending change in the business of gas selling throughout the Metropolis. Its operations were primarily felt within the central area. At Christmas, 1849, the Chartered and City Companies reduced their price from 5s. to 4s. per 1000 cubic feet; and in the year 1850, the contracts for lighting the public lamps having been, as usual, advertised, there was, for the first time for many years previously, *bonâ fide* competition between the Companies. The result was the letting to the Great Central Consumers' Company of the public lighting of the whole area, at a reduced rate equivalent to an annual reduction of £730. The public had, however, to submit to the inconvenience of having 1650 openings made in the pavements for the purpose of laying the supply-pipes to the public lamps.

In 1852, tenders for public lighting were again received for one year, when the Chartered Company, having tendered a reduced price for the portion held by them, they again had the contract; the Great Central Company retaining the remaining portion of the area at the same rate

per lamp as the previous year, but making alteration in certain of their burners. By this letting a further sum of £230 was saved; so that the lighting of the public ways for the year 1852-3 was effected for £990 less than the years 1850-1. Owing to the re-letting, however, of the portion of the area to the Chartered Company, and the consequent reconnection of their supply pipes, and the disconnection of those of the Great Central Gas Company's, about 1093 openings were again made in the pavements. The following tables give the prices for public lighting from the years 1823 to 1852, showing the effect of the competition period that ensued after 1849.

Thus, although within two years a considerable saving had been effected by competition, yet the public suffered by the inevitable opening of the roads. It was with the hope of preventing or diminishing the chance of this annual irruption of the public ways that the expediency of letting the public lighting for a term of three years in the future was agreed upon. In doing so, it was believed that the authorities would still reap all the advantages that might be anticipated from competition—if the price of gas and the circumstances attending its make and sale were the same as those in years previous to 1850. If a large reduction at this time in the price of gas generally had been expected to have its ultimate influence upon the price of lighting public lamps, such a course would not have been recommended. But extraordinary reduction had already taken place; and it was not then expected that any similar reduction to that of the previous five years would follow in the next three years. When the whole area was permitted to be furrowed for the laying of pipes of this new Company, it was after mature deliberation and in the hope of the realization of a large annual saving to the ratepayers. But consideration of the prices then paid for lighting the public lamps indicated plainly that proportionate reductions to those received could not be expected for many years, although it was quite within the limits of probability that further reductions would be made; yet it was felt that there must be a point at which the inconvenience sustained by the opening of roadways would not be compensated for by a reduction in price.

It was also felt that if at the end of the third year either fresh discoveries or economies in the making of gas, or other circumstances tending to reduce the price, came into operation, the local authority would at that time again reap the benefit of them by public competition. As the annual consumption of gas for public lighting in the area under consideration at that time was 52,731,002 cubic feet, it was considered that, by having this guaranteed consumption, the Gas Companies would be able to make arrangements by which they would not only be in a position to supply gas cheaper, but also gain from the supply more profit. It was also considered that every opening made in the road for alteration of the pipes involved an expenditure which, being at first paid for by the Companies, would, unless returned to them in some shape, diminish the profits derivable from the public

Chartered Gas Company, Lighting within the North-Eastern District.

| In Year | Price Per 1000 Cubic Feet Supplied by Meter. | | Price per Light per Annum. | | Hours of Lighting, 4300. |
|---|--|-------|---|--|---|
| | | | Batswing Burner. Estimated Consumption 5 Cubic Feet per Hour. | Cockspur Burner. Estimated Consumption 3½ Cubic Feet per Hour. | |
| | s. d. | s. d. | £ s. d. | £ s. d. | |
| 1823 | | 15 0 | 5 5 0 | 3 3 0 | The contract for the public lighting was from Midsummer day in each year. |
| 1824 | | 15 0 | 5 5 0 | 3 3 0 | |
| 1825 | | 15 0 | 5 5 0 | 3 3 0 | |
| 1826 | | 15 0 | 5 5 0 | 3 3 0 | |
| 1827 | | 15 0 | 4 14 6 | 2 16 6 | |
| 1828 | | 13 6 | 4 14 6 | 2 16 6 | |
| 1829 | | 13 6 | 4 14 6 | 2 16 6 | |
| 1830 | | 13 6 | 4 14 6 | 2 16 6 | |
| 1831 | | 12 6 | 4 14 6 | 2 16 6 | |
| 1832 | | 12 6 | 4 10 0 | 2 14 0 | |
| 1833 | | 11 3 | 4 10 0 | 2 14 0 | |
| 1834 | | 10 0 | 4 10 0 | 2 14 0 | |
| 1835 | | 10 0 | 4 10 0 | 2 14 0 | |
| 1836 | 10 0 & | 9 0 | 4 10 0 | 2 14 0 | |
| 1837 | | 9 0 | 4 10 0 | 2 14 0 | |
| 1838 | | 9 0 | 4 10 0 | 2 14 0 | |
| 1839 | | 9 0 | 4 10 0 | 2 14 0 | At Midsummer, 1849, reduced to 5s. At Christmas, 1849, reduced to 4s. |
| 1840 | | 9 0 | 4 10 0 | 2 14 0 | |
| 1841 | | 9 0 | 4 10 0 | 2 14 0 | |
| 1842 | | 9 0 | 4 10 0 | 2 14 0 | |
| 1843 | | 8 0 | 4 10 0 | 2 14 0 | |
| 1844 | 8 0 & | 7 0 | 4 4 0 | 2 14 0 | |
| 1845 | | 7 0 | 4 4 0 | 2 14 0 | |
| 1846 | | 7 0 | 4 4 0 | 2 14 0 | |
| 1847 | 7 0 & | 6 0 | 4 4 0 | 2 14 0 | |
| 1848 | | 6 0 | 4 4 0 | 2 14 0 | |
| *1849 | | 5 0 | 4 4 0 | 2 14 0 | |
| | | 4 0 | | | |
| 1850 | | 4 0 | 4 4 0 | 2 14 0 | |
| Contract taken by Great Central Consumers' Gas Company. | | | | | |
| 1851 | | 4 0 | 3 17 6 | 2 13 0 | |
| Contract retaken by Chartered Gas Company. | | | | | |
| 1852 | | 4 0 | 3 12 0 | 2 10 0 | |

* "Centenary of Gas Lighting." By W. J. Liberty.

* Commencement of competition.

City of London Gaslight and Coke Company, Lighting within the South-Western District.

| In Year | Price per 1000 Cubic Feet Supplied by Meter. | Price per Light per Annum. | | Hours of Lighting, 4300. |
|---|--|----------------------------|---|--|
| | | | | |
| | s. d. | s. d. | Batswing Burner. Estimated Consumption 5 Cubic Feet per Hour. | Cockspur Burner. Estimated Consumption 3½ Cubic Feet per Hour. |
| | | | £ s. d. | £ s. d. |
| 1823 | | 15 0 | 5 5 0 | 3 3 0 |
| 1824 | | 15 0 | 5 5 0 | 3 3 0 |
| 1825 | | 15 0 | 5 5 0 | 3 3 0 |
| 1826 | | 15 0 | 5 5 0 | 3 3 0 |
| 1827 | | 15 0 | 4 14 6 | 2 16 6 |
| 1828 | | 13 6 | 4 14 6 | 2 16 6 |
| 1829 | | 13 6 | 4 14 6 | 2 16 6 |
| 1830 | | 13 6 | 4 14 6 | 2 16 6 |
| 1831 | | 12 6 | 4 14 6 | 2 16 6 |
| 1832 | | 12 6 | 4 10 0 | 2 14 0 |
| 1833 | | 10 0 | 4 10 0 | 2 14 0 |
| 1834 | | 10 0 | 4 10 0 | 2 14 0 |
| 1835 | | 10 0 | 4 10 0 | 2 14 0 |
| 1836 | 10 0 & | 9 0 | 4 10 0 | 2 14 0 |
| 1837 | | 9 0 | 4 10 0 | 2 14 0 |
| 1838 | | 9 0 | 4 10 0 | 2 14 0 |
| 1839 | | 9 0 | 4 10 0 | 2 14 0 |
| 1840 | | 9 0 | 4 10 0 | 2 14 0 |
| 1841 | | 9 0 | 4 10 0 | 2 14 0 |
| 1842 | | 9 0 | 4 10 0 | 2 14 0 |
| 1843 | | 8 0 | 4 10 0 | 2 14 0 |
| 1844 | 8 0 & | 7 0 | 4 10 0 | 2 14 0 |
| 1845 | | 7 0 | 4 4 0 | 2 14 0 |
| 1846 | | 7 0 | 4 4 0 | 2 14 0 |
| 1847 | 7 0 & | 6 0 | 4 4 0 | 2 14 0 |
| 1848 | | 6 0 | 4 4 0 | 2 14 0 |
| *1849 | | { 5 0 } | 4 4 0 | 2 14 0 |
| | | { 4 0 } | | |
| 1850 | | 4 0 | 4 4 0 | 2 14 0 |
| Contract taken by Great Central Consumers' Gas Company. | | | | |
| 1851 | | 4 0 | 3 17 6 | 2 13 0 |
| 1852 | | 4 0 | 3 17 6 | 2 13 0 |

The contract for the public lighting was from Midsummer day in each year.

Reduced at Lady Day to 6s.
Do. Midsummer to 5s.
Do. Christmas to 4s.

From Midsummer, 1851, to Midsummer, 1852.
The Company agreed to substitute batswing for all the cockspur burners, but charged for those substituted at the price of cockspurs only.

* Commencement of competition.

lighting; and as it is incontestably the case that the consumer of the article must, in the price of that article, pay all the costs and charges expended in its make or procurement, so the expenses of opening the pavements and laying on the supplies to the lamps must ultimately be paid for in the price of the light. It was clear, therefore, that a company who could distribute the reimbursements of such outlay over three years instead of one could *cateris paribus* afford to light the public lamps at a cheaper rate per annum for three years than one. The authority then felt that not only would public convenience be studied, but, in doing so, they would "husband the public purse—conditions rarely compatible in arranging for the carrying out of public works."

So keen was the desire of the competing Companies, even at this early date, to obtain possession of the public lighting, that the new Central Company offered to charge only cockspur burner price for all the lamps, and introduced batswing burners in their place. As the cockspur burner only consumed 3½ cubic feet of gas per hour, and the new batswing 5 feet, this, in 1850, represented a difference of no less than £1 10s. per lamp per annum, the proposition at the time was looked upon as "perplexing," and the authorities cast about to find "reasons" for the same. These they reduced to two—viz., either that the price at which the Company undertook the lighting of the batswing burners was sufficient to cover the loss upon the cockspurs, or that the actual consumption by the two burners was more close than was generally supposed. It was afterwards found that the cockspurs, though supposed to consume 1½ cubic feet less gas than the others, when they had been in use some time consumed a quantity approaching more closely that of the batswing. This fact, and the unsuitability of the cockspurs to obtain as good a combustion as the batswings and the consequent loss of illuminating value, caused this form of burner to be eventually discarded for the purpose of public lighting, though provision was made, by storing them, to put them back if the other Companies at the next tendering would not charge the reduced price. Yet the comparison of charge existed which it was considered would influence the new prices. Thus during a very eventful period of the lighting industry we see the effects of competition and the charge during a part of the period of the average-meter system.

In the public lighting contract with the Chartered Company for the year 1856, provision was made for testing for illuminating power:

An argand burner, having 15 holes, and a 7-inch chimney consuming 5 cubic feet per hour. The stipulated pressure being not less than 5-10ths, giving a light equal in intensity to the light produced by 12 wax candles of six in the pound burning 120 grains per hour; and if the gas supplied by the Company shall at any time during the said period be inferior in illuminating power to that hereinbefore prescribed,

the said Company shall forfeit and pay the sum of £100 for each and every offence, and, in addition, the sum of £10 for each day after notice in writing that the gas is inferior to the said standard during which the offence shall continue.

For the purpose of the test the Company were to provide "at their works a laboratory, with proper apparatus, which was at all times," by day and by night, to be accessible to the officers of the local authority. The pressure books of the Company were to be open at all times to the officers. All mains and services were to be kept clear for the passage of the gas through the same. Lanterns and burners were to be well and properly cleansed, "so that a steady and uniform light be produced and kept up." All such cleansing was to be done under the direction and to the satisfaction of the surveyor. The Company, "at their own cost and charges" were to "repair and amend all lanterns, frames, glass, mains, pipes, services, cocks, plugs, tubes, burners, and apparatus within twelve hours after notice in writing, or in default, to forfeit and pay the sum of 10s. for each and every night that any such neglect or omission shall have happened."

So often as the lanterns shall not be supplied with the full quantity of gas, or shall not be kept properly lighted from sunset to sunrise according to the true intent and meaning of the contract, "the Company were to pay the sum of 10s. per night for each and every such lantern;" and if at any time during the contract period of three years "the whole of the lamps, or five or more in number of such lamps, in any one street, shall not be lighted at sunset, or shall not be extinguished before sunrise, or shall not be properly supplied during the whole of the time between sunset and sunrise," the Company were to forfeit and pay the sum of £20 for each offence, and for every lantern and burner not duly cleansed, 2s. 6d. per night, and that "so often as such offence shall happen."

All lanterns and ironwork were to be painted two coats each year, or, in default, the Company were to be bound to pay "a sum of 10s. for every lantern and iron and frame of which shall not be so painted."

The contract also provided that the Company were to take down or affix any additional lamps

at their own cost, and failing to do so, the authority could do so and charge the expense to the Company; and in the event of wilful neglect, the authority would be free to contract with any other Company "for lighting with oil, or gas, or other manner" any of the streets.

In 1860, the question of fixing meters for the purpose of charge was considered; and Mr. Hughes, giving evidence before the Committee upon the Metropolitan Gas Bill, stated that the results of experiments made by him upon lamps in eight different parts of the Metropolis (the lamps being 106 in number) showed that 30 per cent. less gas was given than was contracted and paid for. On the other hand, it was stated by the London Gaslight Company that the results of observations by meter made in six parishes of London showed that, upon the average, 8·80 per cent. more gas was supplied by them than was contracted for. Mr. Arntz, the Surveyor to the Local Board of Westminster, in 1858 made a similar investigation in the district supplied by three Companies, which showed that so much less gas appeared to be supplied than was contracted for that £2021 6s. 1d. was being paid annually above the proper amount. This calculation was later on supplied by Mr. Hughes.

These statements were startling by their wide difference, and could only increase the doubt and uncertainty upon the point; and it was felt that paying for gas by meter, which, under the joint supervision of the buyer and seller could not fail to give a true result, was a system which ought to be as satisfactory to the gas companies as to the authorities. It was stated that gas was paid for by meter at the public lamps at Leicester, Lincoln, St. Ives, Worthing, Torquay, and at other places, and that it was most universal in Scotland at this date. It was stated that for the London authorities "to have possession of the columns, lamps, and pipes, and to take charge of the lighting, cleaning, and repairs, and to pay by meter, appeared to be the fairest and most correct principle of carrying out the public lighting, and the one which alone can in the present day be satisfactory." The authorities considered that it was the only system which would leave them "unfettered" should they desire from time to time to try experiments, or "avail themselves of the improvements which science may develop."

Three separate and distinct methods of fixing the meters were suggested.

- (1) To fix them upon the brackets of the lamps projecting from the wall, and upon the ladder irons of the lamp-posts.
- (2) To fix them in wells or pits beneath the ground.
- (3) Where there were columns to fix them in the bases or lower portions of the posts.

(To be continued.)

VISIT OF MIDLAND GAS MANAGERS TO SMETHWICK.



View from the Entrance to the Smethwick Gas-Works.

At Smethwick, the home of the President, Mr. Vincent Hughes, the Midland Association of Gas Managers last Thursday held their spring meeting, on the invitation of the Gas Committee of the Corporation. An attractive programme—the promise of which was amply fulfilled—had been prepared; and a day of well-combined interest and enjoyment was spent by the large muster of members who took part in the proceedings. Smethwick, which attained in 1907 the dignity of a county borough, is a place of varied occupations; and there is ample evidence that those responsible for local administration are fully alive to the needs of the times. Its chief distinction, in the words of a local guide-book, is derived from its eminence in the realms of commerce—being the home of the great inventions of Watt, Murdoch, and Boulton. Full, however, as it is of factories of all sorts, there are (as was proved to the members during the day) within easy reach opportunities of enjoying the beauties of Nature to the full; and this is an important consideration in connection with any industrial centre. In the Mayor (Alderman W. H. Goodyear, J.P.), the town possesses an energetic and broad-minded civic head; and a strong Gas Committee has the good fortune to have as Chairman one whose name is well known in the gas industry, more particularly in the direction of gas-engine design. Both these gentlemen spent the whole of the day with the visitors, to whose comfort they, with Mr. Hughes, and the members of the Gas Committee, were assiduous in administering.

A WELCOME.

According to notification, the members assembled in the Council House—a handsome central building which was opened in June, 1907, and which in all respects provides amply for the needs of the borough. Here, in the chamber in which the Council are wont to deliberate, a hearty welcome was, in the course of a few well-chosen remarks, extended to the Association by the MAYOR, to whom a hearty vote of thanks was subsequently passed, on the proposition of Mr. S. GLOVER (St. Helens).

DEATH AND ILLNESS.

The PRESIDENT remarked that it was not usual to transact business at these spring meetings; but there were one or two matters which on the present occasion they could not possibly omit. The country had recently sustained a very severe loss in the death of their beloved King Edward VII.; and they ought certainly to have a resolution on the minutes expressing their regret. So much had already been said and written on this sad

subject that it was not necessary for him to add further words of his own.

The resolution was passed by the members rising silently in their places.

The PRESIDENT said another sad duty rested upon him, and that was to propose a vote of condolence with the family of the late Mr. Alfred Colson, of Leicester. The Association had not had Mr. Colson with them for some considerable period; but they all remembered the time when they looked to him for scientific papers and contributions to their various discussions. He was an exceedingly valuable member of the Association, and had done wonderful work at Leicester.

The motion was seconded by Mr. B. W. SMITH (Walsall), and unanimously agreed to.

The PRESIDENT remarked that the third matter to which he had to refer was the illness of their old and esteemed Treasurer, Alderman Cooper, of Banbury, who was, he learnt, lying in a very serious condition indeed. The members all knew Mr. Cooper's genial and kindly disposition; and he (the President) felt that a letter of sympathy from the meeting would probably cheer him up, and might perhaps do something to restore him to health and strength. He therefore proposed that such a letter be sent.

Mr. T. BERRIDGE (Leamington), in seconding, remarked that no man had taken a greater interest in the Association or in the welfare of his brother gas managers than Mr. Cooper; and he trusted that he might soon be restored to health.

THE GAS INSTITUTION BENEVOLENT FUND.

The PRESIDENT said this was practically the whole of the business; but there was still one other subject to which he would like to allude—the Benevolent Fund of the Institution of Gas Engineers. He had received a very pressing letter from Mr. W. T. Dunn, the Secretary of the Institution, reminding him that last year they established a sort of record for subscriptions from the Midland Association, and set the pace for the other Associations to follow. But Mr. Dunn said this pace had not been maintained. He (the President) was sure it was necessary to do no more than remind the members that cheques should be forwarded before the June meeting; and Mr. Dunn would have no further cause of complaint.

THE GAS-WORKS.

In conveyances which were in waiting, the visitors were then taken to the gas-works, where a very useful hour was spent under the guidance of Alderman Pinkney, Mr. Hughes and his Assistants (Messrs. D. Cooke, S. H. Boyns, and S. Sturges), and Mr. W. J. Sturges, the Secretary. Before the start, the President pointed out that they would not find everything beautifully painted and polished, as they were accustomed to do when visiting gas-works, for the present capacity of the works being very much below the

requirements, extensions were in progress which it had been impossible for him to delay. It is, however, safe to say that, so far from being a drawback, the fact of new work being in hand added still another feature of interest to the visit. It may be pointed out that Smethwick originally formed part of the extensive district supplied by the Birmingham and Staffordshire Gaslight Company, whose powers were in 1875 purchased by the Birmingham Corporation—a clause being inserted in the Bill to enable the outlying districts, subject to arbitration, to erect works for themselves. This was a privilege of which Smethwick, along with West Bromwich, Oldbury, and Tipton, subsequently availed themselves. This explanation, of course, makes it clear that the Smethwick works are comparatively modern—in fact, they were opened on Oct. 1, 1881; and the following year the quantity of gas sent out was 123½ million cubic feet. Since that time, progress has been rapid; and for the past year the output was close upon 450 million feet. No wonder that “Smethwick’s most productive municipal undertaking” (to quote the guide-book again) is a source of such satisfaction to all who are connected with it! With really so short a history, the list of Engineers of the works is naturally also a short one. Indeed, there have been only two. Mr. B. W. Smith (now of Walsall) was the first; and, after occupying that position for nearly twenty years, he was succeeded in 1900 by the present Engineer, Mr. Vincent Hughes. The position of Secretary to the Gas Committee fills an even shorter list, for Mr. W. J. Sturges has occupied it ever since the gas-works were opened—being, with the exception of the Town Clerk, the oldest official under the Corporation.

Passing through the substantially built and well-appointed offices (the photometer-room in which proved a considerable source of attraction to many), the carburetted water-gas plant was first inspected. It is not Mr. Hughes’s practice to make water gas in the summer time; but he had thoughtfully had the plant put in operation for this special occasion. In the winter time things are, however, different. Then every coal-gas retort is pressed into service; and the water-gas-house supplies whatever additional output is required to meet demands—the amount, of course, varying according to the conditions of the moment. The total capacity of this portion of the works is a million cubic feet per day. There are two complete sets of water-gas plant, which were installed (the first in 1901, and the second about a couple of years later) by the Economical Gas Apparatus Construction Company; and a special feature is the arrangement for the supply of coke to the generators. From the time it leaves the horizontal retorts, the coke is not touched—and in the case of the inclined retorts (an installation of which is also to be seen on the works), it is not touched at all. An overhead tray conveyor carrying the coke from the retort-house drops it on to a gravity bucket conveyor and elevator (operated by a gas-engine), by which it is taken to the top of the water-gas house and tipped into the hoppers.

There are two retort-houses. One of these is devoted to horizontal retorts which are hand charged; and in the other (which is practically an extension at the end of the first) there are four arches

of inclined retorts. In both houses Mr. Hughes employs dry mains; and he does not get a stopped pipe once in six months. His experience is that as good carbonizing results are obtained with the inclined as with the horizontal retorts; while the former have, of course, to their credit a very substantial saving in labour charges. A tray conveyor runs the whole length of the two retort-houses, and by this means the coke, which is quenched on its journey, is removed from the house to an elevator which raises it to the overhead conveyor already referred to. A branch of the Birmingham canal runs into the works; and from this overhead conveyor the coke can be dropped direct into barges, shot into the yard, or taken along and tipped into the bucket conveyor for the water-gas house. All the coke that is not used for water-gas making leaves the works either by barge or cart. The conveyors in connection with the retort-house are at present steam-driven; but a gas-engine is now being installed for the purpose in an old coal-store built alongside the house.

The coke-handling plant is, as has been shown, of a very complete character; and during the past few years great improvements have been made in the arrangements for getting coal into the works. Previous to 1906, coal was carted in; difficulties having prevented the carrying out of various schemes for constructing a siding. These troubles were, however, all eventually surmounted; and the Committee decided upon an elevated siding which would be of sufficient strength to carry waggons of 50 tons capacity. A scheme was consequently designed on these lines, and duly carried out—necessitating a bridge over the canal of nearly 150 feet span, and 15 feet wide. The total length of the sidings is about 260 yards; and the waggons are drawn in by the Corporation’s own locomotive. The coal is shot through an opening between the metals into a big hopper, capable of holding nearly 100 tons, for feeding the inclined retorts; or it is run down shoots into the yard for wheeling to the horizontal retorts. There is a gas-engine here for operating the elevator, and also a coal-crusher when necessary. In connection with the sidings there is a double platform weighing machine which will carry 100 tons and weigh up to 80 tons.

Among the other plant which was inspected may be mentioned the purifiers, which consist of four oxide and three lime boxes for the coal gas, and four boxes for the water gas. The Braddock station meter, capable of passing 125,000 cubic feet per hour, is installed in a house in which there is plenty of room for another meter of similar dimensions. New condensers and scrubbers are just now under consideration; while two sets of twin exhausters are at the present moment being installed by Messrs. George Waller and Son. The capacity of each of these four exhausters will be 60,000 cubic feet per hour; and they are being so arranged that any one or more may be used. The storage capacity of the gasholders is nearly 1,400,000 cubic feet; but Mr. Hughes points out that this is very inadequate, as the daily output in winter sometimes exceeds 2,250,000 cubic feet. Some time ago, the workshops were dismantled for the construction of other plant; and at present the fitters, blacksmiths, carpenters, &c., have only



View of the Bridge Carrying the Railway Siding over the Canal.

temporary accommodation. A large block of ferro-concrete workshops which it is hoped will shortly be erected is, however, now under the consideration of the Gas Committee, who have also before them an extensive scheme in connection with coal storage, including a telfer transporter.

An excellent supply of water is raised to an overhead tank by means of compressed air from an artesian well on the works 300 feet deep. A quantity of about 10,000 gallons per hour can be obtained in this way. In concluding the reference to this portion of the day's proceedings, it may be remarked that the accompanying illustrations are reproduced from a souvenir pamphlet which had been prepared in anticipation of the visit of the Association to the gas-works.

THE LUNCHEON.

The party then, on the invitation of the Mayor, sat down to lunch in the station-meter house, which had been decorated for the occasion; and afterwards there was a little appropriate speech making.

The Loyal Toast having been honoured,

Mr. F. W. STEVENSON proposed "The Town and Trade of Smethwick." He expressed the opinion that the prosperity of the borough was assured, owing to the variety of the businesses that were carried on there.

This was responded to by Mr. J. S. ROUND, a member of the Gas Committee, who remarked that Smethwick was now a county borough, and was likely to remain so. At all events, he did not think there was any chance of their being included in the Birmingham extension scheme. The district had developed in a manner which it had taxed the powers of the Local Authority to keep pace with. They were a fairly happy family. The Gas Committee were interested in their officials; and he thought he might say that they got on very well together.

The MAYOR, in submitting "The Midland Association of Gas Managers," said he could assure the members that it was a pleasure to entertain them. He was one of those who believed that a large amount of good was derived from meetings of this character. It was good for men engaged in the same profession to meet together and exchange ideas, and then go home and develop them. If a man was left to merely develop his own ideas in his own office, things would be far more backward than was the case. The knowledge gained by such meetings was very great indeed; and when some local authorities hesitated as to whether it was worth while to allow their officials to attend gatherings of such a kind, they could not realize—as they did in Smethwick—that they would absolutely benefit by the knowledge thus gained by the officials. How could they expect advanced ideas, if men had no chance of meeting together and discussing matters? Though the gathering that day was perhaps more of a social character, it was of a kind which resulted in great good to the community at large. After referring briefly to the history of the Smethwick Gas-Works, he remarked that the Association had honoured Mr. Hughes in making him President, and they had also honoured the town.

The PRESIDENT, in responding, thanked the Chairman and members of the Gas Committee for the hearty way in which they had taken up the matter of this meeting when they learnt that he had been selected as President. He regarded it as a kindness, not only to himself, but to the Association which he represented. The officials of local authorities did not in every town have an opportunity of meeting their *confères*; but in Smethwick they looked upon these things in a way in which he wished they were regarded in every other place. In spite of the smoke and dirt with which it was surrounded, Smethwick was not half a bad place to live in.

Mr. J. H. BROWN next proposed "Kindred Associations," and referred to the remarks of the Mayor as to how such organizations were regarded in Smethwick. Some local authorities, he added, begrudged the expense that they were put to in these matters; but, of course, they were repaid a hundredfold by the benefits which accrued to the gas industry generally. With the toast he coupled the name of Mr. H. Kendrick, President of the Manchester District Institution of Gas Engineers.

Mr. KENDRICK, in reply, suggested that free interchange of opinions between the various Associations by the visiting of members from one Association to another would be a good thing, not only for the individual Associations, but for the gas industry itself. He had long known the Smethwick Gas-Works, and had been much interested in seeing the developments that had taken place the last twenty years. The undertaking reflected great credit, not only on the town and Corporation of Smethwick, but also upon the original Engineer, Mr. Smith, and quite as much on the present Engineer, Mr. Hughes.

Mr. R. O. PATERSON submitted "His Worship the Mayor," remarking that evidently Alderman Goodyear appreciated fully the objects of these meetings. They all regarded it as a privilege to be welcomed by a Mayor who had such sympathetic feelings towards the aims of the Association.

The MAYOR having briefly acknowledged the toast,

Mr. J. F. BELL proposed "The Chairman and Members of the Gas Committee." In the Chairman, Alderman Pinkney, the Committee had, he said, an expert; and it was a good plan to have an expert Chairman. Mr. Pinkney had done much to popularize gas-engines by making certain valuable improvements. Mr. Hughes had stated that they had nothing new to show the members; but they found an up-to-date gas-works where results were obtained that there was reason to be proud of. The gas consumption was growing rapidly; and this was no doubt owing to the liberal way in which the Gas Committee treated the consumers. For lighting and heating purposes, the price of gas varied from 2s. 2d. per 1000 cubic feet to 2s. 7d., less 5 per cent.; while 1s. 6d. per 1000 feet, less 5 per cent., was the rate for power. No less than 30 per cent. of the consumption was sold for power purposes. He congratulated Mr. Hughes on his work. The Association were proud of him, and he believed the Borough of Smethwick were equally as proud of Mr. Hughes as he was of the Gas Committee. The ratepayers of Smethwick had much to be thankful for in regard to the way in which the department was worked.

Alderman PINKNEY, responding, said they were always on good terms

with the officials; and hence the excellent results. They could see, as it were, the foot-prints the late Engineer, Mr. Smith, left behind in connection with the good work that was now being carried on. It was certainly right that they should give Mr. Smith his due; and many of the things the members had seen that day emanated, he believed, from his brain. The Smethwick Gas Committee was a business one; and what they tried to keep in mind was that wherever heat was required gas should be the agent. The Council never begrudged sending the Chairman along with the Engineer to the meeting of the Institution of Gas Engineers; and he had always been able to give a very good report of the work done there. He was most anxious that everything which was good, or even had the appearance of being good, when it was placed on the market should have the assistance of the various gas undertakings. What did it matter if they did drop a little money at first, if the thing was to be ultimately a success? How did they expect, if they themselves were not prepared to take some risk, that other people would spend money? As to gas-fires, they had some good ones; but they wanted a still better one. They had not at Smethwick lost sight of the importance of supplying cheap gas for power and manufacturing purposes. When they considered the advantages of having the portion of the plant which would otherwise be standing idle in the daytime utilized on a reasonable basis which would help to pay interest and sinking fund, the desirability of pushing such consumption as he referred to was manifest. If electricity once got into a works, the trouble was to get it out again. Therefore he said to gas people: "Get a foothold somewhere; and afterwards you can send a representative round, to see if you cannot do a little more."

A DRIVE.

The party were then taken in brakes for a pleasant drive to Warley Park and Abbey. The weather during the afternoon was delightful; and this portion of the day's proceedings was much enjoyed.

THE SOHO FOUNDRY.

The drive terminated at the entrance to the works of Messrs. W. & T. Avery, Limited, the well-known manufacturers of weighing appliances, who had thrown open the celebrated Soho Foundry for the inspection of the Association. Here the members were received by Mr. R. R. Gibbs, the General Manager, and the Branch Managers from Nottingham, Leeds, London, Manchester, Sheffield, and several other places, by whom they were shown over as much of the works as it was possible to see in the all-too short time that was at disposal. We say as much of the works as possible, because it will be readily understood that in a bare hour or so a thorough inspection could not be made of a works covering 25 acres, and employing some 2000 hands. The firm, we believe, have in their service, including all the branches, between 6000 and 7000 employees, which shows that the Soho Foundry, large as it is, only represents a portion of their activity. The visit was one that appealed strongly to the members; for, of course, weighing-machines are practically an indispensable adjunct to the economical manufacture of gas. And such appliances were to be seen in numberless forms and sizes, suitable for all kinds of situations—from analytical scales which turn to 1-1000th part of a grain, up to weighbridges for dealing with 200 tons. Then there were all the memories of Murdoch which are associated with the very old gasholder that was illustrated in the "JOURNAL" for Aug. 24 last, and which is still in use in connection with a Dowson producer gas plant employed for heating and power purposes. It may be recalled that Murdoch carried pipes from these works for supplying gas to his house situated some three-quarters of a mile away. Another feature—still dealing with bygone times—was the old original James Watt engineering shop, the stout oak beams in the roof of which show that in those days it was the custom to do a good deal of lifting by this means. From this to the most up-to-date practice proved to be but a step; for in an adjoining shop attention was drawn to a machine which is being made for the National Physical Laboratory, for taking wax models of ships (say) 25 feet long, which are tested in a tank to see how the best practical results in shipbuilding can be obtained.

Turning to the weighing appliances, it may be pointed out that these are made practically by machinery; and therefore great accuracy is secured, as well as interchangeability. The firm claim to make the best weighing-machine castings in the world; and the excellent finish of the articles on view proved at any rate that there was nothing whatever to complain of on this head. As has already been said, they can provide customers with the means of weighing anything under any conditions; but perhaps the types of appliance that most took the attention of the visitors on Thursday were the automatic weighers and patent totalizers, which will "automatically weigh, register, total, and count all loads without any human interference." These instruments are approved by the Board of Trade under the regulations of the new Weights and Measures Act, and stamped by the Inspectors.

First in this category may be mentioned a weighbridge and totalizer which automatically weighs all the trucks brought upon the platform, and registers the weights upon a special counter, so that the total weight during any period can be immediately ascertained. The number of trucks weighed is at the same time recorded upon a separate counter. A small amount of power is required to operate the mechanism. The machine can be fitted also with Avery's patent printing apparatus, by means of which the individual weights can be printed on a ticket; while another optional addition is an apparatus for automatically preventing the re-weighing of any truckload. A similar machine to the one just noted is designed for an overhead track. It only records the net weight of the material carried, and empty receptacles can be returned over the track without affecting the records. An appliance

which came in for a big share of notice was a hopper weigher and totalizer. It was stated that the Liverpool Gas Company have three of these in operation, and they pay for coal by the records—the weights being accepted by the collieries. The machine consists of the Avery patent totalling mechanism attached to weighing levers which carry a stout hopper large enough to contain the contents of a full grab or skip. A second hopper, supported independently upon a strong girder framework, takes up the shock of the falling coal, and guides it into the weighing hopper below. No feed valves are required; and, in consequence, it will weigh any sized pieces, from nuts to the largest lumps. The contents of each grab load are automatically weighed and registered by the totalling counter. Coke, ore, and other materials can be dealt

with equally as well as coal. A further machine will weigh grain or small coal without power being required—the operation being simply by gravity.

When the time came for leaving the works, the members gave free expression to their admiration of what they had seen; and this feeling of appreciation was embodied in a hearty vote of thanks which, on the proposition of the President, seconded by Mr. H. E. Copp (the Hon. Secretary of the Association), was passed to the firm, and suitably acknowledged by Mr. Gibbs.

The members then returned to the gas-works, where they sat down to tea as the guests of Alderman Pinkney—a function which brought to a close an active and thoroughly successful day.

PUSHING SALES AT WEST BROMWICH.

THOSE responsible for the administration of the West Bromwich Corporation gas undertaking are determined that it shall be through no fault of theirs if the consumption does not go ahead in a satisfactory manner; and so that consumers and prospective consumers shall have every possible opportunity of becoming fully acquainted with the very latest forms of gas lighting, cooking, heating, and other appliances, there has been installed an excellent show-room, of which the accompanying illustration is a photograph, in a central position in the town. It would be difficult to suggest anything that exists for the profitable utilization of gas which is not represented here. In addition to the immense variety of articles that can be seen in the window, there are fitted outside some typical examples of high-pressure lighting, as well as a gas flashing-sign. The show-room has only been opened for about a month; but it has already attracted crowds of people from all over the Midlands, which indicates that its good work will not be confined to West Bromwich. In connection with it, too, a complete system of advertising has been arranged, and most tasteful and elaborate pamphlets have been prepared. While thus drawing attention to what is being done to increase the sale of gas, it will be but fair to remark that this is not the only direction in which activity is being shown at the West Bromwich Gas-Works. As set forth in the accounts, which were referred to in last week's issue, there was in the past year a decrease in the output—doubtless merely a passing phase—amounting to 2.38 per cent., and a falling off of revenue from gas sales to the extent of nearly £1200; but at the same time there was an increase in net profit of something like £800. This is an



A Gas Show-Room of To-day.

excellent result, and it is one on which Mr. Harold E. Copp, the Gas Engineer, is most heartily to be congratulated—for it is striking evidence of the close attention that has been paid to the working.

The Livesey Trust.

The June issue of the "South Metropolitan Gas Company's Co-Partnership Journal" says that the necessary legal matters in connection with the estate of Sir George Livesey having been settled, the special trustees will shortly be in possession of the £15,000 of ordinary stock in the Company bequeathed under the terms of the will. The net annual income receivable, at the present rate of dividend, will be about £771. Under the provisions of the will, there is a charge against this income in respect of annuities during the lives of certain persons, not employees of the Company, amounting to £330 per annum. The trustees, in order to preserve the capital intact, have borrowed the sum of £1952 to pay the legacy duties. Interest on this sum at 3 per cent. amounts to about £59 per annum, and will be a further charge against the income. There will thus be left an annual balance of some £382, subject, of course, to the deduction of any amount that it may be decided to set aside for the purpose of repaying the borrowed money mentioned above.

Photographing by Inverted Incandescent Gaslights.

Our readers are aware that many experiments have been made to use artificial illuminants in photographic practice, either for supplementing daylight or for operation at night. The "British Journal of Photography" for the 27th ult. contains particulars, reproduced from the "Bulletin of Photography," of an arrangement devised by Mr. W. S. Ellis, of Philadelphia (Penn.), for utilizing inverted incandescent gas-burners for the purpose named. Following the line of the windows, he has a range of fifteen burners, a short distance from their tops, and a group of four burners in the centre of the ceiling. It is claimed that they are under instant control, and that the light produced enables the operator to effect upon the ground glass of the camera just the character of illumination he desires to have in the finished picture, also to study light and shade and composition, with the same ease as under the best daylight illumination. According to measurements taken by the Welsbach Company, it was found that the effective illumination on a subject placed in position in the studio approximates that which would be given by a lamp equivalent to 1500-candle power; but with reflecting hoods the intensity is increased

to 1800-candle power. To obtain the same degree of illumination with an electric arc (to say nothing of the superior advantages photographically of the Welsbach burner on account of the purity of the light), at least two lamps would be found necessary; and this would mean considerably more expense for maintenance. The entire cost of the nineteen lamps installed in the Ellis studio is about 6c. per hour while in use.

We understand that the first section of the new experimental high-pressure gas lighting in the City of London, as the result of the visit of the deputation of the Corporation to various Continental cities, will be completed by Wednesday of next week, the 15th inst., just in time for the members of the Institution of Gas Engineers to view the arrangement during their week of meeting in London.

The Law and Parliamentary Committee of the Metropolitan Water Board have authorized the retention of Messrs. E. M. Eaton, H. Rofo, and Walter Hunter as expert engineering witnesses to support the Chief Engineer (Mr. W. B. Bryan, M.Inst. C.E.) in connection with the promotion of the Bill to carry into effect the scheme recently adopted for the future water supply of the Metropolis.

In connection with the proceedings at the meeting of the Manchester Institution of Gas Engineers, as recorded in last week's "JOURNAL," a report of the Committee was given on this matter; and unfortunately two errors crept into the remarks of the President (Mr. H. Kendrick) which followed it. The statement made was: "The President added that one other suggestion had been made which did not altogether meet with approval on the part of the Juniors. This suggestion, which came from Professor Dixon himself, was that it should be a qualification for admission to the classes that members hold a full class certificate in gas engineering or a full technological certificate. He thought it was likely the Juniors' Sub-Committee would view such a proposition with favour, but that the others would not." The suggestion really was that it should be a qualification for admission to the classes that members hold a first-class certificate in gas engineering or a full technological certificate; while the President thought it was not likely the Juniors' Sub-Committee would view such a proposition with favour, but that the others would.

GAS-WORKS EXTENSIONS AT LEIGH-ON-SEA :

A REINFORCED CONCRETE GASHOLDER TANK.

By CHARLES F. HUNT, Assoc.M.Inst.C.E.,

Assistant-Surveyor to the Leigh-on-Sea Urban District Council.

[A Paper read before the Incorporated Association of Municipal and County Engineers.]

The Urban District Council acquired the gas-works in 1899, when the output was about 4 million cubic feet per annum and the price of gas 5s. per 1000 cubic feet. In 1907, when the works could not cope with the rapidly increasing demand, the Council sought the advice of an expert, and on the lines of his report subsequent extensions have been carried out. In 1906 there was an increase of 23 per cent. in the output compared with 1905. It was estimated that in 1909 an output of 20·3 million cubic feet would be attained. Actually it was more than 23 millions—thus exceeding the estimate by about 3 million cubic feet.

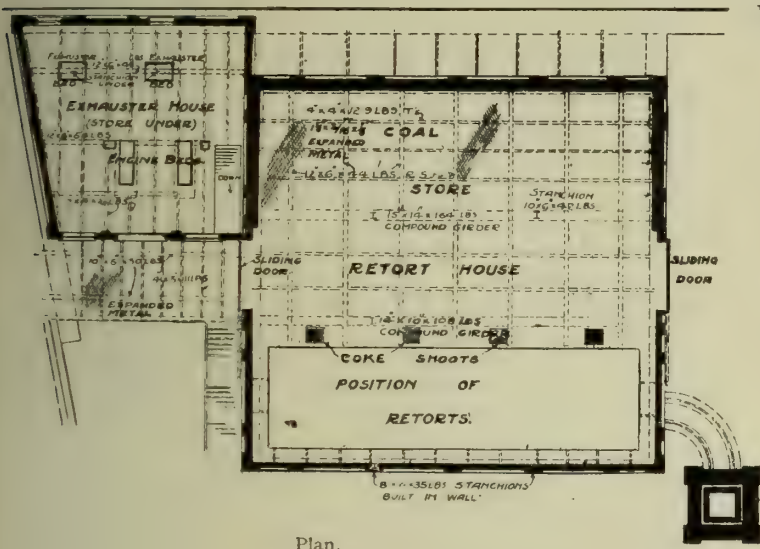
The Council have been greatly hampered by the lack of sufficient storage accommodation; and this in the past has rendered it necessary to buy gas from the Southend Gas Company. To remedy this, a two-lift gasholder of 160,000 cubic feet capacity has been begun, the tank of which is more particularly referred to later. The progress of the works has thus exceeded the highest

expectations, and with the rapid growth of the district the increase will, no doubt, be maintained generally.

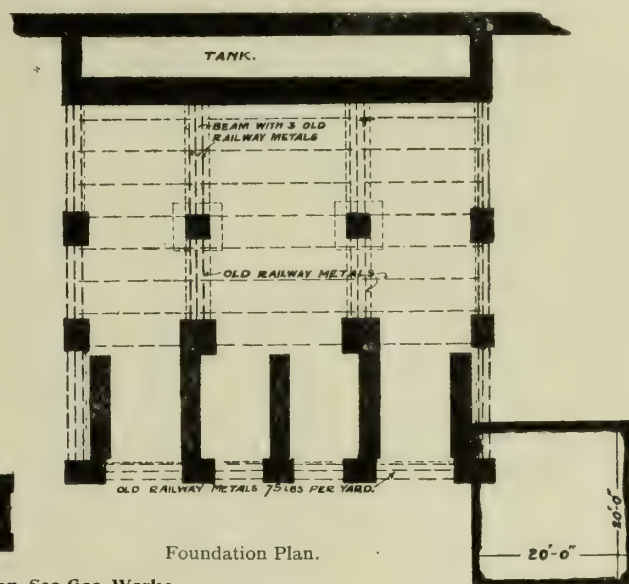
The site of the extensions was to the west of the old portion of the gas-works, and formed part of the foreshore. The level of this was some 8 feet below that of the older portion; and before carrying out the extensions it was necessary to reclaim the area required. This was done by the construction of a mass concrete sea-wall carried down through about 10 feet of soft mud to the boulder clay. The wall has an average height from base to top of about 20 feet. At the top it is 2 ft. 6 in. wide, and 3 ft. 6 in. at ground level. The portion below ground is vertical; but above ground it has a curved face and vertical back. It is stiffened with buttresses at distances of about 18 feet. The total cost of the wall was £550.

In designing the buildings, consideration was given to the fact that the site is overlooked by residential property, and from the Marine Parade Recreation Ground at the top of the hill. Building operations are likely to extend in this direction in the future; and an endeavour was made to give some architectural character to the buildings, so as not to be offensive to the eye. The turret was adopted, having in mind its use for ventilation purposes.

Having regard to the depth of the soft mud overlying the boulder clay, it was decided to adopt concrete pier foundations for the buildings, and to carry the walls from pier to pier by old railway metals. The walls were then carried up in concrete to the level of the charging-floor of the retort-house; and the



Plan.



Foundation Plan.

The Retort-House at the Leigh-on-Sea Gas-Works.

foundations of the retorts were taken down to the boulder clay. The south wall foundation, in view of the weight of coal which will come upon it, was made continuous.

The basement floor was partly supported on the wall and on stanchion foundations by beams formed of steel rails and concrete, which project below the under side of the floor; and the floor itself was stiffened with old rails. The foundations are of Thames ballast concrete, in the proportion of 10 to 1; with walls of the same material, but in the proportion of 8 to 1. Rolled steel joists are embedded in concrete over all openings.

The charging-floor is constructed of 12 in. by 6 in. joists, fixed 6 ft. 11 in. centre to centre, carried on two compound girders—one 15 in. by 14 in. by 164 lbs. per foot run, and the other 14 in. by 10 in. by 108 lbs. per foot run—which are supported respectively by 14 in. by 6 in. by 57 lbs. and 10 in. by 6 in. by 42 lbs. stanchions. The intermediate members in the floor are 4 in. by 4 in. by 1½ in. tees; and the whole is reinforced with expanded metal 1½-inch mesh with ⅜-inch by ⅜-inch strands. The floor, which is 10 inches thick, is of 6 to 1 Thames ballast concrete, and is finished with 1-inch granite grit and cement in the proportion of 3 to 1. The need for a strong floor is evident when it is considered that storage for 200 tons of coal was required. It was in consequence of this that the south wall foundation was made continuous; and advantage was taken of its position with regard to the sea-wall to form a tank the whole length of the retort-house, to which all surface water is drained.

The aim in the construction of the roof of the retort-house has been to avoid the use of small members in the steel constructional work on account of corrosion, and to keep to larger sections which will not be affected to so great a degree. It was therefore decided not to use the ordinary type of roof with small tie-rods, but to adopt stanchions and girders. It was considered the best policy to keep the walls as light as possible, and to carry the weight on stanchions built in the walls. A ventilating lantern of 3 in. by 3 in. by ½ in. tees, with louvres on each side, runs the whole length of the building; and a turret with ventilating louvres is built over the retorts. A flat is constructed in the roof to receive a tank, whence a supply-pipe is taken to a pipe in the basement, to be used for sprinkling the coke. The roof tank has not yet been installed; but a pump is in position in store under the exhaustor-house for the purpose of filling it, when it is fixed, from the tank under the gangway.

On the south side, facing the water, openings have been left

in the wall for coal-hoppers, in readiness for the time when the Council abandon hand labour and adopt a crane for dealing with coal and coke. Openings have been left in the gangway for dealing with material from the basement. Communication between the old part of the works and the extensions is obtained by a bridge formed of steel joists and concrete, and paved with 4-inch cube Bollington setts. The floor of the exhaustor-house is of Thames ballast concrete and steel girders, which are supported on stanchions and the engine-beds, which are taken down to the boulder clay.

The plant at present consists of three sets of eight retorts; four 25 ft. 6 in. by 3 ft. 6 in. condensers, fitted with wing-valves; two exhaustors, each capable of dealing with 12,500 cubic feet of gas per hour at 130 revolutions per minute; one tower washer, 6 feet diameter and 30 feet high, with liquor pump; one washer scrubber, of a capacity of 400,000 cubic feet; and two 12-foot square purifiers.

The power is supplied by a Cornish boiler, 14 feet long and 4 ft. 6 in. diameter, working at a pressure of 60 lbs. per square inch, driving an 8 B.H.P. engine, with another similar engine in reserve.

In the design of the chimney, a departure has been made from the usual practice of having the offsets inside, by forming them externally of blue Staffordshire plinth bricks—thus making them a prominent feature. This and the pilasters break up what would otherwise be a somewhat bald surface, and give light and shade. The foundation is taken well into the boulder clay, and is formed of Thames ballast concrete mixed in the proportion of 12 to 1. It is 20 feet square and 8 feet thick. The shaft is 76 feet high from the bottom of the flue, and is lined with fire-brick to a height of 30 feet.

The cost of the retort and exhaustor houses was £2359, or at the rate of 4·5d. per cubic foot; the total cost of the works being £6220.

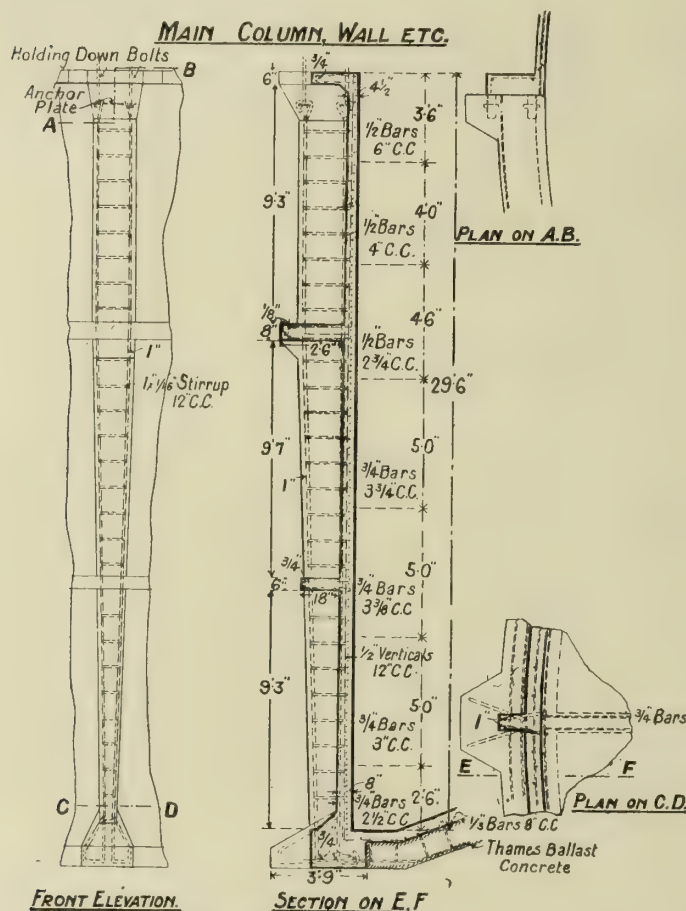
REINFORCED CONCRETE GASHOLDER TANK.

When the Council decided to construct a gasholder with a steel tank, it was reported by the Surveyor to the Council (Mr. J. W. Liversedge, Assoc.M.Inst.C.E.) that, as the ground was impregnated with salt water, a steel tank would have to be protected with concrete to prevent corrosion. The cost of this would have been very high; so that, in the circumstances, it was decided, on the recommendation of the Surveyor, to put in a reinforced concrete tank. Having in view the fact that most of the systems are

subject to patent rights, tenders and designs, in accordance with general plans and particulars prepared by the Surveyor, were invited from firms making this class of work a speciality. The selected design was amended in accordance with the requirements of the Surveyor, and the resulting scheme is described in this paper.

The tank is 64 feet diameter and 29 ft. 6 in. deep; and it has a capacity of about 540,000 gallons. The maximum stress allowed on the steel is 11 tons per square inch, disregarding the inward pressure of earth. It was held that this neglect of earth pressure was advisable in this case, because in any future extensions to the retort-house (which extensions will most certainly be required) the removal of earth from part of the tank wall will in all probability be unavoidable—thus leaving the tank without support on one side at least.

The general design of the tank is as follows: A foundation slab of 5 to 1 Thames ballast concrete, 12 inches thick, is laid over the site of the tank to within 7 inches of the inside face, to distribute the weight evenly, and to provide a firm, clean surface on which to lay the reinforced floor slab, which is 6 inches thick. The weight of the wall and the main and secondary columns is carried by a circular beam 2 ft. 3 in. wide by 1 ft. 6 in. deep, which is reinforced by three $\frac{3}{4}$ -inch rods. The wall itself is 8 inches thick at the base, and tapers to $4\frac{1}{2}$ inches thick at the top, immediately under the balcony.



Details of Reinforced Concrete Gasholder Tank at Leigh-on-Sea.

The reinforcement consists of $\frac{3}{4}$ -inch bars, spaced $2\frac{1}{2}$ inches centre to centre at the bottom to $3\frac{3}{4}$ inches at 17 ft. 6 in. above floor level. Above this height $\frac{1}{2}$ -inch bars, spaced $2\frac{3}{4}$ inches to 6 inches centre to centre, are used. For the whole height of wall, vertical $\frac{1}{2}$ -inch rods are used at 12 inches centre to centre. The $\frac{3}{4}$ -inch bars have 4-foot lap, and the $\frac{1}{2}$ -inch bars 3-foot lap.

The main columns, of which there are nine, carry the standards to the guide-framing. At the top (for the purpose of giving room for holding-down bolts) they are set out with the vertical rods 19 inches centre to centre radially, 15 inches circumferentially. The columns are vertical down to the ground line, below which they taper both ways to 12 in. by 8 in. immediately above the circular foundation beam. The reinforcing rods are 1 inch, and one pair is shaped and turned outward to form a shoe to spread the load over a greater area of ground. This arrangement is shown in the detail drawing, as is also the method of connecting the holding-down bolts to the reinforcing rods.

The secondary columns, of which there are eighteen, are placed to correspond with the channel guides, which are fixed to the inside face of the tank—thus materially stiffening the wall at these places. These secondary columns project 12 inches from the outer face of the tank, and are reinforced by two $\frac{3}{4}$ -inch bars. Belts 6 and 8 inches deep encircle the tank at 10 and 20 feet approximately above the floor level inside. They are reinforced by two $\frac{3}{4}$ -inch and $\frac{7}{8}$ -inch bars. At the top of the tank a balcony, with a projection of 18 inches, is constructed, reinforced with $\frac{3}{4}$ -inch bars, and widened at the main columns where the guide-

framing standards will be fixed. Stirrup-irons are fixed in the belts and balcony 12 inches centre to centre.

In the floor are beams which radiate from the centre to the main columns. They are 9 inches wide by 12 inches deep, and are reinforced by two $\frac{3}{4}$ -inch bars and stirrups fixed 12 inches apart. At the centre, these beam-rods are tied to a 1-inch ring.

The valve-chamber is constructed with walls 8 inches thick at the base, reducing to $4\frac{1}{2}$ inches at the ground level. The chief point of interest is the thickening of the tank wall by 4 inches, and the provision of $\frac{1}{2}$ -inch bars at distances varying from 4 to 5 inches centre to centre. This will resist any tendency of the tank wall to act as a beam, instead of as a boiler shell, between the rigid abutments of the tank wall.

The method of fixing the inlet and outlet pipes is shown in the drawings.

Each consignment of ballast and sand was tested on arrival; the amount of voids being 40 per cent., on an average. There was very little variation in this; the ballast being of a very even quality, with no material over $\frac{3}{4}$ inch. The sand was not washed after arrival unless found to contain more than 10 per cent. fine stuff after shaking in a test-tube with a fixed proportion of water. The sand was of even quality, and needed no washing generally. The 10 per cent. of fine stuff was not considered to be all loam, but to contain very fine sand. Tests were made with sand washed after being received and sand unwashed, and the difference in the time of setting was practically nothing.

The cement used in the work was "Ferrocrete." For the first portion of the work, where quickness was a consideration, owing to the wet weather and the nature of the ground, a quick-setting kind was used; but later a slower cement was adopted. The special feature of this cement is its soundness; for, as the name indicates, it is made primarily for reinforced concrete works. It is specially finely ground. Some time before the work was commenced, test cylinders of various thicknesses—viz., 8, 6, and 4 inches—were made and put under pressure from a head of water of 30 feet, and kept so for a considerable time. For a short time they sweated, but soon became bone dry. The concrete, in the proportion of 1 of cement, $1\frac{1}{2}$ of sand, and 3 of ballast, was mixed by hand, and was turned over twice dry and twice wet. It was mixed wet, and when put in the walls was well worked between the bars with thin rammers.

The walls were carried up in 3-foot lifts, except at the belts. In joining up new work with work previously executed, the old face was hacked rough, and well grouted with neat cement grout. When the work of excavation was proceeded with, the boulder clay was found at a higher level than was anticipated; and advantage was taken of this to avoid a considerable amount of excavation by leaving a dumpling in the middle, in place of the flat bottom originally intended. The dumpling was shaped out, and the 12-inch foundation slab was put in, formed of Thames ballast and cement in the proportion of 5 to 1—radiating channels being left for the beams. The column bars, beam bars, and the three bars in the circular beam were then put in with concrete under them. The circular beam was brought up to the level of the top of the foundation slab. The floor slab and the radiating beams were then put in with $\frac{3}{4}$ -inch bars at 8-inch centres circumferentially and radially, embedded in the former. These bars overlap the radial beams by about 1 ft. 6 in.; thus getting a good bond between the various sections of the floor slabs.

The whole of the bars used were of indented steel, with an elastic limit of 22 tons; an average of three tests giving 22.29 tons per square inch. The chief difficulties met with in carrying out the work were connected with the railway on the north side and the sea-wall on the south. To cope with the first, four concrete buttresses were put down before the work on the tank itself was commenced. The buttresses were 9 feet from back to front, 5 feet wide on the front face, and 2 ft. 6 in. at the back. They are reinforced with a 1-inch steel rod at the back, and have pot-holes to form a heel to resist any sliding tendency.

Bolts were fixed in readiness for attaching walings when the work of excavation to the tank was proceeding. This was done; but the pressure on the walings was such that the bolts drew out. This was due to the abnormally wet weather, resulting in an accumulation of water behind the timber; and it necessitated cutting holes in the buttresses to receive the ends of the walings. In such a position as this, no risks were permissible; and to make assurance doubly sure, further strutting was put to the walings between the buttresses. When the wall reached the height of the struts, and filling had been put in and well watered and rammed, they were removed. The removal was effected without any movement of the material behind the walings.

During the progress of the work close observations were made in the following manner: A line was run through approximately parallel to the face of the buttresses, and measurements were taken from time to time. These proved that the buttresses were absolutely stationary. Levels and measurements were taken on the railway every day, generally twice a day, and no movement of any importance was found. The whole hillside in the vicinity, and indeed for miles east and west, is of material difficult to deal with; and in wet weather, such as prevailed during the time the work was in progress, it is very treacherous. The sea-wall is founded on the boulder clay, approximately at the level of the tank bottom (the inside level). To guard against any movement, extra buttresses were put in, and the existing manhole and buttresses underpinned. This, combined with the strength given to the wall by its curved shape acting as an arch, was ample.

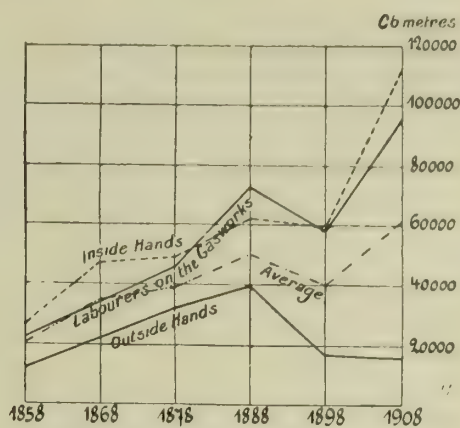
MR. KÖRTING ON THE INDUSTRIAL DEVELOPMENT OF THE GAS INDUSTRY.

The following is a summary of the contents of an article by Mr. E. Körtling, the General Manager of the Imperial Continental Gas Association's Works in Berlin, on the "Industrial Development of the Gas Industry," published in the May number of "Technik und Wirtschaft," which is a monthly supplement to the "Zeitschrift" of the Association of German Engineers.

It is evident from the fact that in Greater Berlin there are about 618,000 gas-meters and only 49,000 electricity meters, that gas supply is much more general and popular than electricity supply. Nevertheless its existence is so uneventful that it scarcely attracts the attention of the general public. This is partly due in Germany to the fact that gas-works in most cases belong to the municipalities, while the large electricity companies, with the opportunities which they afford for speculation in shares, constantly receive notice in the Daily Press. Recently, however, the newspapers of Rhenish Westphalia have become interested in gas supply, because of the attempts to dispose of coke-oven gas in the towns. Some towns have already undertaken to buy coke-oven gas. Essen pays 10½d., and Mulheim 1s. 0¾d., per 1000 cubic feet for it. These extremely low prices have led the Daily Press to believe that a golden age of cheap gas supply is commencing. But this view is based on wrong premises, because the cost of the gas in the holders is only a part of its total cost. For instance, the Municipal gas undertaking of Berlin incurs about 1s. per 1000 cubic feet in various expenses after the gas leaves the holders. Comparison with the cost of current shows that the same conditions prevail in a similar business. High tension current may be had in the immediate vicinity of the Berlin electricity works, in bulk for power purposes, for 0.6d. per unit, whereas customers are charged 4.8d. per unit for current for lighting purposes in order that the electricity works may pay its way and earn a small profit.

Having regard to the immense industrial interests concerned, it may be useful to discuss the limiting point at which it will pay a large gas-works to buy coke-oven gas. Reference must first be made to the advances which have been achieved from the technical side in the modern gas industry. There has been continuous development since the invention of the gas-fired setting about 35 years ago. The direct-fired settings which had previously been in use consumed a great deal of coke, and afforded irregular distribution of the heat in the setting and insufficiently high temperatures. These faults were rectified by the introduction of gaseous heating of the settings and the recovery of a great part of the heat of the flue gases by means of regeneration. The consumption of coke was reduced gradually from 24 to 12 per cent. of the weight of the coal carbonized. The make of gas was at the same time increased by reason of the higher heats; but the latter involved certain ill-effects, which were afterwards avoided by completely filling the retorts with coal so that the gas passed through the zone of high heat at a great velocity. Retorts which were set vertically could most readily and certainly be completely filled; and they had the further great advantage that after carbonization was complete they could be used as natural water-gas generators, and a considerable increase in the make of gas obtained by the introduction of some steam into them. Carbonization in the completely filled vertical retorts resulted in the yield of ammonia being greater than in the half-filled horizontal or inclined retorts. It increased from 0.24 per cent. to 0.34 per cent. by weight with Westphalian and English coals; while there was still further an increase in the production of tar from 10 per cent. to 20 per cent. concurrently with a great improvement in its quality. The coke, moreover, became denser, harder, and larger. Endeavours to reduce wages were made in two different directions. The manual work of the stoker was displaced, on the one hand, by charging and discharging machinery, and, on the other hand, by utilizing the force of gravity, as in inclined and vertical retorts. With the old direct-fired settings, about 53,000 cubic feet of gas were made in 24 hours per man working for a shift of eight hours; so that the wages paid amounted to 16s. 6d. per 24 hours. On the other hand, with ten modern vertical retort settings, six men, receiving 33s. wages, can in 24 hours produce 2,331,000 to 2,684,000 cubic feet of gas according to the description of coal carbonized. Thus, with modern vertical retort settings, the wages amount to 0.17d. per 1000 cubic feet, whereas with the old direct-fired setting the wages amounted to 3½d. per 1000 cubic feet.

The retort-house cost of gas in a town in the coal districts may be computed for both the old type of horizontal direct-fired retort settings and the modern vertical retort settings on the assumption that the former yielded 10,765 cubic feet of gas per ton of coal, and consumed as fuel coke equivalent to 24 per cent. of the weight of coal carbonized, while the latter yield 13,280 cubic feet of gas per ton, and have a corresponding fuel consumption of 12 per cent. In both cases coal and coke are taken at 12s. per ton, wages at 5s. 6d. per man per shift, tar at 20s. per ton, and ammonia at £30 per ton. It will then be found that the net cost of gas with the old settings is 8½d. per 1000 cubic feet, and with the new settings 1.8d. If coal and coke are taken at the higher price of 20s. per ton, the net cost of 1000 cubic feet of gas works out at 1s. 1½d. and 5d. respectively for the two types of



The Curves for Labourers and Outside Hands refer to ten times the quantity of Gas shown

Make of Gas per Man per Annum.

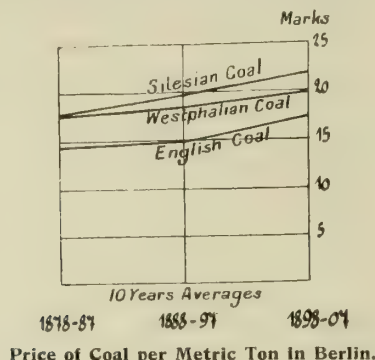
[1 Cb. metre = 35.316 cubic feet.]

settings. A small allowance should, however, be made for the increased interest and depreciation charges in the case of the vertical retorts. Referring to a diagram—which is identical with fig. 3 accompanying the translation of Mr. Körtling's Presidential Address to the German Association of Gas and Water Engineers last year on p. 38 of the "JOURNAL" of July 6, 1909—the author points out that the make of gas has increased per labourer employed on the gas-works in much the same proportion as per stoker engaged in the retort-house. If, however, all the other gas-works' charges and expenses, including coal and coke handling, boiler-house, power plant, and purification wages, supervision, &c., are added to the 1.8d. net retort-house cost of 1000 cubic feet of gas, the total will still remain well below the amount charged for coke-oven gas in the cases already mentioned. The carbonization of the coal at the coal-fields cannot make coke-ovens economically superior to gas-works, for it will be seen that, properly considered, not one penny would be saved in freight, since in the absence of gas-works the same number of railway waggons would be required to convey the coke for household use to the town as would have conveyed the coal to the gas-works. At the present time, the plant used for handling materials on gas-works is superior in design to the coal-preparing and coke-handling plant of the coke-works. As a rule the gas-works can supply coke more cheaply than the coke ovens. It may be contended that the whole capital cost of the gas-works would be saved if the supply of gas were taken from coke-oven works; but this contention is only tenable to a very limited extent. An old rule apportioned one-third of capital expended to the gas-works, one-third to gasholders, and the remaining third to the distributing system. But the cost of the holders and distributing system would not be saved by the use of coke-oven gas; and the interest on the capital expended on the works is equivalent to only 2½d. per 1000 cubic feet of gas made. Moreover, the town which gave up its gas-works entirely would be at the mercy of the coke-oven works, which would then be able to dictate its own terms. Only by maintaining its gas-works, even though they were kept idle, would a town be able to buy coke-oven gas at moderate prices. Even now it is said that the Westphalian coal producers contemplate raising the price of gas coal to gas-works in the neighbourhood of the coal fields in order to force the towns to buy coke-oven gas.

Having regard to the very large and increasing number of gas consumers, it is most important that there should be no risk of interruption in gas supply. At present, in Berlin, for instance, there are half-a-dozen gas-works scattered over the district supplied, each having a store of coal sufficient for several weeks, and each with its trustworthy staff of foreman and workmen. Further, in many cases there is an installation of water-gas plant by which, in case of need, carburetted water gas can be made at a moment's notice. Such security as these provisions afford against interruption of gas supply would not be ensured if the gas were obtained from a single coal mine, the equipment and workmen of which would not be under the control of the town supplied with the gas. The author, therefore, comes to the conclusion that there would be no real saving in the cost of installation if coke-oven gas were consumed in towns, and that the price of such gas per 1000 cubic feet would not be lower than that at which gas is made at the large gas-works. His view is, he says, supported by the report in the "JOURNAL OF GAS LIGHTING" of Jan. 25 last, p. 221, that a colliery has undertaken to supply coke-oven gas to a municipality (and to erect a complete gas-works as a reserve in case of failure of the supply of coke-oven gas); but the price in this case is not to be 10d. or 1s. 1d., but only 7d. but 1000 cubic feet. The author can only suppose that the colliery has an interest in disposing of its gas so cheaply, as it would appear to be far more advantageous to burn the gas in large gas-engines and distribute electrical energy at high voltage. It must be remembered that the distribution of gas to a distance under high pressure is already being carried out in many cases; but careful calculations have shown that pressures of several atmospheres which would enable very small pipes to be used are impracticable, and that the limit is in practice the comparatively low pressure of 60 inches of water. This means

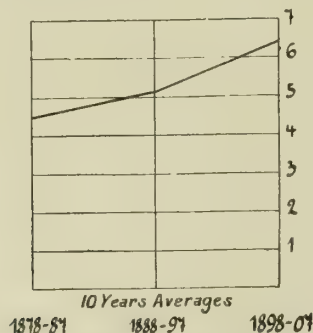
the use of pipes of considerable diameter if the distance is great, and an outlay of tens of thousands of pounds. In any case, it is not clear economically why towns should pay 10d. to 1s. 1d. per 1000 cubic feet for coke-oven gas. In considering the large capital outlay entailed on the plant of a modern gas-works, regard must be paid to the attitude of the social democratic party. It may be pointed out that in Italy, where Socialism is already highly developed, gas workers have rendered the introduction of improved plant almost impossible. In Genoa, for instance, 17 men are required per 24 hours to attend to 60 vertical retorts, whereas in Berlin 6 men attend to 120 or 180 vertical retorts, according as they are in settings of 12 or 18 retorts.

The author believes that, provided proper guarantees are obtained, there are advantages in gas supply being in the hands of private undertakings, as they are naturally better adapted for active business propaganda than the more bureaucratic municipal management. While it does not appear that the purchase of coke-oven gas would be of advantage to the gas industry, it may be useful to consider, by reference to the accounts of gas undertakings, whether there is a prospect of a reduction in the price of gas. It will be seen from fig. 5 on p. 39 of the "JOURNAL" for



[1 mark per metric ton = 12'2d. per English ton.]

July 6, 1909 [here reproduced], that the price of coal in Berlin has continually risen the last thirty years. The price of coke on the other hand, has not always risen, but has frequently fallen. During the last fifteen years in particular, the great expansion of gas consumption per head of the population has naturally increased the supply of coke per head, and has thereby caused the price to fall. As a result, notwithstanding all improvements in working, the cost of production of gas has risen, though the increased make per ton, and the diminished yield of coke due to the production of water gas in retorts, has tended to retard the increase. The continuous rise in the cost of gas in Berlin is shown in the following diagram.



Cost of Gas, including Capital Charges, at the Berlin Municipal Gas-Works—Pfennigs per Cubic Metre.

[1 pf. per cubic metre = 3'4d. per 1000 cubic feet.]

The author proceeds to give an analysis of the cost of gas at the Municipal works of Berlin for the year 1908-9. He points out, however, that the price of coal—viz., over 20s. per ton—was extraordinarily high in that year, and consequently affected the results unfavourably; while with such a large and old-established plant, all the latest improvements in apparatus have not yet been adopted. The costs per 1000 cubic feet of gas made are: For coal, less receipts for bye-products and purifying material, 8½d.; for wages, 3d.; for repairs to settings and apparatus, 1½d. In addition to these costs, there are charges aggregating 1s., which would be incurred even if coke-oven gas were bought by the gas-works, as they refer to items set out in detail—such as maintenance of buildings, mains, insurance, salaries, private and public lighting services, and various expenses. These figures make up a total cost of 2s. 1½d. per 1000 cubic feet; while the receipts, after deduction of the gas sold for public lighting, the unaccounted-for gas, and the works' consumption, amount to 3s. 1½d., leaving a profit of 1s. 0½d. per 1000 cubic feet. This corresponds to a dividend of 6 per cent. per annum on the capital outlay, which cannot be regarded as high if all the facts connected with the supply are taken into account. It may be said that the price of 3s. 6d. per 1000 cubic feet actually charged to gas consumers in Berlin is not excessive, and that consequently the use of gas has extended very greatly. In the coal districts

and on the coast where cheap English coal is available throughout the year, gas should be made in the large works at a total prime cost of 1s. 5d. to 1s. 8½d., which, with an allowance of 1s. 1½d. to 1s. 5d. for depreciation, interest, and a small profit, would bring the price of gas up to 2s. 10d. to 3s. 5d. per 1000 cubic feet. Amsterdam may be quoted as an example, as it lies between the English and Westphalian mines, and therefore has a constant good and cheap supply of coal. Some ten years ago, the price of gas was reduced from 4s. 3d. to 3s. 3d.; and as a result, the gas consumption has increased by 152 per cent., and the number of meters in use from 29,232 to 97,343.

The author next points out that, in addition to a low price of gas, it is necessary for the extension of business in gas supply that there should be very active propaganda upon commercial lines with a view to securing consumers. He refers to the provision of fittings and prepayment meters, and mentions that the interest and redemption charges on the outlay of 10s. per head which the prepayment meter system entails in London are covered by a small supplement to the price charged for gas. Great Britain stands, he says, as a pattern in regard to sound industrial conditions in the gas industry. The Scotch towns, for example, do not take any net profit except the interest and redemption charges on capital outlay. The same condition is secured in London by the sliding scale, the several provisions of which the author proceeds to explain. The prices which prevail for gas are very low, and the consumption is very high. For instance, last year 47 places in Great Britain showed a consumption of 7000 to 10,500 cubic feet of gas per head of the population; whereas in Germany very few towns had over 3500 cubic feet. In Berlin, in 1909, the consumption was 5400 cubic feet per head. Owing to the higher prices of coal it can scarcely be hoped that the price of gas in Germany will be reduced to the British level, but Berlin may be taken as an example of what can be accomplished in Germany. Most towns, however, cannot afford to dispense with the profits from their gas-works. But in regard to the cost of lighting, the extraordinary improvement in gas-burners has effected a very great reduction, notwithstanding the comparatively small change in the price of gas. In the course of fifty years, the cost of 500 candle-hours has fallen to about one-twentieth of its original figure. Consequently gas has become available to the working classes; and as a result there has been a great reduction in the imports of petroleum into Germany. In England, the prepayment meter has spread to an enormous extent. For instance, in Greater London last year with about 8 million inhabitants, there were 539,611 ordinary and 806,235 prepayment gas-meters in use. Berlin has now approximately the same proportion of meters in relation to the population as London, but most German towns are far behind it.

The author finishes his interesting paper with the following general conclusions:

- (1) The gratifying improvement in gas-works' working has enabled economies to be effected, notwithstanding that the prices of coal, coke, tar, and ammonia have moved unfavourably. Heavy manual labour has been almost entirely displaced by machinery, so that the ideal condition is more nearly attained when a few selected foremen and workmen will do all that is required.
- (2) Gas consumption is still susceptible of very considerable development if prices and propaganda are established on commercial lines. Gas supply, like water supply and drainage, makes for the general welfare of the population of towns, and even to some extent of villages.

THE EXTRACTION OF SULPHUR COMPOUNDS FROM COAL GAS.

By RAYMOND ROSS, F.I.C., F.C.S., and JOSEPH RACE, F.I.C.

In the "JOURNAL" for April 5 (p. 41), there appeared an abstract of a paper on "The Extraction of Sulphur Compounds from Coal Gas," read the previous Friday before the Manchester Section of the Society of Chemical Industry. The authors—Mr. Raymond Ross, F.I.C., F.C.S., and Mr. Joseph Race, F.I.C., are in the Public Analyst's Office, Burnley. The text of the paper is given in the current issue of the Society's "Transactions," and so is available for our columns, under acknowledgment, which we have pleasure in making.

Some time ago, the Chairman of this Section (Mr. R. H. Clayton) brought to our notice an apparatus used by the United Gas Improvement Company, of Philadelphia, for the control of oxide purification by means of the iodometric titration of the sulphur contents of the gas.

The apparatus consists of a modified Bunte burette, in which a given volume of gas is titrated with an iodine solution, each c.cm. of which is equivalent to 100 grains of sulphuretted hydrogen per 100 cubic feet of gas. Certain inaccuracies evidently attended its use, as the patentees point out that even with gas entirely free from sulphuretted hydrogen, an appreciable amount of iodine solution is required to colour the starch solution a permanent blue. To overcome this, they recommend that "a certain constant, previously determined on each fresh bottle of starch solution, should be subtracted from all readings."

Having by a series of determinations confirmed the fact that these discrepancies existed, and further found that they were not constant, but variable, we endeavoured to elucidate the true cause of them. It was, of course, perfectly evident from the first that they could not be due to the starch solution, and therefore that they must be due to a constituent of the gas other than sulphuretted hydrogen that was present in varying quantities.

Determinations of the amounts of iodine solution acted upon by coal gas and carburetted water gas, after deduction of the total sulphur as determined by the Referees' test, showed that the latter contained more gases which acted on the iodine solution than did coal gas. This is clearly shown by the following figures.

| | Coal Gas. | Carburetted Water Gas. |
|--|-----------|------------------------|
| Iodine test, H ₂ S in grains per 100 cubic feet | 5.3 to 22 | 98.4 to 166.8 |
| Referees' test, sulphur in grains per 100 cubic feet | 6 to 8 | 6.6 to 9.3 |

The coal-gas figures are on the purified gas and the carburetted water-gas figures on gas which had passed the scrubbers and washer.

From these figures it is obvious that the difference in absorption is not due to sulphur compounds. We, however, thought it advisable to determine to what extent, if any, iodine solution is acted upon by various substances known to be present in illuminating gas and which, from their chemical constitution, might be expected to react with this reagent.

Ethylene.—Pure ethylene when treated with an excess of N/100 iodine solution was practically unacted upon. With strong iodine solution (in potassium iodide) it was very gradually absorbed, forming ethylene di-iodide; but weeks were required to complete the reaction.

Acetylene.—This gas when shaken for 15 minutes with N/100 iodine solution showed no appreciable absorption. After twelve hours, the amount was only equivalent to 52.8 grains of sulphuretted hydrogen per 100 cubic feet, or 0.08 per cent. by volume of acetylene, assuming acetylene di-iodide to be formed.

Benzene, carbon bisulphide, and thiophene did not react with either N/10 or N/100 iodine solution.

Mercaptans have been shown to react quantitatively with iodine solution; but their absence in any but the most minute quantities is proved by the small amount of total sulphur found by direct determination. With a view to determining the nature of the reacting substance, gas was passed through various reagents—including potassium hydrate, Nordhausen sulphuric acid, and sulphuric acid. By the two former, all the reacting substance, and by the latter nearly all, was removed. For the purposes of this experiment, the gas was bubbled slowly through the selected absorbent. The natural deduction from these experiments is that the substance in question is a hydrocarbon so unsaturated as to react easily with dilute iodine solution in the cold.

An attempt to procure some of this hydrocarbon (mixed with others) was made by passing gas through tubes surrounded by a freezing mixture, but without success. Resort was, therefore, had to the formation of bromine compounds in the following manner: Partially purified gas, from which most of the sulphuretted hydrogen had been removed, was passed into bromine covered with water until all the bromine was decolorized. The oily liquid produced was washed with dilute sodium carbonate solution, then with water, and finally dried over calcium chloride. The first 50 c.c. obtained in this manner were fractionated under atmospheric pressure, but some decomposition undoubtedly took place. The principal fraction gave on analysis the following result:—

| | |
|--------------------|--------------------------|
| Fraction | 110–120° C. Per Cent. |
| Carbon | 30.44 |
| Hydrogen | 3.65 |
| Bromine | 65.90 |

from which no definite conclusions can be drawn.

A further quantity of the oil in question (200 c.cms.) was fractionated under reduced pressure (about 200 mm.); and the table below gives the results obtained.

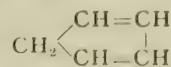
| Temp. C. | Pressure Mm. | Sp. Gr. at 15.5° C. | Refractive Index N _D at 20° C. | Bromine, Per Cent. | Molecular Weight. |
|---------------|-----------------|---------------------------|---|-----------------------|----------------------|
| 68–70 . . . | 230 | .. | 1.50838 | .. | .. |
| 80–84 . . . | 210 | .. | 1.51532 | 65.04 | 204.5 |
| 87–89 . . . | 190 | 1.780 | 1.52388 | 72.2 | 183.4 |
| 91–95 . . . | 190 | 1.883 | 1.52772 | 76.01 | 207.2 |
| 96–99 . . . | 200 | 1.951 | 1.53039 | 103.0 77.2 | 205.3 |
| 93–99 . . . | 180 | 1.981 | 1.53125 | 79.9 | 201.0 |
| 99–108 . . . | 190 | 1.999 | 1.53321 | 79.88 | 211.2 |
| 108–120 . . . | 190 | 1.950 | 1.53432 | 85.1 | 214.6 |

Total Bromine before fractionation = 73.23 per cent.

* Carius. † Lime. ‡ Direct Flame.

The bromine was determined in a sealed tube by the method of Carius. In the case of the fifth fraction, an impossible result was obtained; and, in addition to silver bromide, a considerable deposit of metallic silver was observed. A repetition confirmed this result. The bromine in this fraction was, therefore, determined with lime, when normal results were obtained.

Cyclo-pentadiene.—The fifth fraction heated in a sealed tube for six hours to 240° C. with 0.880 ammonia and silver nitrate gave a deposit of silver and a distinct mirror. A blank with ammonia and silver nitrate gave no reduction. The only substance with which we are acquainted which would be likely to be present and which would give these reactions is cyclo-pentadiene.



This substance was found by Leather and Ross to be present in considerable quantities in the liquid obtained on the compression of oil gas; and it has also been obtained from the crude benzene from coal tar. (Berichte, 22–916.) Its probable presence in illuminating gas may therefore be inferred. Many of the compounds of cyclo-pentadiene were investigated by Thiele (Annalen, 314, 296) and for the cis modification of the dibromide he gives the specific gravity as 1.9443 at 14°–4°. The results from the fifth fraction given in the above table, although not in complete agreement (principally as regards the amount of bromine present), are sufficiently so when taken in conjunction with the other results obtained to confirm the presence of cyclo-pentadiene.

The other fractions are probably mostly dibrom derivatives of hydrocarbons of the ethylene series. From the residue left after distillation, a small amount of a crystalline substance was obtained by extraction with alcohol. A sufficient quantity could not be obtained for analysis, but it may possibly be the trans-modification of dibrom-cyclopentadiene. M.P. 45°–46° C.

The first runnings of the light oils obtained on distillation of the anthracene oil used for the extraction of naphthalene from the gas gave (when precautions had been taken to remove all traces of sulphuretted hydrogen) a liquid which reduced warm ammoniacal silver nitrate freely—indicating the presence of cyclo-pentadiene. Another substance which might be present and would react with iodine solution is isoprene. This does not, however, as far as we are aware, reduce ammoniacal silver nitrate solution. It boils at 37° C., and its dibromide has a boiling point 90°–94° C. at 760 mm.

The foregoing results indicate to what extent the iodine process may be used for the control of the elimination of sulphur in oxide purification.

Its presence in carburetted water gas was well shown under the following conditions of experiment: The gas was passed through toluene kept at a very low temperature by means of liquid ammonia. The toluene was then placed in a distillation flask connected with a receiver and U tube cooled to –15° C. On warming the flask (precautions being taken to eliminate sulphuretted hydrogen) to about 60° C., a distillate was obtained which when warmed with ammoniacal silver nitrate strongly reduced it with the formation of a silver mirror.

LIME PURIFICATION.

The extraction of sulphur by the oxide purifiers proceeds according to our observations quite normally, showing a gradual decrease in the amount of sulphur taken up from commencement to finish, providing that there is no change in temperature due to external causes. Lime purification is by no means so regular in its action, being more affected by the composition of the gases passing through and also considerably by the amount of moisture present.

Daily tests were made at the lime purifiers of the Burnley Corporation Gas-Works for carbon dioxide and sulphuretted hydrogen during a period of three months; and the spent lime from each box was subsequently sampled and analyzed. The tables expressing these results would occupy too much space; but some typical analyses of spent lime may not be without interest, although we were quite unable to derive any definite information on the theory of lime purification from the results obtained up to this point.

| | 1 | 2 | 3 | 4 | 5 |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|
| | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. |
| Sulphur by bromine . . . | 2.31 | 2.24 | 2.46 | 2.51 | 2.24 |
| Sulphur as SO ₂ | 0.19 | 0.15 | 0.16 | 0.20 | 0.16 |
| Sulphur as CNS | 0.84 | 0.92 | 1.05 | 1.46 | 1.04 |
| Sulphur as sulphide (?) . . . | 0.36 | 0.48 | 0.49 | 0.32 | 0.16 |
| Free sulphur | 1.26 | 0.44 | 0.60 | 0.50 | 0.41 |
| Sulphur by xanthate | 2.48 | 2.57 | 2.87 | 2.93 | 2.54 |
| Sulphur by Carius | 2.53 | 2.55 | 2.90 | .. | .. |

All these limes were thoroughly spent, and did not contain any free lime. The amount of calcium carbonate varied from 63 to 70 per cent.

Lime purification is, owing to the number of reacting gases present and their variations in amount, necessarily complex. Butterfield ("Chemistry of Gas Manufacture") suggested that the reactions involved might be best understood from a study of the action of each gas individually. This suggestion we have in some measure attempted to carry out. A certain amount of work in this direction has already been carried out especially by Divers and Shimidzu ("J.C.S.," 1884, p. 270) and Veley ("J.C.S.," 1885, p. 478), who made a careful study of the compounds produced by the action of sulphuretted hydrogen on calcium hydroxide. The main points of their experiments may be summarized as follows:—

(1) By the action of sulphuretted hydrogen on calcium hydroxide in the cold with nearly three parts of water,

$\text{Ca}(\text{SH})_2 \cdot 6\text{H}_2\text{O}$ is formed, which is decomposed on warming even in an atmosphere of sulphuretted hydrogen.

(2) $\text{Ca}(\text{SH})(\text{OH})$ is obtained when more water is added.

(3) CaS is formed when sulphuretted hydrogen is passed over heated calcium hydroxide, and is soluble in water, forming $\text{Ca}(\text{SH})(\text{OH})$.

(4) Sulphur reacts with $\text{Ca}(\text{SH})(\text{OH})$ to form polysulphides which decompose in the presence of oxygen to form thio-sulphates.

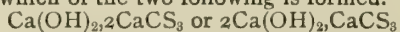
(5) Carbon bisulphide has no action on calcium sulphide.

Following these lines, we have, using commercial lime, repeated some of the above experiments. Dry sulphuretted hydrogen was passed through precipitated calcium hydrate suspended in about four parts of water and maintained at a temperature of 40°C . till no further increase in weight was observed. Precautions were, of course, taken to prevent loss of moisture in this and in all subsequent experiments. A percentage increase in weight of 36.4, calculated on the amount of calcium hydrate taken, was obtained. Theory for $\text{Ca}(\text{SH})(\text{OH})$ would require 45.8 per cent. Carbon bisulphide was then passed through the above until no further increase in weight was obtained. The amount taken up was equivalent to 24.4 per cent. of the calcium hydroxide originally taken. During the passage of carbon bisulphide some sulphuretted hydrogen was evolved. The solid and liquid remaining in the tube were separated and analyzed, with the following results:—

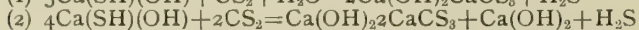
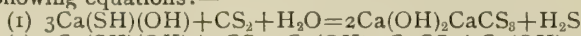
| Liquid portion, which was of a reddish colour:— | |
|---|-----------------------|
| | Per Cent. |
| Total solids | 15.0 |
| Sulphur by bromine | 35.3 of total solids. |
| Sulphur by Carius | 51.3 " " |
| Sulphur as sulphide | 26.0 " " |
| Calcium as CaO | 52.6 " " |
| Solid portion:— | |
| Sulphur | 0.77 |
| Free sulphur | 0.30 |
| Remainder, calcium hydroxide. | |

We have proved experimentally that oxidation by bromine does not affect carbon bisulphide. Therefore the difference between the bromine and Carius methods is due to carbon bisulphide. This is confirmed by results obtained by the xanthate method.

The amount of sulphuretted hydrogen absorbed showed that 3.8 grms. of $\text{Ca}(\text{SH})(\text{OH})$ were present in the solution. From the fact that 0.959 gm. of carbon bisulphide were absorbed by this solution, and assuming that it was all converted to a basic thiocarbonate, one would expect to get either 2.33 or 3.74 grms., according to which of the two following is formed.



These compounds are probably formed according to one of the following equations:—



From Equation 1 it follows that 3.8 grms. of $\text{Ca}(\text{SH})(\text{OH})$ or its equivalent of $\text{Ca}(\text{SH})_2$ should absorb 1.06 grms. of carbon bisulphide. From Equation 2, 1.6 grms. should be absorbed. The results obtained are, therefore, in accordance with the first equation—being only very slightly lower than the theory.

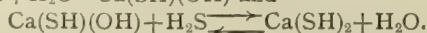
Three somewhat similar experiments were conducted, in which the amount of water present with the calcium hydrate was varied. They may be summarized as under; the results being expressed as percentage increases on the weight of calcium hydrate taken.

| | 1 | 2 | 3 |
|--|-----------------------|-----------------------|-----------------------|
| Percentage of moisture | 3.4 | 12.2 | 29.5 |
| Temperature of experiment | 15°C . | 15°C . | 60°C . |
| Increase, per cent., after passing sulphuretted hydrogen for two hours | 14.5 | 16.8 | 25.1 |
| " " eight hours | 14.8 | 17.4 | 30.7 |
| " " thirty-six hours | | | 63.9 |
| Carbon bisulphide per cent. absorbed | 0.4 | 0.6 | 4.2 |

With calcium hydroxide containing 10 per cent. of water, the variations in the amounts of sulphuretted hydrogen absorbed are slight. The reaction is at first energetic, but rapidly decreases in intensity. It is further shown that with more water more sulphuretted hydrogen is absorbed, especially at somewhat elevated temperatures.

According to Velej, dry calcium hydroxide gives, at 60°C ., with sulphuretted hydrogen, the theoretical yield of calcium sulphide. This is probably, to a certain extent, merely a question of the amount of water present.

Thus $\text{CaS} + \text{H}_2\text{O} = \text{Ca}(\text{SH})(\text{OH})$ and



The point of equilibrium must, therefore, depend on the amount of water and sulphuretted hydrogen present. Further than this, the absorption of carbon bisulphide depends likewise on the amount of water present. The reasons for this are fairly obvious—viz., calcium sulphide does not absorb carbon bisulphide, calcium sulphydrate can only absorb so long as water is present, and $\text{Ca}(\text{SH})(\text{OH})$ can be formed. During this reaction water would be gradually removed from the sphere of influence, and no further CS_2 absorbed. This is well illustrated in the case of example 3. There is an actual loss of weight probably due to the fact that $\text{Ca}(\text{SH})_2 \cdot \text{Aq.}$ is decomposed, with the evolution of sulphuretted hydrogen, when an inert gas is passed through it. (Divers.) It is probable thio-sulphates are not formed in the presence of water alone but that oxygen is also required, as shown by Divers.

When carbon dioxide is passed for three days through calcium hydroxide containing 12 per cent. of water, which has been treated with sulphuretted hydrogen until it contains the equivalent of 14 per cent. of sulphur, the sulphur is reduced to 6.9 per cent. A similar experiment with $\text{Ca}(\text{SH})(\text{OH})$ solution gave approximately the same result. This shows that although most of the sulphuretted hydrogen can be driven off by carbon dioxide, nevertheless the whole of it could not be eliminated. This points to the probable formation of a stable sulphur compound. That such substance is formed in both the solid state and in solution shows that it must be soluble, and would suggest some such formula as $\text{Ca}(\text{SH})(\text{HCO}_3)$, corresponding as it does to a substituted calcium bicarbonate.

Divers mentions that calcium carbonate can be decomposed by sulphuretted hydrogen. We find that when this gas is passed through dry precipitated calcium carbonate for six hours, the final product contains 1 per cent. of sulphur. Although this amount at first sight seems very small, its influence may not be without significance; for if the action of carbon dioxide on the sulphides were not to some extent reversible, none of these could be found in the spent lime.

Discussion.

The CHAIRMAN did not consider the question of the purification of gas by lime had been dealt with as fully as it should have been in the past. In gas-works the method was largely one of rule-of-thumb. He thought the process of purification by lime was doomed, on account of its greater expense and because the question of sulphur compounds in gas was not now so important, owing to the use of the incandescent burner. With regard to purification by oxide, the apparatus mentioned was one he had seen used in Philadelphia. It was a small apparatus, and though, perhaps, not giving strictly accurate but only comparative results, it was sufficiently simple to put in the hands of a man who had no chemical knowledge, and could be used by an intelligent purifier foreman. The principle of the apparatus consisted in titrating 100 c.c. of gas with a standard solution of iodine until the blue starch colour was obtained. He did not think purifiers were tested so much as they should be. They were frequently dropped when they were still working with as much as 80 per cent. of their efficiency, because of small traces of sulphuretted hydrogen passing out of the last box.

Dr. GILBERT FOWLER said it occurred to him, when Dr. Ross was describing the iodine method for determining sulphuretted hydrogen in coal gas, whether better results could not be obtained by the method which was used for determining small quantities of sulphur in steel, where a series of dilute standard solutions of lead acetate were used. It was found that one of the solutions became saturated with lead sulphide before another one became decolorized, and consequently by reading off the number of tubes which were blackened, or partially blackened, a good idea of the amount of sulphuretted hydrogen could be obtained.

Mr. F. S. SINNATT inquired if the authors of the paper had found any compounds of ferric hydrate similar in composition to hydroxy-sulphydrates of calcium. It was possible that the oxide purifier also removed carbon bisulphide, with the formation of compounds similar to the lime compounds.

Mr. RACE, in reply, agreed with the Chairman that the removal of sulphur compounds, other than sulphuretted hydrogen, was not so important as formerly, on account of the smaller quantity of gas used by incandescent burners. In the case of coal gas, the amount of carbon bisulphide present might vary up to 15 or 20 grains per 100 cubic feet. There was no reason to suppose that carburetted water gas contained any; so that in most works where a reasonable percentage of water gas was used (up to 25 or 30 per cent.), the amount would be reduced to an almost negligible quantity. With regard to the constant for the oxide purifier for coal gas, if 15 grains were subtracted from all readings, results would be obtained which would be exact enough for all practical purposes. For carburetted water gas the test was valueless. The present tendency was to pass the coal gas through oxide purifiers without lime, and to pass the carburetted water gas, which contained a much higher percentage of carbonic acid, through lime purifiers only. The small amount of sulphuretted hydrogen which was present in this gas would be removed by the lime, unless worked to its full carbonating power. The Chairman had referred to the practice of engineers and managers taking off the first oxide purifier, when the second just commenced to show sulphuretted hydrogen by the lead paper test. There was another point to be taken into account. When the second purifier commenced to show sulphuretted hydrogen, the first rapidly showed an increase in pressure. A box 900 square feet in area and passing 2 million cubic feet per day gave 1 inch of back-pressure when in good working condition; but when sulphuretted hydrogen was passing the second purifier, 3 and 4 (and sometimes as much as 9) inches of back-pressure was obtained. In reply to Dr. Fowler, the calorimetric test for sulphuretted hydrogen in coal gas was very old, but lead acetate was used instead of the suggested lead acetate solution. The gas was passed into the solution until a standard tint was obtained. Harcourt's carbon bisulphide test was on the same lines; platinized asbestos heated to 400°Fahr. being used to reduce the carbon bisulphide. They had not investigated the point raised by Mr. Sinnatt; but ferric sulphydrates probably formed in the same way as those of calcium, and these would react with carbon bisulphide, thus accounting for the slight loss of carbon bisulphide invariably found in oxide purification.

ASSOCIATION OF WATER ENGINEERS.

Annual Meeting in York.

The Fifteenth Annual General Meeting of the Association was held at York from Thursday to Saturday last week—the business and technical proceedings being conducted in the Lecture Theatre of the Museum of the Yorkshire Philosophical Society. There was a good attendance of members when the retiring **PRESIDENT** (Mr. Robert Askwith, M.Inst.C.E.) took the chair on Thursday morning. The Right Honourable the Lord Mayor (Alderman James Birch, J.P.) was present.

THE LORD MAYOR'S WELCOME.

The **LORD MAYOR** said that, during his tenure of office, it had been his pleasure to welcome many Associations to York; but that day it afforded him very special pleasure to welcome the Association of Water Engineers to the city. He was well acquainted with the important duties it was necessary for gentlemen in the position of the members to carry out, because his own business was one of the most important branches of water-works engineering. His training as a plumber and sanitary engineer had brought him into almost daily contact with matters pertaining to water supply. One could not help being impressed with the great importance of a plentiful water supply, and its proper distribution to large communities. In considering the many phases of this great subject, and in their intercourse for mutual help and enlightenment, the members were following a course which must commend itself to all. It must not only benefit the members, but to a great extent the communities served. The Association, he said, had now been established nearly fifteen years; and the published "Transactions" carried with them the proof of the able way in which important subjects had been presented and discussed. A perusal of the programme of the business about to be discussed assured him that the meeting would be full of instruction and benefit to the members. He gave them all a cordial welcome to the city—a city of which, he need scarcely say, all the citizens were justly proud on account of its ancient and historic associations. He was pleased to see his friend, Mr. W. H. Humphreys, the Engineer of the Water Company, was to be the President of the Association this year. He heartily congratulated the members on their choice, for he knew sufficient of Mr. Humphreys to know that he would do his utmost to make his year of office a credit to the Association, as well as to himself.

The **PRESIDENT** said he was sure the members would wish him to act as their mouthpiece in thanking his Lordship most heartily for his welcome. It would interest the members to know that a great honour had been conferred upon the Lord Mayor, in that he was to be presented with the freedom of London next Tuesday; and he (the President) should like to point out that this was not because he was the Lord Mayor of York, but because he was Alderman Birch.

Dr. TEMPEST ANDERSON, President of the Yorkshire Philosophical Society, also added a few words of welcome.

The thanks of the members to the Lord Mayor were heartily expressed; and his Lordship responded.

THE NATION'S LOSS.

The **PRESIDENT** said the next resolution he had to propose was a very painful one. It was in connection with the death of their late King, and he would ask that it be passed in silence. It ran as follows:

The members of the Association of Water Engineers hereby record their profound regret at the loss all classes of British subjects have suffered in the death of his late most gracious Majesty, King Edward VII., who had shown his interest in the question of water supply by inaugurating several notable works in this country. The members hereby tender to their Majesties, King George V., the Queen Mother, and Queen Mary, and the other members of the Royal Family, humble and respectful condolences in their irreparable loss. The members cordially unite in their unfailing loyalty to the throne, and their sincere attachment to the person of King George V., to whom may God grant a long, prosperous, and happy reign.

The motion was carried by the members silently rising.

INDISPOSITION OF THE SECRETARY.

The **PRESIDENT** announced that their Secretary (Mr. Percy Griffith) was at the present time suffering from ill-health; and though he was at the meeting, his assistant would perform the duties of his office. They regretted exceedingly Mr. Griffith's indisposition, and wished him a speedy recovery.

MINUTES OF LAST MEETING.

The minutes of the winter meeting held at Burlington House, London, in December last, were confirmed.

PRESENTATION OF PREMIUMS.

The authors of papers read last year selected to receive premiums were: Mr. S. R. Lowcock, the President's premium, being represented by a gift of his own selection to the value of £10; Mr. Alfred Towler, a present of books; and Mr. Bruce McGregor Gray, also a present of books.

THE NEW AND THE PAST PRESIDENT.

Mr. ASKWITH said the time had come for him to vacate the chair; and he had much pleasure in introducing to the members

their new President, Mr. W. H. Humphreys, the Engineer to the York Water-Works Company. He had been a member of the Council for several years, and had taken a deep interest in the work of the Association. He had much pleasure in asking him to occupy the presidential chair, and in presenting him with the certificate of his presidency.

Mr. HUMPHREYS on taking the chair was received with loud applause.

The **PRESIDENT** said his first pleasure in the chair was to propose a hearty vote of thanks to their retiring President. The Association had been fortunate in having Mr. Askwith as its President. His extensive and long experience of water-works matters, and his varied knowledge, had enabled him to guide the Association with great skill and ability during his year of office. On his departure from the position of President, he took with him the hearty goodwill of every member of the Association.

Mr. C. H. PRIESTLEY (Cardiff) seconded the motion; and it was carried by acclamation.

Mr. ASKWITH, in thanking the members, acknowledged what a pleasure it had been to him to be President, though it had meant a great deal of hard work. They had an excellent Secretary, who not only did a lot of hard work himself, but insisted on the President agreeing to everything before he brought it forward. He (Mr. Askwith) hoped to remain long interested in the Association, and to see it make greater and quicker strides forward, and becoming more useful every year it existed.

INAUGURAL ADDRESS.

The **PRESIDENT** then read his Inaugural Address, of which the following are the main parts.

In the first place, there were thanks to the members for the honour conferred on the President, and following was a hearty welcome in the name of the Board of the Water Company to the City of York. Proceeding, he said: It is a real pleasure to find that our Association continues to make steady progress. According to the last official returns, we have 3 honorary members, 214 members, 121 associate members, and 38 associates—making a total membership of 376, or an increase of 11 on the previous year. Having to deal with one of the most important necessities of life, we have the greatest possible inducement to take every opportunity of rendering mutual help and support, of extending our knowledge, of visiting each other's works, and of doing everything in reason which may assist us in carrying on our duties, the importance of which we may claim with all modesty to be second to none. Our Association has now been established fourteen years; and during that period papers of great value have been read and discussed, as well as much important business considered and recorded in our "Transactions." The Association has carried out many important duties in the furtherance of its objects; but one of the most important has recently been inaugurated—the collection of statistics relating to water supplies. I commend this matter to your careful consideration, as it is intended primarily for your benefit. The cordial support of every member will make this new venture a great success; and the collection and codification of such valuable information cannot but be of the greatest value to members as well as to the profession generally.

As year succeeds year, it is necessary for each President to find a subject which will be of interest to his hearers. Fortunately, water undertakings provide many such topics. The water supply of a community must be at any time a subject of paramount importance, as a good and plentiful water supply means a healthy populace. To secure such a supply is, therefore, a vital obligation. In this country, we may fairly claim to have set a good example in this respect. The past year has been marked by two events of high importance. The first is the completion of the great scheme for the supply of Welsh water to Liverpool, and its recent inauguration by His Majesty the King as Prince of Wales. The other is the decision of the Metropolitan Water Board to extend their works on the Thames by a scheme which involves an expenditure of about £11,000,000. Both these undertakings illustrate the determination of water authorities to provide their communities, at whatever cost, with pure and wholesome water supplies. On the watershed of the Ouse, great undertakings are now in progress, which, although secondary to those just mentioned, are still of vast importance, and will be of immense benefit in supplementing the supplies of the great neighbouring populations of Leeds, Bradford, and Harrogate. Fortunately, our watershed covers a large area, embracing as it does the Hambletons and most of the extensive and beautiful dales of North Yorkshire.

Having referred to matters of general importance, I will now, with your indulgence, speak on a subject which I hope will interest you. I propose to give you some notes and figures which I prepared some time ago on the subject of mechanical gravity filtration; and as this address cannot be discussed, I will avoid controversial points as much as possible.

MECHANICAL GRAVITY FILTERS.

Mechanical filtration has been described by its admirers in America as a scientific attempt to combine the three principal processes of water purification—viz., coagulation, subsidence,

and filtration. It cannot be denied that mechanical filtration is doing great work in the United States and elsewhere; and the fact that it has not taken a firmer hold here must be ascribed to a certain extent to prejudice, as well as to want of information, and possibly to lack of guarantees as to its capacity to treat our waters in an equally satisfactory manner.

Mechanical gravity sand filters depend for their efficiency on the formation of an inorganic jelly effected by the use of a coagulant, rather than an organic bacterial slime as is the case in ordinary filter-beds. The process consists really of chemical sedimentation, assisted or rapidly secured by coagulating the impurities, including bacteria, into particles of such size that they are caught and retained on or near the surface of the filtering material. The coagulant in general use is basic sulphate of alumina, formed by mixing sulphate of alumina (containing 17 per cent. of Al_2O_3) with caustic soda, which yields, when dissolved, sodium sulphate in solution and aluminium hydrate as a suspended glutinous precipitate. The quantity to be used in each case requires careful investigation of the water to be treated, but it is usually about 1 grain per imperial gallon.

Koch, Kemna, and other eminent scientists have told us of the wonderful work of Nature in slow sand filtration—how organisms in water are surrounded by a gelatinous envelope, which greatly increases their size, and enables them to adhere to surfaces; so that in a short time the sand in a filter becomes covered with a living slimy layer which entangles suspended matters, and effects the main part of purification. We are also told that these finer mineral particles are only about $\frac{1}{100000}$ th of an inch, that most bacteria are about $\frac{1}{10000}$ ths of an inch, both much smaller than the interstices between the grains of fine sand; and from this it is clear that it is not to straining, but to the wonderful action of these organisms that is due the purifying effect of the slow sand filter.

There is no doubt some prejudice against the use of any chemical with a public water supply in this country, notwithstanding the fact that it may be guaranteed by experts to be absolutely harmless to the consumers when used in the quantities and in the manner usual with the mechanical filter. Indeed, Dr. Schrieber, of Berlin, states as a result of his investigations into the subject—and we probably could not have a better opinion—that if we each drank proportionately the whole of the alumina used, it would not be more than may be found in many drinking waters without being considered objectionable. But even the small amount used could only reach the consumer if the entire quantity passed the filters; and he had not been able during any period of his experiments to demonstrate the presence of any trace of alumina in the effluent.

Sulphate of alumina has alone been mentioned as a coagulant because it is practically the only one which has secured permanent use; but solutions of lime (85 per cent. of CaO) and of iron, have also been tried. Indeed, for bacterial efficiency and cost the latter is claimed to be superior to sulphate of alumina, and may therefore attain wider use. Lime and iron solution has, however, been adopted in connection with the installation of mechanical filters for the City of New Orleans so as to allay local prejudice against the use of sulphate of alumina.

The average rate of filtration of the seven London supplies is 1.72 imperial gallons per square foot of filter surface per hour; and this may be taken as a fair average of English practice with river and other similar waters. The rate adopted in mechanical filters, when using a coagulant, is from 66 to 132 imperial gallons per square foot per diem. The maintenance of this extremely high rate of filtration requires a filtering head varying from 10 to 14 feet; and there is usually installed with each plant a "loss of head" gauge to each filter, so that the attendant may see at a glance when it is necessary to wash the filter. In some cases the gauges are electrically connected to an alarm, which is thereby automatically rung when the safe limit is reached. In order to control the rate of filtration, each filter is fitted with an automatic controller which maintains a uniform rate of flow under all conditions.

The sand recommended for use has an average effective size of from 0.46 to 0.5 mm., and a uniformity co-efficient of 1.5 mm. This can only be obtained by twice screening through sieves of 24 mesh and 40 mesh respectively, using only that which is passed by the former and retained by the latter. The sand can readily be sterilized by a steam connection from the boiler to the washwater pipe of the filter; but sterilizing is not generally considered necessary more often than about once in six months. A cold process can also be used by dissolving soda ash, and leaving the water in the filter for about fifteen hours, and then washing the filter in the usual way. The standard of efficiency of a filter is, of course, judged by the bacterial results. Sedimentation is usually obtained in a chamber specially constructed for the purpose in the lower part of the filter, and into which the coagulant is fed. In many cases separate tanks or basins having a capacity of from one to six hours' flow are constructed; and this practice gives the most satisfactory results.

The operation of washing the mechanical gravity filter is claimed as being immeasurably superior, on hygienic and other grounds, to that necessary with the slow sand filter. The washing is invariably done by a reversal of the flow. In the gravity filters the sand can be washed in segments, or as a whole, as at York; or it can be stirred during the washing by revolving rakes or agitators. Filtered water is used for washing; about 4 per cent. of the quantity filtered being usually sufficient. At York the preliminary

filtered water is used. The operation usually takes from ten to twenty minutes. Compressed air under a low pressure from a rotary blower can be used in conjunction with the washing; but both systems are not used at the same time.

For the removal of turbidity, chemical sedimentation is very effective. Mr. Allen Hazen gives a table of operations over 199 days with an average removal of 94.4 per cent.; the lowest being 55.71, and the highest 99.57. The average quantity of sulphate of alumina used was 1.19 grains per gallon (U.S.). The reduction in colour, according to published returns, varies from 70 to 100 per cent. At Berlin it was 93; Little Falls, 82.70; East Providence, 90; Norfolk (Va.), 93.6; at Elmira, Rensselaer (N.Y.), and at York (Penn.), 100 per cent.

MECHANICAL GRAVITY FILTERS AT YORK.

In the works supplying this city, there is an installation of gravity filters equal to a maximum capacity of 5,250,000 imperial gallons per 24 hours. These are used as preliminary filters only; and, although many experiments have been made with sulphate of alumina as a coagulant, it is not the practice to use that salt in their working. As the erection of these filters was the result of my own personal investigation and experience, I may perhaps be permitted to deal in some detail with the facts which led to their adoption, and of the experience gained since they have been in operation. The water supply for the City of York, which is taken from the River Ouse, has reached a maximum of 4,000,000 gallons per day; but the average now is approximately 2,800,000 gallons per day. The water is pumped direct into the city and district from the filtered water wells. There are three subsiding reservoirs of about 2,000,000 gallons each; and before the introduction of preliminary filtration, the water, after settlement in these reservoirs, flowed direct on to the ordinary sand-beds. During periods of floods, when the river becomes turbid with fine flocculent clayey particles, the filters were soon blocked, owing to the restricted provision for subsidence.

When preparing schemes for the extension of the works, there were many difficulties in the way of obtaining further subsidence. Various processes in substitution therefore were anxiously studied; and, finally, it was decided to adopt a system of preliminary filtration, at the same time proceeding with the construction of additional filter-beds of an area of 4950 square yards. Before deciding upon the description of filter most suitable to adopt, it was decided to test what were considered the best of the mechanical filters on the market.

Experiments were carried out over a considerable period, and it became evident that a much clearer effluent could be obtained by those means than we were obtaining from our subsiding reservoirs, or were likely to obtain from any others we might construct, and at a reduced cost. Before proceeding with the erection of these filters, information was obtained from the United States as to the mechanical filters in use there for the purification of drinking waters. The result of these investigations and inquiries was that an offer was received to erect four 17 ft. gravity filters, each having a capacity of 750,000 imperial gallons per 24 hours. The filters were to be so arranged that they could intercept the water flowing from the subsiding reservoirs to the two beds then in existence, and to two others in course of construction; the whole having an area of 8893 square yards. The offer was accompanied by the following guarantees:

1.—Each of the four filters to be capable of delivering an average of not less than 750,000 imperial gallons of water per 24 hours.

2.—That when a coagulant is used and the filters are not working at a greater velocity than 750,000 imperial gallons per 24 hours each: (a) The filtered water shall be practically free from matter in suspension and colour. (b) In the case of the unfiltered water containing 1000 or more bacteria per cubic centimetre, there shall be an average reduction of not less than 90 per cent. in the filtered water. (c) In the case of the unfiltered water containing less than 1000 bacteria per c.c., the bacteria in the filtered water shall not exceed an average of 100 to the c.c. (d) The filtered water shall contain no greater quantity of alumina than before filtration. (e) The filtered water shall not show any increase of hardness as compared with the unfiltered water. (f) The average quantity of water used for washing the filter when a coagulant is used shall not exceed 5 per cent. of the quantity filtered.

3.—That when a coagulant is not used: (a) The condition of the filtered water shall be such that practically none of the particles in suspension shall be visible to the naked eye. (b) Such matter in suspension shall not average over 10 parts per million by weight. (c) The average quantity of water used for washing the filters shall not exceed 4 per cent. of the quantity filtered. (d) The filtering material will not have to be renewed to an extent of over 4 inches per annum. (e) By the use of the sectional wash for cleaning the filters, the filters shall at all times be free from channels and in good condition for filtering.

Sufficient samples of the water had to be taken to enable a public analyst, who was mutually agreed upon, to determine whether the foregoing guarantees had been properly fulfilled. The analyst's report was so entirely satisfactory that my Board had no hesitation in taking over the filters. They have continued to perform their duties without cessation ever since. The cost of maintenance has been trifling; but their assistance in the purification of the water has been invaluable, and their working is found to be extremely economical.

The filters are 17 feet internal diameter and 9 feet in depth. They are constructed of cypress, 3 inches thick, bound with adjustable iron hoops. They each contain 4 feet of sand and 6 inches of fine gravel. The unfiltered water from the subsiding reservoir is delivered on to the top of the filters by branch pipes from a

21-inch main. There are four 6-inch perforated pipes fixed across the top of the filters, about 6 inches above the sand, for delivering the water on to the filter. To prevent overflowing, a float attached to a butterfly valve closes the valves as soon as the water reaches a prescribed level. The water passes through the sand of the mechanical filters into 21-inch pipes, and is then delivered through fountains on to each of the four filter-beds. The rate of flow is gauged by closing the inlet-valve and timing the rise of the water on a scale fixed to the inside of the filter from the sand level to the top of the filter. A coagulating apparatus, consisting of two large tanks with the necessary appliances for mixing and regulating the quantity used, is fixed at one end of the building, at a sufficient height to allow of delivery by gravitation into the 21-inch supply-pipe. An 8-inch wash-out pipe connected up with a centrifugal pump worked by a 10 H.P. Marshall vertical engine supplies water for washing, which, being taken from the outlet of the roughing filters, has therefore passed the preliminary filtration stage—thus also saving the erection of special tanks. The suction-pipe is laid on to two beds, so that water can be taken from either, if one is off for cleaning. By closing the inlet and outlet valves, and opening the wash-water and drain valves, a complete reversal of the current can be obtained. The drain pipe is 12 inches in diameter, and conveys the water direct into a watercourse clear of the works. In the bottom of each filter, there are four radiating pipes with many branches, which completely distribute the water, through specially devised nozzles, over the whole area. A four-way valve is fixed on the main pipe in the centre of these radiating pipes, so designed that the wash water may be forced up through one section of the sand at a time. This four-way valve is regulated by a lever on the platform. It usually takes from fifteen to twenty minutes to wash each filter; and, if desired, the first water filtered after washing may be turned into the drains. The whole of the filters and appliances are enclosed in a neat brick building. They are operated by unskilled labour; the only attention required being to get up steam and attend to the levers on the platform during the process of washing.

The experience gained by the use of this installation of mechanical filters has been so eminently satisfactory that a further installation has since been made, in another part of the works, to treat $2\frac{1}{4}$ million gallons per day—thus giving a total maximum capacity of $5\frac{1}{4}$ million gallons per 24 hours.

EFFICIENCY OF THE MECHANICAL GRAVITY FILTERS.

A bacterial examination is frequently made of the effluent from each filter; and a comparison of the results obtained with the condition of the water delivered thereon from the subsiding reservoirs, has shown the following records of efficiency for the past three years—no coagulant being used: No. 1 filter, 86.4 per cent. reduction of bacteria; No. 2, 86.9 per cent.; No. 3, 86.2 per cent.; No. 4, 87 per cent.; No. 5, 86.5 per cent.; No. 6, 85.9 per cent.; and No. 7, 85.1 per cent. The average efficiency of the seven filters without the use of a coagulant is equal to 86.2 per cent. reduction of bacteria. The average reduction during the same period in the water as supplied to the city was 99.1 per cent. With the use of sulphate of alumina as a coagulant in the proportion of 1 grain per gallon, a continuous test made for six days, working at a vertical velocity of 184.48 inches per hour, gave the following results: No. 1 filter, 92.97 per cent. reduction; No. 2, 93.43 per cent.; No. 3, 93.55 per cent.; and No. 5, 93.55 per cent.—average efficiency, 93.37 per cent. The average reduction during the same period in the water as supplied to the city was 99.3 per cent. Frequent turbidity and colour tests are made of the unfiltered, settled, preliminary, and finally filtered waters, which show a marked change during each process. The total maintenance charges—labour, coals, oils, cleaning, and repairs—the past six months work out at 3s. 6½d. per million gallons.

On the motion of Mr. F. J. BANCROFT (Barnet), seconded by Mr. W. MILLHOUSE (Scarborough), a hearty vote of thanks was passed to the President for his interesting address.

HON. AUDITORS.

On the proposition of the PRESIDENT, Mr. J. C. Melliss and Dr. Taylor were appointed Hon. Auditors.

NEW MEMBERS.

The Scrutineers of the balloting-lists reported that the following gentlemen had been added to the roll of membership:

Members: Mr. J. J. Bithell, of Seville, Spain; Mr. A. W. Branson, of Caerphilly, Glam.; Mr. G. Christie, of Kilwinning, N.B.; Mr. W. Clemence, of London; Mr. G. R. G. Conway, of Monterrey, Mexico; Mr. F. W. Davies, of Nottingham; Mr. P. C. Dormer, of Chesham; Mr. S. J. Dunn, of Salford.

Associate Members: Mr. H. W. Brown, of Sheffield; Mr. J. H. W. Stocks, of Heaton Moor.

Associate: Dr. Samuel Rideal, of London.

WATER SUPPLIES PROTECTION BILL.

There was a long discussion on this Bill, initiated by

Mr. EASTON DEVONSHIRE (London), who said he had been asked to represent the Council, and to tell the members what had occurred in the matter of the Water Supplies Protection Bill, which had been sprung upon them as an Association to this extent—that at the last Council meeting nothing was known of it. In April the Bill passed the second reading in the House of Lords, and was referred to a Hybrid Committee, who sat in April for the first time. At this sitting, Mr. Lithiby, of the Local Government

Board, was the first witness; and the sittings of the Committee were then adjourned. It was probable the second sitting would take place soon after Parliament re-assembled. The matter was so urgent that the ex-President (Mr. Askwith) called a meeting of the Water Areas Committee to take action on behalf of the Association. The Committee met on two occasions, and carefully considered the provisions of the Bill; and they came to the conclusion that no time must be lost in approaching the Lord Chairman of the Committee with the view first to being heard, and secondly to collecting evidence. Lord MacDonnell, the Chairman, had consented to receive on behalf of the Association two representatives who would give technical evidence, as it might be called, as distinct from the general evidence that would also be heard from the Secretary (Mr. Percy Griffith), who was collecting a large amount of information and a considerable number of resolutions passed by the water authorities represented by the membership of the Association. The action of the Water Areas Committee had been approved by the Council; and now it was necessary for as many members as possible to send resolutions and information to the Secretary on the point of specific hardship that was likely to accrue as the result of any or all the clauses of the Bill being applied.* The Bill was called "The Water Supplies Protection Bill," but, in his opinion, it should be called "The Private Water Supplies Protection Bill." Mr. Devonshire then read the four principal clauses (Nos. 3, 4, 5, and 6). He added that the Bill opened the door to a considerable amount of hardship and abuse. The resolution that he had to move was as follows:

That this meeting of the Association of Water Engineers is strongly opposed to the provisions of the Water Supplies Protection Bill on the following grounds:—

- (a) Clause 3 would involve water authorities in needless, excessive, and even prohibitive cost in carrying out their statutory obligations, and would retard the necessary development of public water supply. The Association is of opinion that its provisions should be limited to the abstraction of water from or under lands not authorized nor scheduled for the purpose.
- (b) Clause 4 would involve needless and costly litigation in meeting the various claims for compensation which are likely to be made under this clause, and that such cost will ultimately fall upon the consumers. The Association is of opinion that the onus of proof of depletion should generally rest with the parties making the claim for compensation. Provision should also be made for the compensation of water authorities whose sources of supply are proved to be depleted by the works of private owners.
- (c) Clause 5 seriously interferes with the provisions of many private Acts in regard to the supply of water to areas either within or without the limits of supply and would in many cases involve serious injury to water authorities. The Association is of opinion that the claims of any authority on a particular source of supply should be made at the time when parliamentary sanction is sought for the acquisition of that source.
- (d) Clause 6 maintains the obligations and liabilities of water authorities under Private and General Acts without at the same time preserving the powers, rights, and privileges of the said authorities conferred by such Acts. The Association is of opinion that no general Act should deprive water authorities of powers, rights, and privileges conferred by Private Acts upon the faith of which large sums of money have been spent.

In the opinion of this Association, the existing general water-works law urgently requires revision and consolidation, but that such revision should be preceded by the fullest inquiry into the whole question, circumstances, and development of water supply by a specially appointed Royal Commission.

Mr. F. J. BANCROFT (Barnet) in seconding the motion, said he had discussed the Bill with several managers and engineers; and he was sorry to say that a number did not seem to think that the Bill affected them. They appeared to be under the misapprehension that it had not a retrospective effect. Therefore he had endeavoured to show that practically nearly all the water-works in the country would be affected if the Bill went through in its present form. Dealing with local authorities who had constructed works under the Public Health Act, he said the Bill would apply to those works, because the works and lands were not distinctly specified in an Act of Parliament. Further, no works could be built or extended under the powers of the Public Health Act unless an Act of Parliament or Provisional Order was obtained. This would involve considerable expense. The provisions of the Bill appeared to be unnecessary, because under the Public Health Act lands could not be taken compulsorily; and there were sufficient provisions as to protection and compensation. Any additional unnecessary expenditure on such parliamentary powers as was proposed by the Bill must inevitably fall upon the consumer. In the case of local authorities acting under a Provisional Order, the works were subject to the approval of the Board granting the Order. The application of the Local Government Board for many years of the restrictive provisions and compensation clause of the Public Health Act to works of local authorities constructed under Provisional Orders was sufficient protection to all parties. No Order was issued until a full inquiry had been held, of which due notice was given; and any one hostile to a Provisional Order could submit his opposition far cheaper, and with probably greater effect, than in the case of a Parliamentary Bill. Any alteration therefore of existing legislation should be in the direction

* The clauses of the Bill were published in the "JOURNAL" for the 12th of April, p. 128.—ED. J.G.L.

of giving more authority to the Local Government Board to grant further powers than they were authorized to do at present. The existing powers were not considered sufficient in the case of corporations and councils who had lately been before Parliament. They had had imposed upon them the Lord Chairman's clause, which restricted them in a similar way to the proposal in clause 3 of the Bill now under consideration. Recent decisions of the Law Courts showed how far-reaching this clause was—more far-reaching than was at first commonly thought. Regarding instances outside the Lord Chairman's clause, where a local authority possessed powers to take land by agreement, they would probably be subject to the decided cases of East Grinstead and Frimley and Farnborough. There was a point, however, as to how far on such land they could apply the Public Health Act. In either case, under the Bill, further extensions of works could not be proceeded with without the considerable expense of applying to Parliament, either direct or through the Local Government Board. In some cases, Parliament had granted clause 3 to local authorities and companies, giving them general power to purchase land by agreement, and had allowed constructional powers, no doubt after very careful consideration of the matter, and for specific reasons. Clause 3 would (without regard to any circumstances which might have been the reason for conceding such constructional powers) annul any power that had been so given. In the case of companies, the consent of the local authority and of the road authority was necessary before the Board of Trade would grant a Provisional Order, except in a few cases where it was thought desirable to dispense with the consent. Under a Board of Trade Order, land could only be taken by agreement, and then merely to a limited extent. A full inquiry was held by the Board granting an Order; and any opposition could be made at minimum expense and inconvenience. As the companies constructing works under this legislation could only obtain lands and water by agreement, and the constructional works under general powers were subject to the approval of the Board of Trade, it did not appear necessary for their works to be specified. In the case of Acts of Parliament containing the Lord Chairman's clause, companies acting under it could only, under the existing law, execute such works as were distinctly specified; and without the Lord Chairman's clause, the same remarks applied as to local authorities, except, of course, that no works could be constructed under the Public Health Act. In the case of his own Company, they obtained, after a fight in the Lords and Commons, a Bill in which originally they proposed to take water from outside sources. The power to take land from outside was struck out; and general powers were given the Company to purchase lands within the area of supply by agreement. After full consideration by the Committees, and after the matter had been carefully explained to them, they granted power to construct works upon these lands; but the works were not specified in the schedule or by plans. Land was bought, and works were constructed; and it had been decided in two Courts, and ultimately in the House of Lords, that the Company's particular clause gave them power to construct works, and the Company were continuing the works. The present Bill, if it went through, would rob the Company of the clause obtained after full explanation, and also of the victory they secured by appealing to the House of Lords. While the Bill was undoubtedly an attempt to protect landowners, it was not probable that the ratepayers in any district would derive much benefit from it. Landowners generally did not provide their tenants with water; and the tenants themselves, at their own expense, had to sink wells and provide the labour for raising the water. There was nothing in the Bill to prevent one owner drawing water away from an adjoining owner by sinking a deeper well; and there was nothing to prevent an extensive private supply from interfering with works sanctioned by Parliament, and which had a statutory duty to perform under penalty. A tenant of property would doubtless be supplied by a properly constituted authorized authority very much cheaper, and with a better service, than he could obtain by his own efforts. Generally speaking, too, the public requirements of a district could be better supplied by such an authority than by each individual or council relying upon isolated wells, which might, or might not, give a satisfactory supply, both as to quantity and quality. This point was of considerable importance from the sanitary and health standpoint. Duties had been specifically laid on both urban and rural sanitary authorities and companies with reference to a supply of water for their districts; and, therefore, no obstacle should be placed which would render it difficult to carry out these duties. The Bill would be productive of enormous litigation, and would place considerable hardships upon the operations of water undertakings, instead of encouraging them. It further attempted to provide one set of rules for conditions which varied considerably throughout the country. The Bill left untouched the operations of private companies, collieries, breweries, railway companies, and other large premises. The supplies taken in this way were generally very considerable—often larger than those taken by statutory authorities; and it was inequitable that they should be specially favoured in being exempted by the Bill. These supplies did infinitely more injustice than those of a water authority; and the owners were under no obligation to provide a supply for other persons. The whole question, in his opinion, should be referred to a Royal Commission, as was suggested in the resolution; or else to the Local Government Board, with instructions for them to consider a new Water-Works Clauses Act. A large additional power

should also be given to the Local Government Board. Water authorities were at present suffering from having to work under the general water-works law of half-a-century ago, which was obsolete and insufficient in many respects. Regarding clause 5 of the Bill, it was provided that the undertakings were not only to give a bulk supply to the county district from which they drew water, but also to other county districts through which the line of pipes might pass. In some cases, they might have to give more water to the areas through which their pipes passed than they would want for their own district. Though to some extent consideration should be given to the district from which the water was taken, there appeared no reason why the water authority (who were undertaking the whole expense of obtaining the supply for the needs of their own district, and to fulfil their statutory obligations) should be compelled to afford to every county authority a supply which probably the undertakers would soon require. The matter should be left to be dealt with on the merits of each particular case. As the clause was at present drafted, it would appear that the Local Government Board must give their sanction to this, unless there was some special reason why the supply should be given. Turning to the clause dealing with compensation, they knew there were a great many cases of gradual diminution of underground water owing to drainage and to sewerage operations. The onus of proof of no damage was placed on the water authority; and in a dry season it would be extremely difficult to prove the negative. It was probable that in such cases the authority would have to pay compensation in many instances in which they had not in any way affected the supply. The arbitration costs would be expensive, adding to the cost of the water supply; and this would have the effect of increasing the charges to the consumer. The whole Bill tended to retard the proper development of the water supplies of the country; and every water authority should support what the Association were proposing to do in regard to it.

Mr. WILLIAM WHITAKER, B.A., F.R.S., F.G.S. (Croydon), said he happened to be one of the delegates appointed by the Royal Sanitary Institute to represent them before the Committee. He agreed that the Bill ought to be entitled "A Bill for the Protection of Private Water Supplies." It was an absolutely one-sided measure, well devised from its point of view. It would protect private suppliers from public supplies. But it did not protect public supplies from anybody or from anything. The people who would seriously suffer from it would be small water authorities. He did not know how the rural suppliers would stand the expense which would undoubtedly be put upon them by the Bill. The suppliers would have to prove a negative; and there was nothing more difficult than that. It was a mistake, too, to suppose the Bill did not touch gravitation supplies. The Bill seemed to embody the ideas of a number of respectable landowners; but not of experts. There was room for legislation on water supplies; but such legislation must have in front of it a detailed and full inquiry as to the actual facts. The promoters of the Bill did not know the state of water supply generally in this country. Water supply was a progressive and changing thing, and legislation required to be modified to suit the times; but there should be an inquiry first by a Royal Commission—by a body of qualified men—into the condition of the water supply generally of the country. He hoped the members would bring the matter to the serious notice of their Boards and Committees. The Metropolitan Water Board were opposed to the Bill; and that Board drew, roughly, 20 million gallons from wells in Kent. But the private supplies in the county drew some 21 million gallons; and this illustrated how inequitable the measure was. It seemed to him there should be mutual protection as between public and private supplies.

Mr. EASTON DEVONSHIRE said he ought to have mentioned that the representatives proposed to go before the Committee were Mr. William Matthews in relation to well supplies, Mr. Edward Sandeman, of the Derwent Valley Water Board's works, and Mr. Percy Griffith.

Mr. EDWARD SANDEMAN (Derwent Valley Water-Works), referring to clause 5 of the Bill, said that it dealt with the right to take water from any aqueduct or pipe that passed through the area. He did not think anyone could object to the general principle of the clause; but it should in fairness be altered to an extraction only amounting to a small proportion of the whole.

Mr. C. H. PRIESTLEY (Cardiff) also believed the Bill would affect every water authority in the country; and he foresaw that, if it passed, they would be put to great expense in self-protection. With regard to the power to local authorities through whose districts a pipe-line passed to ask for a supply of water, he pointed out the hardship of this—where a pipe-line was long, and there were several local authorities in a position to make the demand—upon an authority who had promoted Bills and constructed works to meet the necessities of their own community.

Mr. H. G. KEYWOOD (Ossett), Mr. N. M'K. BARRON (Lincoln), and Mr. W. R. LOCKE (Hemel Hempstead) spoke in similar strain.

Mr. A. B. E. BLACKBURN (Sunderland) thought the seriousness of the compensation clause was only illustrated when they came to look into the definitions of what was a private water supply, and what was a protected area. In his opinion, the whole of the water law of the country required revision.

Mr. H. C. HEAD (Winchester) alluded to the activity of the promoters to get resolutions in support of the Bill from Agricultural Societies from one end of the country to the other.

Mr. J. H. TAYLOR (Barnsley), Mr. R. ASKWITH (Weardale and

Consett Water-Works Company), and Mr. C. CLEMESHA SMITH (Wakefield) spoke generally in support of action being taken by the Association, and of the necessity for inquiry being made before any further legislation was passed.

Mr. H. W. WOODALL (Bournemouth) said it seemed to him that the most important point of the Bill was that it upset the whole of the tendency of the law of this country. Clause 5 appeared to be the most dangerous of the whole of the clauses of the Bill. He could not see that there was any legitimate claim on the part of a local authority to a supply simply because pipes happened to pass through its district. The water authority had to pay for the privilege of carrying the pipes through the district, and had to pay for the reinstatement of the ground afterwards. So far as clause 4 was concerned, it looked simple enough; but he thought it would prove to be nothing but iniquitous if put into practice. He had little hope of the Bill being stopped, except by the united efforts of those whom it affected so completely and so gravely. The resolution was unanimously carried.

PAPERS READ.

The papers read and discussed during the sittings on Thursday and Friday were as follows:—

"Reservoir Outlets," by Mr. GEORGE N. YOURDI, M.Inst.C.E.

"Effect of Sinking Head on Large Castings," by Mr. THOMAS KENNEDY.

"Observations on the Permanency of Overflow Springs," by Mr. HENRY PRESTON, F.G.S.

"Notes on the Colour of Water," by Dr. ADOLPH KEMNA. (Dr. Kemna was unfortunately unable to be present; and his paper was therefore read by Mr. Easton Devonshire.)

A paper was also presented on "The Wellingborough Water-Works and Softening Plant," by Mr. E. Y. HARRISON, Assoc.M.Inst.C.E. (Mr. Harrison was also unfortunately prevented from attending; and the discussion of his paper was therefore adjourned to the winter meeting.)

Abstracts of the papers, with an indication as to the trend of the discussions, will in due course appear in our papers.

VOTES OF THANKS.

Several votes of thanks were passed before the termination of the proceedings—to the Yorkshire Philosophical Society, for the use of their rooms and lecture hall; to the Chairman (Sir Joseph Sykes Rymer, J.P.) and Directors of the York Water-Works Company, for their kindness and hospitality on the occasion of the visit to their works; to the Chairman (Mr. Councillor A. Willey) and members of the Leeds Corporation Water Committee and Mr. C. G. Henzell, M.Inst.C.E., for their kindness and hospitality in connection with the visit to the Leighton reservoir of the Corporation, also to the Contractors (Messrs. H. Arnold and Sons). The readers of the papers, the Council and the officers, and the President were also thanked in turn.

QUESTION OF INCORPORATION.

The PRESIDENT, in responding to the vote to himself, announced that the Council had been considering the question of the incorporation of the Association. They meant to rise to an even more substantial position than that at present occupied; and the feeling was unanimous as to taking this step forward. The question had been submitted to a Committee; and it would be brought before the members in formal manner in due course. But he thought they would like this intimation as to the movement being made.

ANNUAL DINNER.

The annual dinner was held at the Royal Station Hotel on Thursday evening, with the President (Mr. W. H. Humphreys, Assoc.M.Inst.C.E.) in the chair. Among the guests were the Right Hon. the Lord Mayor, Sir J. Sykes Rymer, J.P. (Chairman of the York Water-Works Company), Dr. Tempest Anderson, the Town Clerk (Mr. H. Craven), Dr. E. Smith, the Medical Officer of Health, Mr. J. W. Hame, the Electrical Engineer, several other officers of the Corporation, and representatives of industry, including last, but not least, Mr. John H. Hill, the Engineer and Manager of the York Gas Company. The dinner was excellently served; and afterwards a number of toasts were honoured, and an excellent programme of music was rendered, prominent in which latter were the York Minster Quartette. Mr. Robert Askwith proposed "The Lord Mayor and Corporation of the City of York;" and the Lord Mayor in a racy speech replied. In the course of his remarks, his Lordship congratulated the President upon having been elected to such high office, and the Association upon their selection. He had known Mr. Humphreys all the time that he had resided in York; and there was not a more sound and straightforward business man in the city. Besides this, they knew from experience, that he was well versed in his profession. The "Association of Water Engineers" was submitted by Sir Joseph Sykes Rymer; and he, despite his many years and active life, made a speech with all the buoyancy of a much younger and capable speaker. The President, in his reply, mentioned that, though the Association was only fourteen years old, it had approximately 400 members; and this he regarded as excellent, seeing that often one undertaking, with one engineer at the head, supplied with water a considerable district. "The Visitors" was proposed by Mr. E. Sandeman, M.Inst.C.E. (the Vice-President), and was responded to by Mr. Craven (the Town Clerk). A most enjoyable evening was spent.

VISITS TO WORKS.

The visitors spent as much time as their set engagements would permit in exploring the wealth in antiquity of the famous city. On Thursday afternoon, by invitation of the Chairman and Directors of the York Water Company, the members and their lady friends visited the Acomb Water-Works, accompanied by the President. The journey was made from the landing-stage at Lendal Tower; and a pleasant afternoon was spent wandering about the works at Acomb, though there was a little temporary marring by a thunderstorm. Tea was served on the works. It may be said that the drainage area of the watershed of the York works is one of the largest in England, consisting of 1200 square miles, and including the watersheds of the Swale, the Ure, and the Nidd, and their many tributaries. It is estimated that the minimum flow is never less than 100 million gallons daily; the average being approximately 140 million gallons. The site of the Acomb works was acquired on the recommendation of the late Mr. Thomas Hawksley; and the late Mr. James Simpson—the designer of the first filter-beds erected at Chelsea in 1828—designed the works to be placed on the site. Extensions were made in 1868 and 1886; and in 1895 Messrs. Simpson and Son erected a compound horizontal engine and pumps of the Worthington type. Further extensions were completed in 1902, including an increase of the filtering area by 44,550 square feet; and the erection of roughing filters equal to 3 million gallons per 24 hours. In 1903 an extension of the mechanical filtration plant, to the extent of 2½ million gallons daily, was carried out. About this plant the President's address gives some valuable information. It is claimed for the York Water-Works that they are now the oldest incorporated water-works in the country; having held second place to those of the New River Company until that Company's absorption by the Metropolitan Water Board.

On Friday afternoon, the Leighton Reservoir of the Leeds Corporation was visited by the kindness of the Chairman (Councillor Willey) and members of the Water Committee. The inspection was made under the personal guidance of Mr. C. G. Henzell, the Corporation Water Engineer; and the Contractors, Messrs. H. Arnold and Sons, did their utmost to render the visit pleasant and profitable. The Water Committee kindly extended their hospitality to the provision of tea on the works, which was much appreciated, as the excursion was a long one—the special train leaving York for Masham at two o'clock, and York Station not being reached again until just before eight o'clock. It may be of interest to mention that the site of the Leighton reservoir is on the Pott Beck. A little higher in the same valley the Roundhill reservoir of the Harrogate Corporation is also under construction, powers for which were obtained at the same time. Both reservoirs will impound the waters of the Pott Beck. When completed, the head waters of the Leighton reservoir will wash the toe of the Roundhill reservoir embankment. Harrogate may take 2 million gallons per day from the valley; the rest will flow into the Leighton reservoir, so that, with the addition of a supply from the Grimes Gill in the same valley, and the Spruce Gill Beck in the Burn Valley, Leeds will be able to take from this source a daily supply of 4,146,000 gallons, and give compensation water of 2,500,000 gallons. The drainage area of the Leighton reservoir is 4702 acres. The reservoir, when completed, will have a water area of 105 acres, and a capacity of 1136 million gallons. The embankment (under construction) will have a length of 1145 feet, and a maximum height of 112 feet. It will contain 951,000 cubic yards of earth; the puddle wall will contain 84,200 cubic yards; and the concrete wall 55,500 cubic yards. The waste weir is 181 feet in length, and the bye-pass varies from 50 feet to 100 feet in width. The bye-wash and river channel are 1670 feet long. The contract price is £437,182.

The Leighton reservoir is about 41 miles from Leeds, and will be connected with the Swinsty reservoir in the Washburn Valley by means of an aqueduct 24 miles in length, 2½ miles of which is tunnelled through the hillside near Kettlesing. This tunnel, which has a diameter of 6 feet, is now completed, and has cost approximately £100,000. At the tunnel outlet there is a bye-pass, by means of which, in case of necessity, the water can be conveyed past the Swinsty reservoir direct to the mains which convey it to Eccup. The Colsterdale reservoir will be proceeded with after completing the Leighton reservoir.

The programme ended on Saturday morning with a visit to Castle Howard by motor brakes, though several of the members were unable to undertake the interesting excursion, owing to the distance between York and their homes necessitating an early leavetaking.

Mr. H. M. Thornton (Vice-Chairman of the Richmond Gas Stove and Meter Company, Limited) has been elected a member of the Society of Chemical Industry.

By the recent death, in his 78th year, of Alderman William Groom, the Harwich Gas Company have lost their Chairman, and one of the mainstays of the business and commercial life of the borough has been removed. Deceased was, with his father, in 1854, one of the founders of the Company. He became a Director some ten years later; and in September, 1891, he succeeded Mr. F. R. Hales in the chairmanship of the Board—an office he filled to the time of his death. He was held in the very highest esteem by all his colleagues; and he evinced the keenest regard for the shareholders.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Japan-British Exhibition.

SIR,—The exhibit organized by the Joint Gas Companies' Committee at the White City is now complete, and (as the inquiries that are being daily forwarded by the Superintendent to gas managers all over the country clearly testify) it is proving a great attraction to the public. All that is wanted now to make the venture an entire success is financial support.

Appended is a list of subscriptions guaranteed up to date, amounting to just short of £2500. The Committee need at least £3000 altogether to make ends meet.

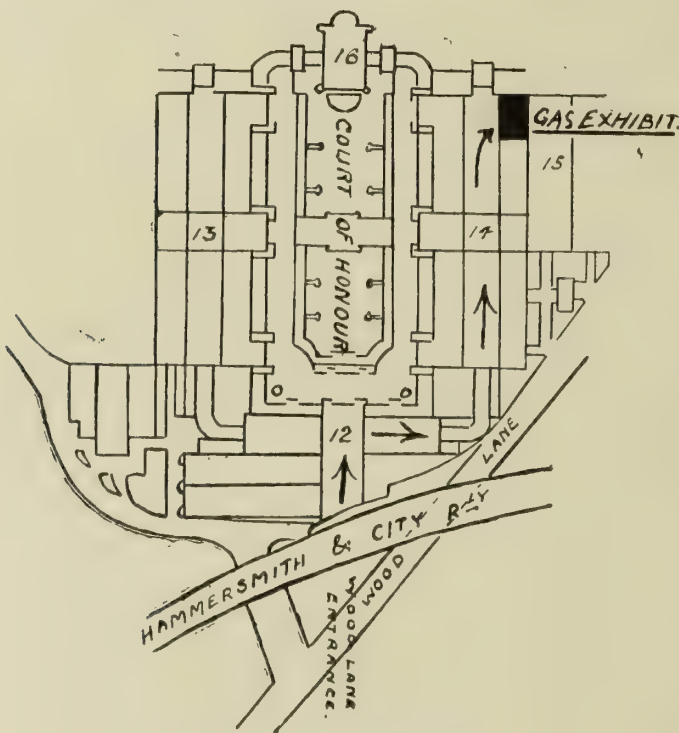
Gas managers from all over the country will be in London within the next fortnight, attending the Institution meetings. They will one and all be very welcome at the stand at Shepherd's Bush; and it is hoped that they will come there in large numbers—to go back to the very first meetings of their Boards and Committees and say that it is not fair that a work of national value to the industry should be supported by so few undertakings, nor that the Organizing Committee should find themselves in the humiliating position of having to beg for the funds that could so easily be provided if only the many would follow the lead of the few.

It only needs £10 from each of fifty additional undertakings to put the exhibit on a paying basis. Is that a serious matter for an industry such as ours?

D. MILNE WATSON, Chairman,
F. W. GOODENOUGH, Hon. Secretary and Treasurer,
Japan-British Exhibition Gas Companies' Joint Exhibit Committee.

Gaslight and Coke Company's Offices, Horseferry Road,
Westminster, S.W., June 3, 1910.

P.S.—To assist visitors to find their way to the exhibit, a plan of the portion of the exhibition in which it is situated is enclosed for reproduction. Entering from Wood Lane, the visitor should turn to the right, instead of going out into the Court of Honour, and he will then readily find his way to the stand through the British Dress Section.



JAPAN-BRITISH EXHIBITION.

List of Gas Companies who have Guaranteed Subscriptions.

| | £ | s. | d. |
|--|------|----|----|
| Barking Gas Company | 5 | 5 | 0 |
| Brentford Gas Company | 200 | 0 | 0 |
| British Gaslight Company | 100 | 0 | 0 |
| Chigwell, Loughton, and Woodford Gas Company | 20 | 0 | 0 |
| Commercial Gas Company | 100 | 0 | 0 |
| Cradley Heath Gas Company, Staffordshire | 2 | 2 | 0 |
| Croydon Gas Company | 200 | 0 | 0 |
| Enfield Gas Company | 10 | 10 | 0 |
| Gaslight and Coke Company | 1000 | 0 | 0 |
| Hampton Court Gas Company | 10 | 0 | 0 |
| Harrow and Stanmore Gas Company | 5 | 5 | 0 |
| Hornsey Gas Company | 20 | 0 | 0 |
| Ilford Gas Company | 21 | 0 | 0 |
| Imperial Continental Gas Association | 52 | 10 | 0 |
| Kingston-on-Thames Gas Company | 21 | 0 | 0 |
| Lea Bridge District Gas Company | 20 | 0 | 0 |
| Leamington Priors Gas Company | 2 | 0 | 0 |
| Mitcham and Wimbledon Gaslight Company | 10 | 10 | 0 |
| North Middlesex Gas Company | 5 | 5 | 0 |
| Reading Gas Company | 50 | 0 | 0 |

Carried forward £1855 7 0

| | | | |
|--|-------|---|---|
| Brought forward | £1855 | 7 | 0 |
| Richmond Gas Company | 21 | 0 | 0 |
| Sheffield United Gaslight Company | 50 | 0 | 0 |
| South Metropolitan Gas Company | 250 | 0 | 0 |
| South Suburban Gas Company | 50 | 0 | 0 |
| Staines and Egham District Gas and Coke Company | 5 | 5 | 0 |
| Tottenham and Edmonton Gaslight and Coke Company | 200 | 0 | 0 |
| Uxbridge Gas Company | 10 | 0 | 0 |
| Waltham Abbey and Cheshunt Gas and Coke Company | 5 | 0 | 0 |
| Wandsworth and Putney Gaslight and Coke Company | 50 | 0 | 0 |

£2496 12 0

Sulphur Purification.

SIR,—In your issue of April 12 there is a letter from Mr. C. W. Somerville, who states that the inaccuracies in the iodometric estimation of sulphur compounds in coal gas are in his opinion almost entirely due to HCN. In this connection, the following experiments may not be without interest.

(1) To 10 c.ccms. of N/10 KCN, 10 c.ccms. of N/10 iodine solution were added, the solution acidified with HCl, and titrated with thio-sulphate. No iodine was used up. In neutral solution, a certain amount of iodine is used up, but the whole is recovered on acidifying.

(2) About 500 c.ccms. of pure HCN gas were passed slowly through 100 c.ccms. of N/100 iodine solution; and 10.3 c.ccms. were used up. This corresponds to only 0.2 per cent. absorption of HCN.

(3) 25 c.ccms. of a 0.1 per cent. solution of HCN treated with 25 c.ccms. of N/100 iodine solution absorbed 1.6 c.cm. of iodine solution. This is equivalent to 0.002032 gr. of iodine. The 0.025 gr. of HCN present, assuming HCN + I₂ = HI + CNI to be correct, would absorb 0.235 gr. of iodine. The percentage absorption is less than 1 per cent. of the theoretical.

Lastly, we determined the amount of HCN present in the gas issuing from the last oxide purifier. This amounted to 5.22 grains of HCN per 100 cubic feet, which is equivalent to 6.57 grains of H₂S. A concurrent determination of the iodine absorbed by the gas experimented with gave the equivalent of 18.6 grains of H₂S per 100 cubic feet, or three times the HCN equivalent, assuming that the reaction was quantitative.

In view of the results given above, this supposition is impossible; and the obvious conclusion is that HCN is not the disturbing factor.

RAYMOND ROSS, F.I.C., F.C.S.
JOSEPH RACE, F.I.C.

Public Analyst's Office, Burnley, May 31, 1910.

[The text of the paper which called forth Mr. Somerville's letter and our present correspondents' reply, appears in another column of to-day's "JOURNAL," p. 630.—ED. J.G.L.]

Carbonizing Systems—Dr. Geipert's Criticisms.

SIR,—The remarks contained in my letter of the 17th ult. were not intended to be personal, other than as replying to an individual upon the points raised by him.

In an experience extending over nearly thirty years in the active management of gas-works, I have generally found the rate of formation of scurf to be *pro rata* to the amount of pressure within the retort, whether partially or wholly filled; and I have never before heard the theory advanced that this is not the case. Practical experience, better than accepted theory, will prove whether this is not so; and while recognizing and appreciating the value of text-books, I prefer to rely upon actual experience rather than to fall back upon theory to prove the point at issue.

Dr. Geipert stated in his lecture that my remarks did not relate to the results of experience, but were conjectures which he would like to correct. I venture to suggest it is neither sound argument nor fair criticism to attempt such correction by means of a theory (which after all is only a matter of conjecture) directly contradictory to the result of actual experience.

Dr. Geipert is not correct in saying that the difference in the quality of the coal does not apply to the case in question, and inferring that in the trials made care was taken to use only such coals as are known to be good gas coal. The coal with which the Woodall-Duckham test was made is much inferior both in yield and quality to the best Yorkshire gas coals; while I have the authority of Mr. Samuel Glover for stating that the coals used in the Glover-West trials were purposely selected from ordinary qualities of coal generally used in his district, and that vastly superior results could have been shown had only the best gas-producing coals been used.

It is not my intention to continue this correspondence further, having regard to the fact that the discussion of my paper by the Midland Association has not yet taken place.

Market Harborough, June 3, 1910.

ALFRED T. HARRIS.

Another Injustice to Ireland.

SIR,—In looking through the columns of the "JOURNAL" for the 31st ult., I see under "Arbitration Proceedings" the case of the Lisburn Gas-Works purchase. Messrs. E. H. Stevenson and J. Hepworth, who are engaged in the matter, are reported as having said: (1) Most of the gas companies over there are not well managed; (2) he also agreed that gas management in Ireland was out of date.

Now, Sir, are the gas managers in Ireland to take this as an impeachment of their capabilities, or are these gentlemen referring to the directorate of the companies? If the former, might I ask with how many of the 110 gas-works in Ireland have they personal contact, and can speak from inside knowledge? If the latter, why should the management be impeached without bringing in the directors? A great many of the

gas-works in Ireland are very small, and are managed by men who have no say in the commercial transactions of the concern—being directly under the instructions of the secretary. But if you take works of from 15 millions upwards, it will be found that of the 29 works of this size, thirteen are managed by, or are dominated by, Englishmen; seven are managed by Scotchmen; and only nine by Irishmen.

To bring such a charge against Irishmen is cowardly in the extreme; for they have proved, and are proving, their worth every day. Otherwise, with the keen competition now going on, their places would soon be filled. Perhaps Messrs. Stevenson and Hepworth could be persuaded to come over and teach us the business.

We have many things to contend with here that people on the other side know nothing about. Politics, religion, &c., enter into every business; and the policy which prevails on the other side would not do here at all.

These gentlemen seem to forget that nearly all our materials—including coal, bricks, clay, and ironwork—have to be seaborne, which adds very considerably to the cost of manufacture. Still, for our output, we are able to sell at very reasonable prices; and that our make is able to come within measurable distance of the exaggerated makes on the other side, is very much to our credit.

To my mind, the remarks of these two gentlemen regarding gas management in Ireland were totally uncalled for.

IRISH GAS MANAGER.

June 3, 1910.

REGISTER OF PATENTS.

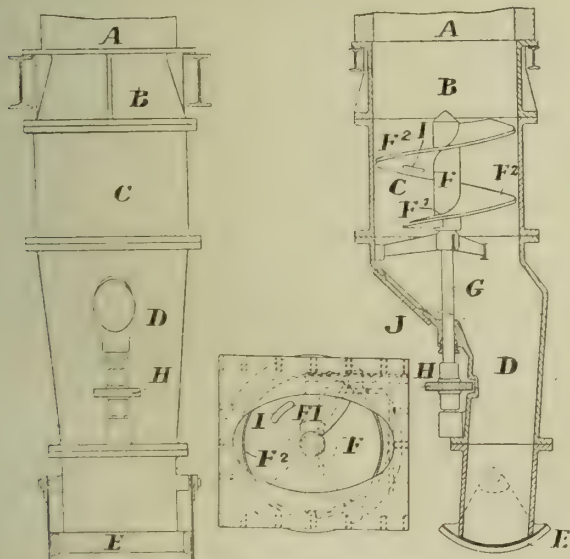
Vertical Retort Discharging Apparatus.

WEST, J., of Southport, and GLOVER, S., of St. Helens.

No. 8572; April 8, 1909.

This invention relates to mechanical means for extracting and regulating the extraction of coke from vertical retorts, and is especially applicable to continuous carbonization systems—where the material fed to the retorts is continuously or intermittently extracted at such a speed as to conform to the requirements for complete carbonization.

To accomplish this object, the ironwork at the outlet or bottom end of the vertical retort is made circular in section, whatever the upper portion of the retort may be. In this circular lower portion, there is introduced a helix or worm of such a pitch that the incline of the vane or screw is at the angle of repose of the material to be extracted from the retort. In consequence, when the weight of the material to be extracted lies on the helix or worm, it will be at rest on it unless the worm is rotated by the driving gear.



West and Glover's Vertical Retort Discharger.

The illustration shows an elevation of the chamber containing the coke discharging apparatus, and forming the sealed receptacle for the coke discharged from the retort; also a section of the chamber showing the sectional shape of the retort at the juncture where it develops to a circular shape for the reception of the helix or worm of the discharging apparatus.

A is the bottom end of a vertical retort (of oval or other suitable section). B is a casting, the top side of which is of the same section as the retort, and the bottom of circular section. C is a circular continuation of the casting of an internal diameter suitable for the reception of the helix or worm. D is a chamber for receiving the coke periodically discharged through the opening at its base, and which is sealed by a gas-tight door E. F is a helix or worm rotated by a shaft H driven by gearing H, which, in turn, is put into motion by gear adjustable as to the speed of rotation. The vanes of the worm F are so constructed that the pitch of the lower part of the worm at F¹ close up to the shaft is smaller than would be the case if developed in the ordinary way, by following the ordinary development of a helix or worm set out from the pitch of the exterior of the vane at F². In this worm the outside of the blade is a true helix, while the inside of the worm close up against the shaft is formed of two separate helices—the upper portion, extending for (say) a complete revolution, being of larger pitch than the lower portion that extends for (say) three-eighths of a revolution. This arrangement has the effect of making the mean inclination of this part

of the worm smaller than that of the upper part. I is a slotted hole in the vane or plate of the worm for the purpose of permitting a poking rod to be passed through it and through the inspection door J.

Anti-Pulsator and Pressure Regulator for Gas-Mains.

THORP, T., of Whitefield, near Manchester.

No. 12,508; May 27, 1909.

This invention, relating to the regulation of the flow and pressure of gas in gas-mains, consists in a combined anti-pulsator and pressure regulator; the object of the former being to maintain a practically uniform pressure in the pipe to which the anti-pulsator delivers the gas, and to prevent pulsations in the main, while the regulator serves to prevent the pressure in the main supplying the anti-pulsator from falling below a predetermined pressure in case an exceptional quantity of gas is consumed by the engine or other plant supplied through the anti-pulsator.

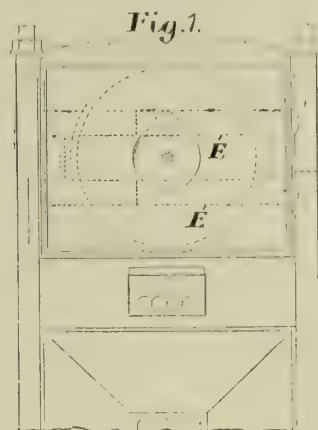


Fig. 2.

Fig. 4.

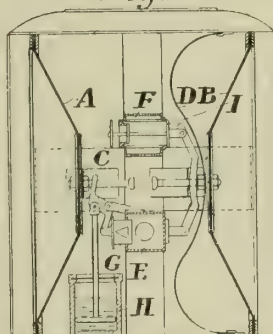
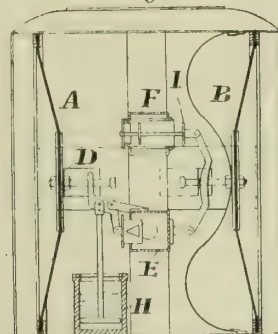


Fig. 3.

Fig. 5.



Thorp's Combined Anti-Pulsator and Pressure Regulator.

The illustration shows the anti-pulsator and pressure regulator as applied to a gas-meter. Fig. 1 is a front elevation of the meter and combined apparatus; figs. 2, 4, and 5 are vertical cross sections with the moving parts in different positions; and fig. 3 is a horizontal cross section of fig. 2.

An anti-pulsator of the kind described in patent No. 15,697 of 1905 is combined with a gas pressure regulator or governor similar to that described in patent No. 22,134 of 1906 in one casing. The combined anti-pulsator and regulator is constructed as follows: A casing (cylindrical or rectangular) has openings in its opposite ends closed by flexible diaphragms A B fixed to the ends. Through the centres of the diaphragm bolts are passed, between the nuts on which circular discs enclosing the central parts of the diaphragms are secured, and also corrugated springs C D, of the kind described in patent No. 5791 of 1905. These pull the diaphragms inwards with a pressure increasing with their inward movement, and counteract the variable pull of the diaphragms as they are forced inwards; so that they move in and out with a very small difference of pressure in the casing, as described in the patents first mentioned.

Across the casing extend two pipes E F, which at one end communicate with the delivery pipe of the meter, but are separated by a partition in this pipe. The pipes are closed at their other ends (or

beyond the middle of the casing) by walls. In the pipe E a valve G is arranged, formed of a hollow cylinder closed and flanged at the outer end and having triangular openings in its sides. The valve is connected to a Z-shaped lever fulcrumed in a bracket fixed on the pipe E. The other limb of the lever is attached to the rod connected to the piston of a dashpot H; and the bent extension of the lever embraces (by a fork or an eye) the bolt attached to the diaphragm A. The dashpot will hold the valve in any position—for instance, that shown in fig. 5; so that under frequent pulsations of pressure or volume the diaphragm can move inwards and outwards without shifting the valve. But when the pressure in the chamber falls, and the diaphragm is pulled into the position shown in fig. 2, the valve is fully opened; while when the pressure rises and the diaphragm is pushed outwards into the positions shown in fig. 4, the valve G closes.

In the other pipe F, an equilibrated valve I is arranged. It is attached to a bent lever fulcrumed on a bracket on the pipe E. A light corrugated spring presses the lever outwards with a practically uniform pressure, and holds the valve open while the diaphragm B moves in or out within the positions shown in figs. 4 and 5; a cross-bar or its equivalent being fixed to the valve-spindle to limit the opening. When the pressure in the casing falls, and the diaphragm B is pulled inwards by the spring D, the pull of the spring closes the valve I, as fig. 2.

The action of the apparatus when used in combination with a gas-meter and gas-engine is as follows: The apparatus is made of such size that the difference in the volume of gas enclosed between the diaphragms in the positions shown in fig. 4 and in the positions shown in figs. 2 and 3, is about equal to the volume of gas drawn in by the gas-engine during its suction stroke. As no gas is taken from the apparatus during the remaining cycle of the engine, the apparatus will be filled, and the diaphragm will be about in the positions shown in fig. 4 at the commencement of the suction stroke of the engine, and move inwards during this stroke—more particularly at the middle of the stroke, when the greatest suction occurs. Ordinarily the diaphragms will not be drawn into the position shown in fig. 2, as gas continues to flow into the apparatus through the inlet valve G during the suction stroke. The meter therefore need only be of the size required for passing during the complete cycle of the engine the quantity of gas required for the suction stroke, instead of being large enough to pass this quantity during the suction stroke itself, as would be required if the combined anti-pulsator and regulator were absent. If the pressure of the gas entering the apparatus rose above the predetermined pressure to which the springs are adjusted, the diaphragms would attain the positions shown in fig. 4, and the valve G would be closed. The gas-engine therefore is always supplied with gas at the predetermined pressure required for uniform working. On the other hand, if the pressure in the supply main and apparatus fall below a predetermined pressure, the action of the spring D upon the diaphragm B would overcome the pressure of gas upon the diaphragm and of the spring holding the valve I open. The valve would therefore close and prevent the pressure in the supply main falling below the predetermined pressure.

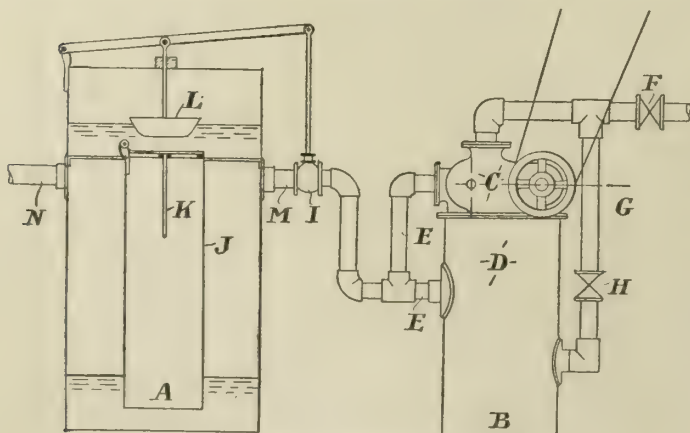
When no special meter is used for measuring the gas consumed by the engine, the pipe E will be connected to the gas supply main and the pipe F to the pipe leading to the engine. The action would be the same as above described, and the pressure in the main could not be lowered below that at which the valve I closes, nor rise in the anti-pulsator above that at which the valve G closes. Gas at a uniform pressure will thus be supplied to the engine, and a lowering of the pressure in the supply main below the predetermined minimum prevented.

High-Pressure Carburetted Air-Gas Apparatus.

Fox, H. L., of Cannon Street, E.C.

No. 13,712; June 11, 1909.

This apparatus consists of an automatic generator whereby pressure is obtained by the employment of a hydrostatic column. In a previous patent (No. 3805 of 1907), an apparatus embodying these features was described in which an intermediate receiver operated as an expansion chamber and bye-pass, whereby gas generated in excess of the demand was compressed until the pressure within the expansion chamber was greater than that of the gas-bell, when an automatic valve closed the inlet to the gas-valve, allowing the compressed gas within the expansion chamber to circulate. With the present improvements, however, in place of the gas-bell, it is intended to use, in conjunction with the gas-generating apparatus and expansion chamber, a hydrostatic gas-receiver of special design in conjunction with an automatic valve whose operation is dependent upon the pressure of the gas within the receiver.



Fox's High-Pressure Carburetted Air-Gas Plant.

A is the hydrostatic column, adapted to hold the gas after generation and dilution and while under pressure. B is the intermediate receiver, as described in the 1907 patent. The blower C receives gas from the

generator (not shown) in the required state of dilution. It is compressed and enters the pressure receiver D by a pipe E, whence it may be led to the hydrostatic receiver A. Between the generator and the blower is a non-return gas-valve F, and between the valve and blower is a bye-pass G and a pressure release valve H, whereby the blower is capable of compressing direct into the receiver A, or should this path be closed by the throttle valve I, then the pressure will rise in the receiver B until the resistance of the valve H is overcome and the valve F closed, when the blower merely circulates the gas within the receiver on a closed circuit.

The part A consists of a vessel formed with a diaphragm, depending from which is a tube J reaching almost to the bottom of the tank. The upper part of the tube is covered by a hinged flap valve and prevented from absolutely closing the mouth of the tube by distance-pieces. A balance rod or plate K helps to keep the valve from chattering. Within the upper part of the vessel is a float L linked to a rod by a spindle, which passes through a guide. The rod is hinged to a stirrup on the tank C, and at its other extremity has a valve-rod pinned to it, and operating the admission valve I on the inlet pipe M. An outlet pipe N is provided beneath the diaphragm as shown.

The operation of the plant is as follows: Water is poured into the upper part of A and flows under the flap-valve, and by rising under the diaphragm it compresses the imprisoned air. The gas under pressure is allowed to enter and displaces the water upwards through the depending tube J, raising the flap-valve if the action is vigorous. The gas is now drawn off as consumed; the water rising to the upper part of the tank above the diaphragm, and, in so rising, lifting the float L and so closing the throttle valve I, rendering the action automatic. If the pressure be excessive within the part A, the communication between A and B is closed; the blower C in this case merely circulating the gas. The flap-valve, by its stem and raised seating, tends to modify the force of the upward and downward rushes of water, and thereby equalize the flow.

Taps or Stop Cocks.

EVERED and Co., LIMITED, and DANKS, J. T., of Smethwick.

No. 16,026; July 9, 1909.

According to this invention, the plug is made without a side projecting stop pin; combined with the plain plug being a washer having in one therewith a teat or projection—the washer being fitted on the square or angular part near the lower end of the plug. The arrangement was described and illustrated in the "JOURNAL" for Dec. 21, 1909, p. 815.

APPLICATIONS FOR LETTERS PATENT.

- 12,515.—FISCHER, P. G., "Indicating the escape of gas from pipes or conduits." May 23.
- 12,544.—HILL, H. W., "Cock and valve." May 23.
- 12,562.—HAWORTH, J. R., and SKIPPER, F., "Gas-irons." May 24.
- 12,606.—CHISHOLM, C. F., and TENNEY, A. B., "Coin-freed meters." May 24.
- 12,621.—MILLER, A. E., "Water-heaters." May 24.
- 12,668.—WEIPPERT, E. D., and CHESHIRE, W. D., "Gas-meters." May 24.
- 12,673.—JENNINGS, W. C., "Water-heaters." May 25.
- 12,747.—SCHMIDT, P., and DESGRAZ TECHNICAL BUREAU G. M. B. H., "Gas-furnaces." May 25.
- 12,748.—LARSEN, A. S., and STORN, O. J., "Separating a single gas from a mixture of gases." May 25.
- 12,765.—HARRISON, H. T., "Indicating illumination values of light." May 25.
- 12,776.—TATLOCK, C. S. A., "Removal of rosolic acid and other like colouring matters from tar, blast-furnace, gas-producer, and other oils." May 26.
- 12,793.—BARRACLOUGH, W., LTD., and BARRACLOUGH, W. T., "Gas cooking apparatus." May 26.
- 12,823.—SCHMIDT, G. H., "Gas-stove burners." May 26.
- 12,848.—FALK, STADELMANN, and CO., LTD., "Ball and socket joints." A communication from A. Barella. May 26.
- 12,850.—BENNIS, A. W., "Gravity bucket, tray, or plate conveyors." May 26.
- 12,857.—INHOFFEN, R., "Measuring gas." May 26.
- 12,894.—DEMPSTER, R., and SONS, LTD., and BROADHEAD, J. W., "Gas-purifiers." May 27.
- 12,947-8-9.—HENRI, V., HELBRONNER, A., and RECKLINGHAUSEN, M. VON, "Treatment of liquids by means of ultra-violet rays." May 27.
- 13,001.—LEE, H., "Blowers and meters." May 28.
- 13,011.—SOCIÉTÉ DES RACCORDES ET FERMETURES RAPIDS "DAYOL" and DAYOL, J. M., "Union or plug for connecting or closing pipes or tubes." May 28.
- 13,016.—LUCAS, P., "Incandescent gas-lamps." May 28.
- 13,017.—LUCAS, P., "Inverted lamps." May 28.
- 13,018.—SOKAL, S., "Apparatus for closing tubes." A communication from Carl Engler, Ltd. May 28.
- 13,019.—DEPREZ, O., and RICHIR, A., "Carburettors for illuminating or heating purposes." May 28.
- 13,025.—MOORE, T., and CULLING, P. E., "Automatically locking gas-cocks." May 28.

Presiding last Wednesday at the annual meeting of the Liberty and Property Defence League, Sir Richard Temple said the League had reason to be proud of what they had achieved during the past year. They were the first to start the agitation against the Budget; and the course which they advocated from the very first—that the House of Lords should throw it out—was eventually adopted. Though they did not succeed in getting rid of the Budget, they gave the Government a very severe check, which would make them walk warily in future. The work of the League in Parliament had resulted in the defeat of many mischievous Bills, notably the Unemployed Workmen Bill, which would have led very quickly to public bankruptcy; and the Shops Bill, which would have turned the shop employee into a kind of serf.

MISCELLANEOUS NEWS.

COAL CONTRACTS AND METER-RENTS AT SALFORD.

At the Meeting of the Salford Town Council last Wednesday, considerable discussion took place in regard to certain resolutions bearing upon the price of gas passed by the Gas Committee, to which reference was made in the "JOURNAL" the preceding day (p. 573). Before they were considered, however, the question of the coal contracts engaged attention. The MAYOR (Alderman Snape) presided.

Alderman PHILLIPS, the Chairman of the Gas Committee, submitted a resolution accepting certain tenders for supplying quantities of coal and cannel required at the several gas-works during the ensuing twelve months. In doing so, he criticized the action of the General Purposes Committee in regard to these tenders, and said that, as the result of the methods adopted, £7200 more would have to be paid for coal. [Question.] If someone else knew more about the matter than he did, he would sit down.

The MAYOR: Order, order. Alderman Phillips holds a very responsible position, and whether you agree with him or not I will ask you to give him a respectful hearing.

Alderman PHILLIPS said it was an extraordinary thing that the Mayor had to make such an appeal for a member who had sat in the Council for 25 years. He had repeatedly told the General Purposes Committee that the course adopted was not in the interests of the ratepayers. He had told them that they were paying higher prices than were necessary; and that they were paying out money which might be contributed in relief of the rates. The Committee were told that they ought to consider the lowest tenders, and that there should be no negotiations. The irony of the situation was this: In the list submitted to the Council that morning, the name of a certain contractor appeared. A representative called at the Gas Offices and said: "We are anxious to have an order from the Corporation for coal, and we are prepared to take 3d. per ton off." The representative did not know that the contractor's name appeared on the selected list. The Committee were precluded from entering into negotiation with the firm, and therefore they were called upon to pay the original price. "If you compel us," said Alderman Phillips, "to adopt these unreasonable methods, and prevent us from buying in the cheapest markets, you cannot expect the Gas Committee to contribute as much money towards the reduction of the rates as they have done in the past."

Mr. STEELE seconded the motion, which was carried by a large majority.

[The following are the contracts for coal and cannel approved by the Town Council, and the prices: Bloom Street works—cannel, H. A. Nickson and Co., 1500 tons, at 13s. 9d.; Earl of Ellesmere, Bridge-water Collieries, 1500 tons, at 14s. 6d. Coal, W. & J. E. Kennedy and Co., 4-feet and 6-feet washed nuts, 2000 tons, at 11s. 7d.; Clifton and Kersley Coal Company, No. 4-washed nuts, 3000 tons, at 12s.; Regent Road works—cannel, J. & G. Wells, Eckington, 3000 tons, at 12s. 6d.; Hucknall Colliery Company, 5000 tons, at 12s. 6d.; Sheep-bridge Coal Company, 2000 tons, at 11s. 9d.; R. C. A. Palmer, Morewood, Swannick, 10,000 tons, at 12s. 8d. Coal, J. Roscoe and Sons, Arley coal, 40,000 tons, at 9s. 10d.; Sheffield Coal Company, Birley nuts, 5000 tons, at 10s.; Old Silkstone Colliery Company, double-screened nuts, 5000 tons, at 10s. 9d.; Pearson and Knowles Coal Company, Moss nuts, 5000 tons, at 10s. 10d.; Ashley and Dumville, Hartley coal, 4000 tons, at 11s. 1d.; Astley and Tyldesley Coal Company, Hartley coal, 10,000 tons, at 11s. 1d.; Hodgson and Co., Arley coal, 3000 tons, at 10s. 10d. Albion Street works—cannel, Earl of Bradford, Great Lever, 20,000 tons, at 13s. 2d.; J. E. Cowcill, Wharnccliffe, 8000 tons, at 12s. 6d.; J. & G. Wells, 9000 tons, at 12s. 10d. Coal, J. Roscoe and Sons, Arley coal, 10,000 tons, at 9s. 10d.; J. E. Cowcill, Wharnccliffe, 8000 tons at 12s. 6d.; J. & G. Wells, 9000 tons, at 12s. 10d.; J. E. Cowcill, Arden coal, 18,000 tons, at 10s. 3d.]

Alderman PHILLIPS then moved the following resolutions, which had been passed by the Gas Committee: "(1) That from and after July 1, 1910, the charges for meter-rents, which were discontinued in the December quarter, 1893, be re-imposed. (2) That from and after July, 1910, the quantity of gas allowed for 1d. by prepayment meter be reduced from 30 to 27 cubic feet. (3) That from and after July 1, the charges for gas to large consumers, both within and without the borough, be reduced as follows—viz., to consumers of 2 million cubic feet and under 4 million cubic feet per quarter, a reduction of 1d. per 1000 cubic feet, making the net price 1s. 10d.; to consumers of 4 million and under 6 million cubic feet per quarter, a reduction of 2d. per 1000 cubic feet, making the net price 1s. 9d.; to consumers of 6 million and under 8 million cubic feet per quarter, a reduction of 3d. per 1000 cubic feet, making the net price 1s. 8d.; to consumers of 8 million and under 10 million cubic feet per quarter, a reduction of 4d. per 1000 cubic feet, making the net price 1s. 7d.; and to consumers of 10 million cubic feet and upwards per quarter, a reduction of 5d. per 1000 cubic feet, making the net price 1s. 6d." In dealing with the first resolution, he said the Committee were of opinion that the time had arrived when they ought to charge a moderate rent for gas-meters. In July of last year, the largest gas undertaking in the world—the Gaslight and Coke Company in London—found that they had no less than 7000 meters out but not returning any revenue at all for gas consumed, and imposed a charge. People were merely keeping the meters as a stand-by in case the electric light failed.

Mr. STEELE seconded the motion.

Mr. PICKERING asked whether the resolution would apply to consumers using slot-meters. He said he quite agreed that a change should be made; but he did not think it would be fair to treat all people alike. Those who had meters in their houses and were not burning gas ought to pay more than those who used it.

Alderman PHILLIPS: We have 69,000 consumers; and I am afraid we cannot make the conditions absolutely equitable.

Mr. STEELE said meters which were kept as a stand-by depreciated in value more than those in use; and the Committee suffered a great

loss. This meant an increase of 1½d. per 1000 cubic feet to the ordinary consumer; but it would regulate the expenditure on unused meters.

Alderman JENKINS thought people who kept meters as a stand-by ought to pay.

Mr. BARKER said the position was quite clear. The Gas Committee had to hand over a certain amount of money for the relief of the rates. They had to consider a means of finding this money, and they had decided to make the gas consumers suffer.

The proposition was lost by a majority of two.

Alderman PHILLIPS then moved the second resolution. He said the methods proposed had to be adopted for the purpose of raising money; and there was only one alternative to them, and it was to increase the price of gas.

The MAYOR suggested that the resolutions should be withdrawn, and the whole matter dealt with by the General Purposes Committee at a meeting called specially to consider it.

Alderman PHILLIPS said he was bound to move the resolutions—there was no alternative. It was presumed that those who used slot-meters were the poorest of the poor; but this was not so. A number of people had them because they found it much better to put a penny in the slot than to have a gas bill coming in. Those who used these meters burnt less gas than the ordinary consumers, while the collection alone cost something like 2d. per 1000 cubic feet.

Mr. STEELE said the Gas Engineer had supplied a statement which showed that the cost of the collection of ordinary consumers' accounts was 1 per cent., while it cost 5 per cent. to collect the slot consumers' money. The difference in price was 6½d. per 1000 cubic feet; and the present deficiency, compared with ordinary meters, was 4½d.

Mr. DELVES said he hoped to see the day when the slot system would be abolished; but he joined in the protest against this additional charge on poor consumers.

Mr. BARKER said they were taking 3 cubic feet of gas from the very poorest to enable the Gas Committee to provide a certain sum towards the reduction of the rate.

Alderman LINSLEY said he sympathized with the Chairman of the Gas Committee. A great deal had been said on this question, but nobody had suggested a better way of raising the money than that proposed. The Mayor had suggested that the resolutions should be withdrawn, and that the whole matter should be discussed by the General Purposes Committee. He hoped the Council would allow this to be done; and he moved, as an amendment, that a special meeting of the Committee be called.

Alderman WORSLEY seconded the amendment.

On a vote being taken, the numbers were found to be equal; and the Mayor gave his casting vote in favour of the amendment. When, however, the names were called for and given, it was found that the amendment had been defeated by 18 votes to 17.

Mr. PICKERING remarked that if the Gas Committee were unable to give a sufficient return, it was time they took into consideration the price of gas. A sum of £4000 was a very poor return for a capital of nearly a million sterling.

Alderman PHILLIPS pointed out that the profit which the Committee contributed in relief of the rates was not made from the slot-meter consumers. The Council seemed determined not to accept the resolutions; but, as he had already said, there was only one alternative, and that was to increase the price of gas.

The second and third resolutions were then put and lost by large majorities.

GAS PROFITS IN AID OF RATES.

At the Meeting of the Bolton Town Council last Wednesday, considerable discussion took place on the report of the Finance Committee as to the rates for the year. Despite a cutting-down in the estimates of the spending Committees and an increase in grants from the trading departments, there is an advance of 3d. in the pound in the central district rate, and from 2d. to 6d. in the other districts, compared with last year. From the Gas Department, the Finance Committee obtained an increase of £2500 in the grant out of profits—making a total contribution of £20,000 for the year; and from the Electricity Department they had £7500 instead of the £7000 at first decided upon by the Committee. Mr. Harwood protested against the policy of the Finance Committee in demanding increased grants from the trading departments, and said it was not only an injustice to the consumer but was throwing dust in the eyes of the ratepayers. He was in favour of economy where it could be legitimately produced; but he was also in favour of fairly and squarely meeting debts incurred. If the Council were ashamed of their expenditure, let them say so to the ratepayers. Their duty to them was not to cook the accounts—appropriating money which undertakings could not possibly afford to give up in order to show that they were doing all these things at the same rate, or at a slight increase. He objected to what he called the increasing depredations of the Finance Committee on the various trading Committees; contending that it was not in the interest of the consumers, and would not, in the long run, be beneficial to the ratepayers, because, even though they might now get a small reduction, they were really depreciating their security. An amendment moved by Mr. Harwood on the point was defeated; and the estimates as submitted were approved.

In a revised abstract of accounts ordered by the Rochdale Town Council, the Borough Treasurer gives particulars of the amounts handed over by the Gas Committee out of profits in relief of rates. It appears that during the last fourteen years £172,710 has been allocated for this purpose from the gas profits and the reserve fund. The largest sum so granted in one year was £19,598, in 1905-6. In the preceding year, £18,228 was handed over. In their annual report, the Gas Committee point out that the amount appropriated in the past twenty years totals £211,171, exclusive of the cost of street lighting for the last thirteen years of this period, during which this expense was borne by their department. With the large expenditure necessitated by the erection of a new retort-house and the installation of Glover-West vertical retorts, the Committee state that the amount available in aid of rates will be less than usual for the next year or two.

NOTTINGHAM CORPORATION GAS UNDERTAKING.

The Past Year's Working—Record Profits.

The annual report of the Gas Committee of the Corporation of Nottingham was issued last week, and it was to come before the City Council yesterday. The following are its principal features.

The total income for the year ended March 31 amounted to £328,780, and the total expenditure to £218,483; leaving a balance of £110,297 carried to the profit and loss account. After deducting the interest on capital and the sinking funds, and placing £2000 to the depreciation of stoves, there remains a net profit of £54,016 at the disposal of the Council. The Committee recommend that the sum of £35,000 should be handed over to the Finance Committee in aid of the general district rate, and that the balance of £19,016 should be disposed of as follows: £3000 to be added to the depreciation fund, £10,016 to the reserve fund, and £6000 to the renewals account. They express the opinion that some reduction should be made in the price charged for gas supplied to the ordinary consumers; and they therefore propose to reduce the price to those hitherto charged at 2s. 6d. and 2s. 5d. to 2s. 4d. per 1000 cubic feet from and after Michaelmas next.

The Committee express regret that during the year the market values of residuals were adversely affected in sympathy with the general depression in trade. Compared with the previous year, the income from tar, sulphate of ammonia, coke and breeze, &c., showed a diminution of £3499. The rates and taxes increased by £1557.

The quantity of gas sold during the year amounted to 1,980,617,900 cubic feet, against 1,980,416,700 cubic feet in the previous year—an increase of 201,200 cubic feet. There was an increase of 73 cubic feet in the quantity of gas made per ton of coal carbonized; and the unaccounted-for gas was proportionately less than at any other period in the history of the concern—being about 11½ million cubic feet less than in 1908-9, or 4½ per cent. against 5·03 per cent. on the total make. These two factors were largely responsible for the increased profit, which is the largest on record.

At the Basford station, No. 2 gasholder has been entirely rebuilt out of revenue. The carburetted oil-gas plant has been duplicated, and is now capable of making 2 million cubic feet of gas per day. The sum of £10,000 allocated in 1908 for the new retort-house at the Radford works has not yet been appropriated, and a further sum of £6000 has been placed to the renewals account with the object of remodelling these works. The Basford and Eastcroft gas-works and the Giltbrook chemical works are in excellent condition; and the Committee have under careful consideration the remodelling of the Radford works.

Appended to the Committee's report is that of the Engineer and General Manager (Mr. J. H. Brown) on the works and manufacturing operations, &c., last year. It contained the following particulars.

The plant, buildings, &c., and machinery generally are in a good and efficient state of repair. The carbonizing plant has produced greatly improved results at all three works, and is being maintained in a thoroughly efficient state. Owing to the improved condition of the plant at the Eastcroft works, it has been found possible to arrange to work the inclined-retort house alone during the coming summer. At the Radford works the carbonizing plant is being maintained in as efficient a working condition as possible. At the Basford works exceedingly satisfactory carbonizing results have been obtained. During the past season it was not necessary to work any of the carbonizing plant except that operated by the compressed air stoking-machines. The No. 2 section in the No. 3 retort-house at Basford is being entirely rebuilt, and provision is also being made for the No. 1 section to be dealt with in the same manner during the coming season. The hand-worked retort-houses are all being repaired where necessary, and maintained in good working condition. The carburetted oil-gas plant was of very great assistance during the winter; and it produced during the year 109,485,000 cubic feet of gas, or equivalent to 5·28 per cent. of the total gas made. This plant is of exceptional value in the event of rapid changes in the weather or of sudden need; and its duplication during the year has been of considerable service.

The carbonizing results again show some record figures. During the past year, 175,468 tons of coal and 306,621 gallons of oil were carbonized, yielding 2,074,023,000 cubic feet of gas, or 11,196 cubic feet of coal gas per ton of coal carbonized, against the previous highest make of 11,123 cubic feet per ton for 1908-9. The gas sold per ton of coal again increased from 10,564 cubic feet to 10,692 cubic feet. This figure is by far the highest in the history of the undertaking, and is 1546 cubic feet more than the quantity of gas sold per ton of coal carbonized for the year 1902. This improvement represents a saving of 31,300 tons of coal on the past year's figures compared with 1902.

In the distribution department, £14,252 has been spent in the repair, &c., of mains and services—an increase of £903 on the amount spent in the previous year. The gas lost by leakage shows the abnormally low figure of 4·5 per cent. on the total quantity of gas made, or 93,405,100 cubic feet, against 104,889,300 last year—a reduction of 11,484,200 cubic feet. Climatic conditions assisted very considerably in producing such an exceptionally low figure; and it is questionable whether it can be maintained year by year in an undertaking covering such a very large mining district, and with such wide ramifications, as the Nottingham distribution system.

The chemical works and sulphuric acid plant are being well maintained, and continue to give very satisfactory results; 2379 tons of sulphuric acid having been produced in 1909-10, against 2157 tons for the previous year. The sulphate of ammonia plant at Basford continues to deal with the whole of the ammoniacal liquor produced at the three works, and has been worked to its full normal capacity. The cyanogen plant has also given greatly improved results; and £700 was received from the sale of the chemicals produced during the year.

Improved working results have been obtained throughout every department of the undertaking; but, unfortunately, the anticipated improvement in the chemical market has not matured so rapidly as was expected. The returns from coke have fallen from £37,564 in 1908-9

to £32,365 in 1909-10—a reduction of £5199. This difference is largely accounted for by the reduced quantity of coal carbonized owing to the improved yield of gas per ton, and also to the increased amount of coke used at the works in the production of carburetted oil gas. The receipts from sulphate of ammonia decreased from £16,580 to £16,498—a difference of £82. The receipts from this product show an actual increase per ton of coal carbonized, due largely to the improved working results—the increase in the production of gas per ton having the same effect on sulphate of ammonia as on coke—and also to the rise in the market value of sulphate.

The receipts from tar and chemical products are £13,922, against £12,326—an increase of £1596. This has occurred in spite of the decreased quantity of coal carbonized, and is principally due to the greater value of tar products generally. The extensive use of coal tar for road spraying has taken very large quantities of tar from the chemical market. The boom in rubber has had a reflex action on the value of rubber solvents, which are mainly obtained from tar products. The rapid increase in the value of mineral oils has also affected tar oils in the same manner. These causes combined are responsible for the increase in the value of chemical products. The total receipts from residuals for the year are £62,785, against £66,470 for 1908-9, or a decrease of £3685.

The increase in the rate of wages was in force throughout the whole of the year, and was evident in every department. On the other hand, coal (including 306,621 gallons of gas oil) cost the department £87,767, against £95,018 for 1908-9. The reduction in the cost of coal was principally due to the smaller quantity used, owing to the greater yield of gas per ton of coal carbonized.

Rates and taxes rose from £16,720 in 1908-9 to £18,277—an increase of £1557. The reduction in the price charged for gas to slot-meter consumers, which came into operation in September last, amounted to £2389. These two items are equal to a loss in revenue of £3946.

The total quantity of gas sold shows an increase of 201,200 cubic feet. A very substantial increase in the consumption of gas was shown to the beginning of March; but, owing to the exceptionally mild weather experienced during that month, this was almost entirely wiped out. The number of consumers connected with the mains shows an increase of 2339 for the year. The small increase in consumption generally is undoubtedly largely due to the very extensive use of incandescent burners. This is more clearly shown in looking back over a period of years. In 1902, there were 51,800 consumers, using 1,651,052,000 cubic feet of gas, or 31,873 cubic feet per consumer. In 1909-10, there were 74,380 consumers, using 1,864,147,800 cubic feet of gas, or 25,062 cubic feet per consumer. In fact, since 1904, the increase in the number of consumers—viz., 15,502—has only been sufficient to counterbalance the loss due to the increasing use of incandescent gas-burners.

The consumption of gas by the public street-lamps, for which, since 1902, incandescent burners have been adopted, is a striking proof of the saving effected by this system of lighting, and the consequent loss of consumption to the department. The following are the figures:—

| Year. | No. of Lamps. | Total Consumption of Gas. |
|----------------|---------------|---------------------------|
| 1902 | 5787 .. | 115,026,500 cubic feet. |
| 1910 | 7450 .. | 92,686,200 .. |

This reduction in the consumption of gas in street-lamps alone, compared with 1902, is equivalent to 55 million cubic feet, representing a decrease to the lighting authorities of £5950 per annum.

The changed character of the business of the department is obvious from the large increase in the number of prepayment consumers; the proportion of these meters compared to ordinary consumers rose to 46·03 per cent. last year, against 43·73 per cent. in 1908-9, and 27·56 per cent. in 1902. This largely accounts for the decrease in the amount of gas sold per consumer, and clearly demonstrates the change which is taking place in the character of the business and the necessarily greater cost of administration.

In spite of the decrease in the return from residuals, the increased charges for rates and taxes, the increase in the cost of administration and wages, and the reduction granted to prepayment meter consumers, the gross profit for the year establishes a new record—being £110,297, compared with £106,940 for 1909 and £75,907 for 1902.

The following statement of working results shows the development of the undertaking since 1902:—

| | 1902. | 1909. | 1910. |
|--|---------------|--------------|---------------|
| Coals carbonized (tons) | 196,681 .. | 187,469 .. | 185,247 .. |
| Gas sold (thousands) | 1,798,779 .. | 1,980,417 .. | 1,980,618 .. |
| Do. per ton of coal | 9,146 .. | 10,564 .. | 10,692 .. |
| Average price of gas | 2s. 8'93d. .. | 2s. 6'4d. .. | 2s. 6'18d. .. |
| Gross profit. | £75,907 .. | £106,940 .. | £110,297 .. |
| Interest and sinking-fund charges, &c. | 50,891 .. | 54,284 .. | 54,281 .. |
| Net profit | £25,016 .. | £52,656 .. | £56,016 .. |
| In aid of rates | 24,516 .. | 31,000 .. | 35,000 .. |

The concluding portion of the report relates to the distribution department. It shows that the total mileage of mains is 383·75—an increase of 6·26 miles during the year. The number of meters fixed to March 31, 1910 (including 470 lamp meters), was 74,850; being an increase of 2344 meters. Of these, 72,023 belonged to the Gas Department and 2827 to the consumers. The demand continues for prepayment meters. At the end of the financial year, 34,454 of these meters were in operation—an increase of 2743 on the previous year. There were 2946 new services laid in the past year, compared with 3037 before. Mr. Brown says the application of gas for trade and domestic purposes, other than for lighting, continues to increase. There are at present in use about 30,249 cooking-stoves, 14,912 gas-fires, and 730 gas-engines, besides a very large number of other appliances of almost every description, which have not been numbered. Of the 30,249 cookers in use, 9564 are rented from the department, and 19,983 are supplied with the automatic meter rent free.

Appended to the report is a table showing the comparative workings per ton of coal and per 1000 cubic feet of gas sold for the past and the preceding year; and this is followed by the accounts of the Gas Department in the usual form.

LEICESTER CORPORATION GAS UNDERTAKING.

Tributes to the Late Mr. Colson.

At the Meeting of the Leicester Town Council last Tuesday, tributes were paid to the late Mr. Alfred Colson, for his successful management of the gas undertaking.

Alderman SMITH said he felt very acutely the position in which he was placed, as his first duty as the new Chairman of the Gas Committee was to move a resolution announcing the death of their very able and efficient Manager. It was a most painful duty, because he had been for eighteen years, in one way or another, connected with Mr. Colson as a member of the Committee. During that time there had, of course, been differences of opinion; but upon one point they all would agree—viz., that Mr. Colson was one of the best officials Leicester had ever seen. It was nearly 28 years that day since he entered upon his professional duties as Manager of the gas-works; and during the whole of the time it could be safely said that he performed his duties with great fidelity, conspicuous ability, and great financial advantage to the town. The works under his able guidance were admitted to be the best equipped, the cleanest, and the most model gas-works in the country or on the Continent. The efficiency and success of the gas undertaking was the great hobby of Mr. Colson's life; and, as exemplifying his loyalty and devotion to Leicester, it might be said that he more than once refused to be tempted away from the town by the offer of higher salary for his skill and administrative ability. As showing the enormous growth of the works since the date of Mr. Colson's first appointment on Nov. 21, 1882, it might be said that at that time 62,000 tons of coal were carbonized, whereas to-day the quantity was 180,000 tons; the gas made in 1882 was 650 million cubic feet, to-day it was 2100 millions; the number of consumers was then 20,000, and 58,000 now; the maximum daily delivery of gas, 3 million cubic feet, and to-day 9,950,000 cubic feet; the mileage of mains was then 95, and to-day 277. What was more important probably to Leicester was that the total amount of profit paid over for the relief of the rates since Dec. 31, 1882, was £667,617. This in itself was a monument of the industry of their late Manager. Mr. Colson's life was many-sided. He was not only concerned in making profits for the rate-payers, but took a deep interest in the welfare of the workpeople under him. This was shown by the fact that during his management a reading and recreation room had been provided, baths and wash-houses built, open-air swimming baths opened, ambulance corps established, a band formed, a sick and benefit society founded, a cot given in the Children's Hospital, and £1530 had been paid in six years to the Infirmary Fund. Mr. Colson also took a deep interest in the Soldiers' Fund during the South African War, and £322 was raised. Another important matter was that during the whole of this long period of Mr. Colson's management there had been no serious accident at the works. This went to show to what a pitch of perfection they had been brought under him; and his care permeated the whole staff. Many references had been made in the Press to Mr. Colson's great ability. Those who knew him best knew that he lived a strenuous life—that he was a man of high character, of strong will power, and of great courage and confidence in his own ability to overcome difficulties. This might be illustrated by mentioning his discovery of the cause and dispersion of naphthalene, which had saved the Corporation many thousands of pounds. He was a strict disciplinarian. At the same time he was just, and kind to those in his employ; and he fully appreciated the loyalty and help of those who served him. As showing the deep and abiding interest and anxiety for the institution of which he was the head, almost his last words to him (Alderman Smith) were: "Give my kindest regards to the members of the Committee and the staff, and tell them how much I have appreciated their help in my work." He had always been proud of the gas undertaking, and hoped it would continue to be of great benefit to Leicester. In the death of Mr. Colson the Council had lost one of its ablest officials, and the town a distinguished and useful citizen. He was sure the rate-payers of Leicester would join with the Council in offering to Mrs. Colson and the members of the family their sincere condolence in their great bereavement. He begged to move the following resolution:—

That this Council learn with deep and sincere regret of the death of Mr. Alfred Colson, who for 27½ years so ably and successfully discharged the duties of Chief Officer of the Leicester Corporation Gas Department, and, since its inauguration, of the Electric Lighting Department. They recognize that the advance of the undertaking is very largely due to his energies, and to his able administration. They feel that the Council have suffered a severe loss; and they desire that their appreciation of his past services and their deep sympathy with his family in their bereavement be conveyed by the Town Clerk.

The MAYOR (Mr. G. Chitham) seconded the motion. He said that Alderman Smith had told them very fully of the great loss the town had sustained by the death of their Chief Gas Engineer; and he (the speaker) was sure he had not exaggerated in the least the terms in which he had moved the resolution. Mr. Colson had been an ideal public servant. He thought it stood very greatly to the late Mr. Colson's credit, and a thing to be remembered, that he loved the town of Leicester, and refused offers of considerable promotion in order to settle there and complete the great organization of which he was the head. That the Council had been thoroughly satisfied and gratified with Mr. Colson's achievements went without saying; and he was sure they would heartily agree with the resolution, that the town had lost a very worthy citizen. It was a great pleasure to them, as councillors, to feel that a man had stayed with them for so many years, and had won their admiration, and he thought he might say their affection. No one in his (the Mayor's) short experience on the Council had ever heard to say a word against Mr. Colson; on the other hand, members had expressed their admiration for him.

The resolution was passed by the members rising.

The Manchester Gas Committee, at their meeting on Friday, decided to pay the wages of all employees in the works for the day they lost on the occasion of the late King's funeral.

WEST BROMWICH GAS UNDERTAKING.

At a Meeting of the West Bromwich Town Council last Wednesday, Alderman Wilson (the Chairman of the Gas Committee) proposed that of the year's profits of the undertaking (*ante*, p. 574), amounting to £4111, the sum of £1000 should be allocated in aid of the general district rate, and £1333 be carried to the credit of the extensions and suspense account. He pointed out that the most unsatisfactory part of the annual report was the very considerable decrease in the consumption of gas of 7,800,000 cubic feet. This was not an unusual thing. He believed in 1904-5 the Committee had to report a very serious reduction in the quantity of gas consumed, which was some 3,000,000 feet more than the decrease of last year. So it was only one of those ordinary fluctuations which they met with in all businesses. It had been said pretty freely in the town that the decrease was in consequence of the competition of the electricity undertaking. He wished to deny this statement, and to say that was only responsible for a small portion of the decrease—about 1,000,000 cubic feet. They did not begrudge the Electricity Committee this. If they could do better than the Gas Committee, let them do it. On the whole, the gas accounts showed up very considerably better than in the previous year. He pointed out that the amount of the extensions and suspense account would be reduced to £5595, and urged that it would be a great advantage when they got rid of this incubus, which had been a bugbear to them for years past. He was pleased to state that the satisfactory results of the past year's working were largely due to the excellent management of the concern by Mr. Thomas Hudson and their distinguished Engineer Mr. Harold E. Copp. Both had done their best for the concern, with the result that they had made a fair profit.

The motion was seconded by Mr. W. Lawley, who referred to the excellent equipment of the works, and observed that he believed they were in the position of being able to turn out an enormous amount more gas than at present, if they only had the customers to buy it. The results he felt were very gratifying.

Alderman Blades said he was not a member of the Gas Committee; but upon going through the accounts, he had come to the conclusion that there must have been extraordinarily good management to have made the profit they had with such a reduction in the sales of gas.

The Mayor also bore testimony to the excellent way the affairs in connection with the gas undertaking were managed; and the resolution was then carried.

OLDBURY GAS DEPARTMENT.

Annual Accounts.

The accounts of the Gas Department of the Oldbury Urban District Council for the year ended the 31st of March, as certified by the Auditors (Messrs. Howard Smith, Slocombe, and Co., of Birmingham), have lately been issued. They show that the amount spent on capital account in the twelve months was £1247; bringing up the total expenditure to £81,405, or £2206 in excess of the sum authorized. The net revenue from the sale of gas was £1505; residuals produced £4100; and the total receipts were £19,627. The manufacture of gas cost £10,783 (coal and oil figuring for £7614); distribution, £1116; public lighting, £864; management, £376; and the total expenses came to £14,346—leaving a balance of £5281 to go to the profit and loss account. This was made up to £5357 by two items of dividend and interest; and after payment of interest on mortgages, instalment of loans, and the transfer of £600 to the general district rate, there was left a balance of net profit of £1689. Appended to the accounts are the statistics of working, furnished by the General Manager (Mr. A. Cooke). The quantity of coal carbonized was 10,009 tons; and the make of gas was 135,073,000 cubic feet, of which 129,660,000 cubic feet were sold—leaving 6,013,000 cubic feet, or 4.45 per cent., unaccounted for. There were 25,841 gallons of solar oil used, which produced 10,851,000 cubic feet of gas. The cost of coal was 14s. 4.92d. per ton, and of oil 3.16d. per gallon. The sale of residuals produced 8s. 5.10d. per ton of coal carbonized.

The position of the gas undertaking was discussed at a meeting of the District Council on Friday. The Chairman of the Gas Committee (Mr. C. Thomlinson) proposed the adoption of the annual accounts, and, replying to questions, mentioned that the gas unaccounted for was only 4½ per cent., while in some undertakings it was 9 per cent. Mr. J. W. Wilson, M.P., considered that the result of the past year's working was most satisfactory, and reflected great credit upon the Manager and staff and all concerned. He felt that the Council were fortunate in being served by such an all-round earnest Engineer as Mr. Cooke, who watched the interests of the department, and also, as a true business man, those of the consumers as well. The net profit this year amounted to £1600, compared with £800 for 1908; showing a difference of £800 between the two years. The explanation of the difference in the profit for the two years was that this year the expenditure was only £300 on maintenance of mains and services, whereas in 1908 it was £1600; so that if the extra profit was given to consumers they might find themselves landed in a deficiency. The Gas Committee had pledged themselves to undertake the entire renewal of the purifying plant, which would cost nearly £2000; so that the Council would see that it was not desirable to mortgage the margin of profit in view of this prospective expenditure. If they were to reduce the price of gas, the only alternative would be to borrow money to carry out the renewal of the plant; and the aim of the Committee was that the cost of any incidental repairs should be defrayed out of revenue, as was done in every sound business, instead of incurring fresh capital charges. If they went on next year as they had done during the past twelve months, the Committee were satisfied that they would be able to do this and meet their liabilities in the same satisfactory way as they had already done. Mr. Jackson said he appreciated the manner in which the works were managed, but he thought the Committee might reduce the charges for gas consumed through prepayment meters. The Chairman of the Committee explained that these consumers had their fittings put in free, whereas the ordinary consumers had to pay the cost of them. The accounts were then adopted.

LANCASTER CORPORATION GAS UNDERTAKING.

Working in the Past Year.

The Gas Engineer and Manager of the Lancaster Corporation (Mr. Charles Armitage) has presented to the Gas Committee his report on the analysis of the accounts of the gas undertaking for the year ended the 31st of March, together with a working statement. The total receipts, including bank interest, were £28,787; the expenditure was £18,228—leaving a gross profit of £10,559. Out of this sum, £3419 has been paid for interest on stock and mortgages, £1883 added to the redemption fund, £643 paid for income-tax, £3000 contributed to the borough fund in aid of the rates, and the balance—viz., £1614—has been carried to the reserve fund, making it £12,109. The receipts for gas were £14,439, or an increase of £88 on those for the year 1908-9. There have now been fixed 3074 prepayment meters; and the receipts from them amount to £4794—an increase of £171. For the public lamps 17,259,192 cubic feet of gas were supplied during the year free of charge; being equal to a further contribution of £1654 in aid of the rates. The net receipts for private lamps were £37. The average cost of coal was 11s. 1'28d. per ton, against 11s. 8'79d. in the preceding year. Coke contributed in return 5s. 6'69d., and products from tar and ammoniacal liquor 3s. 3'95d.—making 8s. 10'64d. per ton of coal carbonized, or equal to 80 per cent. of the cost of coal. The average price received per 1000 cubic feet of gas sold was 1s. 10'28d. Of this sum, gas cost 10'02d.; new mains, services, and meters, 0'87d.; interest on stock and mortgages, less interest from bank, 3'88d.; redemption fund, 2'18d.; contribution to the borough fund in aid of the rates, 3'47d.; and balance to the reserve fund, 1'86d. Nothing was added to the capital account during the year; but £752, the cost of new mains, services, meters, and prepayment stoves, was charged to revenue account. The quantity of gas made was 215,295,000 cubic feet, or an increase of 4,214,000 cubic feet on the preceding year; the leakage or unaccounted-for gas being 2'69 per cent.

In moving the adoption of the minutes of the Gas Committee at the monthly meeting of the Town Council, Mr. N. W. Helme, M.P., referring to the accounts, said he was glad to report that the undertaking was in a satisfactory condition. There had been an improvement of £836 on the accounts of the previous year, after taking into full comparison all the items involved. The net balance, after providing for interest and redemption fund, was £4613; and to this should be added £1654, the value of the gas supplied for public lamps free of charge. If the cost of new mains (£752) had been charged to capital instead of revenue account, the net balance for the year would have been £7020, compared with £6184 for the preceding year by a similar method of reckoning—or an increase of £836. There was a strong movement in the country in favour of reducing the candle power of gas. He served on a Committee of the House of Commons before whom Middlesbrough brought a Bill in which authority was sought to reduce the gas to 12-candle power, in order to lessen the cost of production. The lower candle-power gas was equally good for lighting purposes, if incandescent burners were used; and it could be produced at much less cost than that which ordinary burners required. Such gas was increasingly needed for cooking and heating purposes. As the House of Commons Committee granted the powers asked for, he thought he would take the opportunity of calling attention to the matter. The public could reduce the charges for lighting if they would adopt incandescent burners; and this would allow the Gas Committee at some future time to reduce the candle power, with advantage to the consumers. The candle power Lancaster was obliged to supply under its Act was 14; but the Gas Committee had been supplying gas at 15'55-candle power, and Middlesbrough was going to supply 12-candle gas. On the Continent, especially Germany, this system was practically universal; and in Berlin 8 to 10 candle-power gas was used. It would be difficult to find an ordinary flat-flame burner in the city.

The minutes were confirmed.

MOSSLEY CORPORATION GAS DEPARTMENT.

The Past Year's Working.

The Gas Engineer and Manager of the Mossley Corporation (Mr. James Taylor) has presented to the Gas Committee his report on the working of the department for the year ended the 25th of March last, together with certain statistical information. The gross revenue amounted to £19,888, and the gross expenditure to £15,192; the gross profit being £4696. The instalments to the sinking fund amount to £1224, and the interest on loans requires £2969; so that the net profit on the year's working is £502. Of this amount, £500 has been transferred to the borough fund. The reduction of 3d. per 1000 cubic feet in the price of gas which took effect from the 25th of March last year caused a considerable decrease in the receipts; but it was slightly compensated for by the greater quantity of gas sold—the net decrease being £919. Concessions in price made to users of gas in large quantities for trade purposes also contributed in reducing the receipts. The market for residuals was not very satisfactory during the year; but a slight improvement is to be observed, more particularly as regards tar and ammoniacal liquor. Considerable work was executed in connection with repairs and renewals in the works; and this accounts for an addition of £340 under this head. An increase of £556 in the cost of purification was due to the extended use of lime during the past year. The higher calorific power of the gas thus produced has, however, given greater satisfaction to the consumers.

The unaccounted-for gas amounted to 14,250,400 cubic feet, or 10'79 per cent. of the quantity delivered from the works, compared with 11,770,000 cubic feet, or 9'31 per cent., in the previous year. The increased quantity is entirely accounted for by the temperature of the gas at the station meter having been higher as the result of the reactions in the lime purifiers. Mr. Taylor estimates that of the 10'79 per cent. of unaccounted-for gas fully 3 per cent. is due to the contraction in volume owing to reduced temperature after leaving the works, and is

therefore not to be regarded as a loss in the same light as is leakage. The actual leakage appears large; but he points out that in so scattered a district as that supplied, it is improbable that the amount can be very greatly reduced. He says the condition of many of the mains is unsatisfactory, and will probably entail heavy expenditure for some years. The maximum quantity of gas delivered in 24 hours was 687,200 cubic feet, on Dec. 23, 1909; and the minimum was 148,000 cubic feet, on June 4, 1909.

During the year, 18 additional lamps were erected and 114 incandescent burners fixed in place of ordinary burners. Owing to the adoption of an improved torch for use by the lamplighters, a large number of bye-pass lights were dispensed with, with a consequent saving in gas. The total consumption by the street-lamps for the year was 6,492,400 cubic feet, against 7,277,100 cubic feet the previous year. There are 17 lamps which are lighted and extinguished by clockwork controllers. The working of these was satisfactory throughout the year.

The quantity of coal carbonized was 11,304 tons 17 cwt., and of benzol used 586 gallons. The gas made was 132,170,200 cubic feet, compared with 126,226,000 cubic feet, or an increase of 4'71 per cent. The make per ton was 11,691 cubic feet, against 10,666 cubic feet. The coke produced per ton of coal was 9 cwt. 3 qrs. 16 lbs.; tar, 1 cwt. 1 qr. 3 lbs.; and ammoniacal liquor 21'46 gallons—the average price realized per ton being 7s. 7'7d., 16s. 11'1d., and 12s. 9'7d. respectively.

STREET LIGHTING IN HACKNEY.

At the Meeting of the Hackney Borough Council last Thursday, the Works and General Purposes Committee reported having had under consideration for some months past the question of the lighting of the roads and streets in the borough which are at present lighted by means of upright incandescent gas-burners.

The Committee find that the present lamps, which are fitted with upright incandescent mantles, and which consume $3\frac{1}{2}$ cubic feet of gas per hour, give a light of 63 to 65 candle power; those which are similarly fitted, but which consume $4\frac{1}{2}$ cubic feet of gas per hour, give a light of 82 to 85 candle power. As against these, they were informed that a lamp fitted with an inverted incandescent mantle, and consuming $3\frac{1}{2}$ cubic feet of gas per hour, will give a light of 80 to 85 candle power. They have also had submitted to them the "Dacolight" regenerative lamp fitted with an inverted incandescent mantle, for which it is claimed that, with a consumption of $3\frac{1}{2}$ cubic feet of gas per hour, a light of 120-candle power can be obtained. The annual cost of this lamp would, however, be somewhat more than that of the ordinary type of incandescent burner. The advantage of substituting inverted incandescent burners in place of the present upright incandescent burners is thus obvious, so far as an improvement in lighting is concerned. But beyond this, the Gaslight and Coke Company have intimated that they will be prepared to revise and reduce their figures for the lighting, repair, and maintenance of the lamps, if a system of lighting by means of inverted incandescent burners is adopted in substitution for the present system of upright burners, and that they will be prepared to light, repair, and maintain public lamps, fitted with one inverted incandescent burner to consume $3\frac{1}{2}$ cubic feet of gas per hour, for the sum of £2 3s. 6d. per lamp per annum; if similarly fitted with two inverted burners, for £3 8s. 6d. per lamp; if with three inverted burners, for £4 13s. 6d. per lamp. The Company will, at their own expense, carry out the whole of the work of conversion of the lamps; but the terms quoted are subject to the conditions that they shall be accepted by the Council in respect of all the existing gas-lamps within the borough, and that the Company shall be granted a contract for a period of five years at the above-named prices, irrespective of any variations in the price of gas during that time. If at the end of the period the Council desire to renew the contract for a further term of five years, they shall have the option of doing so, at a deduction of 5 per cent. from the prices set out.

The Committee consider these terms extremely liberal, and have no hesitation in expressing themselves in favour of their adoption. Not only will an improved light be obtained so far as about three-fourths of the present number of lamps is concerned, but there will be a reduction in cost of over £2000 per annum. The foregoing prices and figures of cost are based on the use of the ordinary type of inverted burner. If the "Dacolight" regenerative burner is adopted, the annual cost will be somewhat more, and will involve an increase of about £230 per annum over the whole number of lamps; the anticipated total saving being correspondingly reduced. The Committee's tests of the comparative lighting power of the two types of lamps are proceeding; and at this stage they are not able to submit a definite report thereon. If, however, the claim which is made on behalf of the "Dacolight" lamp is maintained, it will clearly be to the advantage of the Council to adopt this type of lamp, as its increased lighting power will more than represent the relatively small increase of cost of £230 per annum.

In conclusion, the Committee recommended that the Council enter into a contract with the Gaslight and Coke Company for the substitution of inverted incandescent burners in place of the existing upright burners for a period of five years on the terms mentioned, and that the Committee be empowered to arrange for the adoption of the "Dacolight" regenerative lamp instead of the ordinary type of inverted burner, if, as the result of further tests, it would, in the Committee's judgment, be to the advantage of the Council to do so. This recommendation was passed.

Fires Due to Electricity.—Owing to the fusing of an electric wire, the match-boarded ceiling in one of the windows at Messrs. Blake and Son's premises in High Street, Maidstone, recently became ignited; and but for the promptitude with which the Fire Brigade dealt with it a serious conflagration would have resulted. A few evenings later, a fire originating from a similar cause broke out in the Presbytery of the Week Street Church, Maidstone. The wire in this case fused near a compo. gas-pipe; but fortunately the damage done was slight.

TAR-TANK ON FIRE AT SALTLEY.

Considerable alarm was created on the Saltley side of Birmingham on Monday morning last week by the neighbourhood being enveloped in a mass of dense smoke, which gave rise to the report that the gas-works were on fire. The rapid arrival at the works of a number of fire-engines went far to justify the report. The cause of the alarm was the discovery, shortly after half-past ten o'clock, that the tar-tank, which is capable of holding about 5000 gallons, was on fire. Flames shot up, and thick, suffocating volumes of smoke rolled away. The staff on the works were at once organized, under the direction of Mr. F. J. Bywater, the Engineer; and while one party attacked the seat of the fire with sand, another threw jets of water on the adjoining cyanogen shed in the hope of saving it. It was soon realized that it was hopeless to attempt to extinguish the burning tar; and even when the combined brigades were present, all they could do was to concentrate their energies in order to cool the iron tank and prevent the destruction of adjoining premises. So heated became the tank that the water from the hose-pipes caused it to crack and liberate a stream of burning tar into the arm of the neighbouring canal. Burning tar also ran over the top of the wall by the side of the towing path of the canal. While at work, two firemen were injured by boiling tar splashing into their eyes, and a gas-works employee was also treated at the hospital for a slight burn.

The explanation of the fire, as given by Mr. Bywater, is that a fracture was found in the pipe of one of the tar-tanks. This tank stands 5 feet above the ground, and there is a pump underneath which raises the tar through the pipe that was fractured to the adjoining tar-works. Two men were underneath the tank at the time, on the ground level, when the pipe was found to be fractured. The tar found a vent through the fracture, and, of course, spread quickly over the ground. How the conflagration started Mr. Bywater was unable to explain; but a spark must have come in contact with the tar. One of the factors which contributed to the rapid extinction of the fire was the pumping of ammoniacal liquor on to the tar in the tank. The gas-works fire brigade was quickly on the spot, and materially assisted the regular firemen. On the whole, the damage is not extensive, and is covered by insurance.

PUBLIC LIGHTING OF BETHNAL GREEN.

Increased Efficiency at Less Cost.

At the Meeting of the Bethnal Green Borough Council last Thursday the question of the better lighting of the public thoroughfares of the borough was under consideration on a report of the Works Committee, who have had before them a proposal of the Gaslight and Coke Company to reorganize the lighting of the district, and convert the present upright incandescent burners to inverted burners, as well as to supply 153 new 3-burner inverted Kempton-Ede lanterns for the main roads.

The Committee, with the Borough Surveyor (Mr. E. E. Finch), visited several important thoroughfares in the City and West-End of London where improved systems of lighting have recently been installed, and have had before them detailed reports by him on the subject. They came to the conclusion that the high-pressure system of lighting is far too expensive for installation in Bethnal Green; but they considered a scheme of lighting by inverted burners, which system they think the best under the circumstances, in the whole of the Gaslight and Coke Company's area. This is at present lighted with 1167 lamps (1018 fitted with one burner, 148 with two burners, and one with three burners), which give a total light of about 85,000-candle power at an annual cost of £3631. The Company would be prepared to provide and fix along the main roads of the borough (which would not affect the part of Bethnal Green west of Brick Lane) 153 new all-copper circular lamps, fitted with three inverted burners giving 250-candle power (to take the place of the existing two-burner and three-burner lamps), and also two groups of three 250-candle power lamps in front of the new municipal buildings in Cambridge Road, including the provision of columns on loan. It was also proposed to fit the existing 148 two-burner lamps with inverted burners giving 170-candle power per lamp, and transfer these lamps to such thoroughfares within the borough as are in need of a higher standard of light than is provided by the single-burner lamps. Of the remaining 870 of these lamps, 496 are unfit for further use, and these the Company proposed to replace with new all-copper lanterns; but the remaining 374 could—and it was proposed that they should—be fitted with one inverted burner giving 85-candle power. If the Council entered into a contract for five years for the supply of gas to, and the maintenance of, the 1171 lamps (or any additional lamps required), the Company would be prepared to supply all the necessary lamps and burners, and carry out the whole work of conversion, transfer, and installation, including the painting (two coats), of the lamps and columns throughout, for the sum of £2084, and reduce the existing annual charge from £3631 to £3315 15s.; thereby saving £315 per annum. The total lighting value of the proposed inverted burner lamps would be upwards of 125,000-candle power, compared with 85,000-candle power at the present time. Appended to the report was a comparative statement of the present system and that proposed, which showed as follows: Present system—One three-burner lamp, cost per annum, £6 15s.; 148 two-burner lamps, cost £4 19s. 7d. each; 1018 one-burner lamps, cost for 374 £2 17s. 3d. each, and for 644 £2 15s. 2d. each; total number of lamps 1167, total power 85,000 candles, cost per annum £3631. Proposed system—153 three-burner lamps, cost per lamp per annum £5 5s.; 148 two-burner lamps, cost £3 15s. each; 870 one-burner lamps, cost £2 5s. each; total number of lamps 1171, total candle power 125,000, cost per annum £3315 15s. For this the Council would be required to pay £2084 for the new installation, or they could pay £3484 per annum for ten years, which would include the cost of the new installation, or £3732 for five years, which would include the cost of the installation, after which the price would be reduced to £3315 per annum. The Committee agreed to recommend

the Council to adopt inverted burners in the Company's area on the terms offered, to enter into a contract for five years, and to pay for the cost of the installation (£2084) by instalments. The Finance Committee had considered the scheme, and they recommended that the £2084 should be met out of revenue.

The report was submitted by Mr. W. J. Lewis, who, in moving its adoption, remarked that if the Council adopted the recommendation the borough would be getting 125,000-candle power compared with the present 85,000-candle power, and at the same time be saving £315 per annum on their lighting bill. In seconding the motion, Mr. Brueton said he was sorry the Committee had not seen their way to adopt the very excellent high-pressure system of lighting which they had inspected in the City of London; for, had they done so, the lighting of Bethnal Green would have been second to none in the Metropolis. But he was glad to see they were going to get a better light at less cost. Alderman Woods asked if the scheme was going to "damage the electric light." The question was met with laughter and cries of "Yes," "Wait and see." The report was adopted *nem. con.*

With reference to Alderman Wood's question, it may be explained that, on the recommendation of the Electricity Committee, the Council decided, but only by the casting vote of the Mayor, to take a supply of current from the Shoreditch Borough Council for a period of seven years; but it is not to be used for public lighting.

ELECTRIC LIGHTING AT WATFORD.

Remarkable Statements at a Local Government Board Inquiry.

At the Offices of the Watford Urban District Council on May 26, Mr. H. Shelford Bidwell, M.Inst.C.E., held an inquiry, on behalf of the Local Government Board, into an application made by the Council for a loan of £7500 for extensions in connection with the electric light undertaking. The application was opposed by the Trades Protection Society and Ratepayers' Association.

Mr. H. M. TURNER, the Clerk to the Council, supported the application; Mr. A. M. PADDON represented the opposing Association.

The CLERK said the money applied for was for the purposes of the electric light undertaking during the next three years. He was instructed to reduce the amount to £7049, which was required for the provision of sub-stations, high and low tension mains, meters, transformers, public lighting apparatus and mains, service-boxes, &c. The Council had £484 in hand.

Evidence was then given to the effect that the cause of the capital being overspent to the extent of £227 was the cost of certain mains. Notwithstanding the increased number of lamp-columns, &c., during the last four years, the annual amount set against public lighting remained at £4174 per annum, and so far no charge had been made to the Highways Committee in connection with the new columns. Whereas there were only 858 columns in 1907, now there were 1010, with an illuminating power of 33,370 candles, and 18 arc lamps. The old lamps were being replaced by metal filament lamps at the rate of not less than 100 each year. The repayments on loans averaged 21 per cent.; and it had always been contended that this fact alone more than compensated for lack of allowance for depreciation.

Mr. PADDON, opening the case for the opposition, began by asking the Clerk how many years the undertaking had been in progress; and, after some difficulty, he elicited the reply that the Council had been supplying electricity since the end of December, 1899, and that the accounts had been completed to March, 1909. Counsel put it to the Clerk that the figures showed a loss of £5531 from the beginning of the undertaking; but Mr. Turner declined to accept this. He said the total loans to date, apart from the one now applied for, amounted to £89,370; and he submitted that, deducting the net profit of £1136 made in 1895, the accounts showed a net loss of £4395. Mr. Paddon then asked if the Council entered into a contract with a certain firm; and the Clerk declined to answer the question. Mr. Paddon said he wanted to know the commercial basis on which the undertaking was run, and what was intended to be done in the future. He wished to know the exact conditions under which electricity was sold; and he suggested that the ratepayers did not know them. Eventually the Accountant to the Council (Mr. J. Ginger) produced the contract, and it was handed to the Inspector. Mr. Paddon next asked the Clerk if the Council had ever considered the relative advantages of gas and electricity for public lighting, and if a price had ever been asked for from the Gas Company. Mr. Turner replied that, speaking from memory, he should say it was likely that a price was asked for; and he added that Counsel might be sure every care was taken in the matter of cheapness. Mr. Paddon then asked if the Council had ever supplied, under contract or otherwise, energy for lighting at a lower charge than that made for public lighting; and, after a pause, Mr. Turner said he must decline to answer the question. He then put in a Parliamentary Paper showing that the normal profit on the undertaking for the year ended March, 1907, was £323, for the next year £915, and for 1909 £110. He said there was no reason to anticipate a call upon the rates during the next three years. In two years there were unfortunate circumstances necessitating sums of capital expenditure having to be charged to revenue account.

Mr. PURSE was then questioned by Mr. PADDON. On the subject of depreciation, he asked whether, assuming they kept the plant bought twenty years ago up to its fullest efficiency, it did not suffer great disrepair through having become obsolete; and the witness replied that the majority of the plant was probably as good as when it was put down ten years ago. But twenty-five years ahead one would, of course, buy something more up-to-date. Counsel said this was the whole point he was trying to get from the witness; and he asked him if he should not allow for depreciation. Witness replied that their maintenance charges were so heavy and substantial as to cover any matter of depreciation. After some further questions, Mr. Paddon said that, having regard to the fact that the all-round average cost of the production of electricity was over 3d. per unit, whereas the all-round charge was less than 3d., he should put it to the witness that, in the ordinary way, a

loss must be shown. Witness resented this as a misleading statement. He said everything depended upon conditions. They could not store electricity as they could gas. The Council were not taking unfavourable business. Mr. Paddon repeated that if the average cost was more than 3d. per unit, and the Council sold at less than 3½, there must of necessity be a loss. Witness replied that there was not.

Mr. PADDON then addressed the Inspector. He said he appeared on behalf of the ratepayers; and while he would not go so far as to ask that the loan should not be granted, he would ask that if it was granted there should be a revision in the prices charged under certain circumstances, so that the public at large should not be sacrificed to certain contracts entered into. Let it be ascertained that all private lighting by electricity should be done only where there was a reasonable return. He did not suggest that 3d. per unit was a high price, but as far back as 1906, £4174 was the sum set down for public lighting; and the Council presumed to point out that the figure remained the same to-day, notwithstanding increased consumption. This very fact alone provided food for serious reflection. His main contention, however, was that the charge for public lighting must be at least level with the lowest price charged to the private consumer. Having regard to the fact that the Council seemed on the verge of extending their business, he asked the Inspector to recommend, if the loan was granted, that due consideration should be given to past losses; also that any supplies to consumers outside the district should be ascertained by the Council to be remunerative, for any loss sustained by a council undertaking as the result of anything supplied to consumers outside the urban area had to be borne by the ratepayers of the latter, while the consumers themselves profited from the negligence which might cause such loss. He concluded by saying he most earnestly hoped that the Council's policy of the past would not be continued in the future; otherwise some steps would be taken to secure the ratepayers from what they had already suffered.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A very agreeable visit, at least from the point of view of the hosts, was paid to-day to the Granton works of the Edinburgh and Leith Gas Commissioners by the Yorkshire Junior Gas Association. The day began early with the visitors, who made a morning call at the meter-works of Messrs. Alder and Mackay in Edinburgh. They were there received by Messrs. John Mackay, of Bradford, and A. Mackenzie and J. Scott, of Edinburgh. At Granton they were received by Mr. A. Masterton, the Station Manager; Messrs. D. Bisset, J. T. Scott, and E. Scott, chemists; Mr. Stanway, draughtsman; and Mr. J. McGillivray, general foreman. The works were inspected, and received very high commendation. Unfortunately, the Engineer—Mr. W. R. Herring—was, on account of the late arrival of the visitors at Granton, obliged to leave shortly before they reached the works, in order to keep an appointment in Edinburgh.

A joint meeting of the Finance and Gas Committees of the Dundee Town Council was held on Monday, to consider the gas accounts for the past year and estimates for the current year, a summary of which was given in these "Notes" last week. Treasurer Soutar, in moving approval of the accounts, explained that the meeting was preliminary to the meeting of the Town Council a fortnight hence, when the price of gas will be formally fixed. Bailie Reid moved that they delay fixing the price till they had a report showing that 4d. per 1000 cubic feet, which was the difference between the charges to ordinary and prepayment meter consumers, was proved to be necessary. There was a very large number of prepayment meters; and while the ordinary consumers got discount, the consumers using prepayment meters did not. Bailie Macdonald seconded. He thought that when people paid cash they were entitled to some consideration. It was decided to pass the accounts and estimates as they stood, on the understanding that a report on the question would be prepared and submitted to a special meeting of the Gas Committee prior to the meeting of the Town Council; and that, if this report justified it, relief would be given to the prepayment meter consumers. This report has now been prepared and issued. It states that with the prepayment meter there is the extra cost amounting in all to 5·033d. per 1000 cubic feet. Another item of outlay is stated in the expense of supplying the growing demand for prepayment meters, which means that many ordinary meters have to be discarded. Only an approximate estimate of this can be made; but it is regarded as undoubtedly amounting to 1d. per 1000 cubic feet. The conclusion is that slot-meter consumers are getting gas at a rate barely sufficient to cover the cost, and that the extra rate charged is no more than is actually expended on prepayment meter supply.

At a meeting of the Gas-Works Committee of the Arbroath Town Council on Wednesday, with Bailie Smith, the Convener, in the chair, the Manager—Mr. A. C. Young—reported that the quantity of gas manufactured during the year amounted to 98,513,400 cubic feet. The increase in the sales was 1,200,000 cubic feet. The revenue from the sale of gas was £13,087. If £180 be taken as the revenue from the increased sale, the amount to which the reduction in price of 2½d. per 1000 cubic feet, made a year ago, affected the revenue is £880. Unaccounted-for gas amounted to 4·74 per cent.—a decrease of 0·5 per cent. The number of cookers and grills in use was 4346—an increase of 343. There were 68 radiators hired, and 48 gas-fires were sold. After paying interest on the bonded debt, and paying annuities and £250 for the harbour, there is a balance in hand of £3351. From this sum it is recommended, as formerly, to pay £575 towards the sinking fund; £531 in respect of depreciation, to the amount of 10 per cent., on gas-stoves; £51 for new mains; and £34 for renewal of the roof of the boiler-house. There remains £2150, which the Committee recommend should be applied—£2000 towards the cost of the new gasholder, £100 to be added to the emergency account, and £50 to be carried forward. In the current year the increase in the cost of coal will be £350; but it is anticipated that there will be an increased revenue from the sale of tar, and that this, with the reduction in the amount paid for interest and feu duties, will amount to £200. The recommendation of the

Committee is that the prices to be charged for gas should remain the same as last year—2s. 8½d. to ordinary consumers, and 3s. 1½d. to prepayment meter consumers.

The Kettle, Freuchie, and Ladybank Gas Company have paid a dividend of 5 per cent.

The Strathmiglo Gas Company, Fifeshire, was registered in Edinburgh this week as a limited liability Company, to acquire an existing undertaking. The capital is £1000, in £1 shares.

The Biggar Gas Company, Limited, have reduced the price of gas for all purposes from 5s. 10d. to 4s. 7d. per 1000 cubic feet during the summer months.

At a meeting of the Gas Committee of the Dunfermline Town Council on Thursday, it was reported that the consumption of gas last year had increased by about 9 million cubic feet. The Committee agreed to recommend that the price be reduced by 3d. per 1000 cubic feet to all consumers, which will make the prices for ordinary purposes 2s. 3d. per 1000 cubic feet, and 1s. 6d. for power. The Convener—Mr. T. Stewart—submitted a proposal to lay a gas-main to Torryburn, with a view to supplying the increased population which is expected there in connection with the mineral developments now in progress. The proposal was well received; and it was agreed to recommend to the Council that the question be carefully inquired into, and a scheme presented at an early date.

A public meeting, at which, it is reported, there was an audience of fairly large proportions, was held in Falkirk on Monday evening, for the purpose of protesting against "the manner in which the Town Council had handled the grievances of the gas-works employees." The meeting was presided over by Mr. J. Duncan, a Trades Councillor, and was addressed by Messrs. Sherwood and P. Card, representatives of the Gas Workers' Union. A resolution was proposed by Mr. Lawson, a Trades Councillor, to the effect that the meeting protested against the action of the Town Council in victimizing members of the Gas Workers' Union, and called for an open inquiry into the dismissals of gas-works employees. This was spoken to by the representatives of the Union, and by Councillor Muirhead, of Falkirk. The latter stated that before the dispute arose there were 36 or 37 members of the Union in the gas-works, but that after the Manager had gone round them the number was reduced by about 30; and he asked if this showed that there had been no intimidation used. Never, he said, in all the years the gas-works had been in existence, nor in any other gas-works in the country, were retort men dismissed when the summer season began. It was the yard men who were dismissed. The resolution, when it was put to the meeting, was carried unanimously.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, June 4.

Sulphate of Ammonia.

During the week new orders direct from consumers have not been plentiful; but the demand for the covering of anterior sales has been sufficient to absorb current production, and values have been maintained at last week's level—viz., £11 16s. 3d. per ton f.o.b. Hull, £11 17s. 6d. per ton f.o.b. Liverpool, and £11 18s. 9d. per ton f.o.b. Leith. For July-December delivery, in equal monthly quantities, makers are still quoting £11 15s. to £11 17s. 6d. per ton f.o.b., according to port of shipment; but buyers are disinclined to operate unless at less money.

Nitrate of Soda.

This article on spot continues to be firmly held for 9s. 6d. and 9s. 9d. per cwt. for ordinary and refined qualities respectively, with a fair amount of business passing thereat.

LONDON, June 6.

Tar Products.

The markets for tar products have been fairly steady throughout the past week. Pitch maintains its price; but the volume of new business has not been very large during the last few days. Creosote is steady, and makers seem firm in their ideas of price. Benzols and solvent naphthas are in fair demand, and there are a good many inquiries for the former for forward delivery. Business is still impossible in crude carbolic acid.

The average values during the week were: Tar, 18s. 3d. to 22s. 3d., *ex* works. Pitch, London, 41s. to 41s. 6d.; east coast, 39s. 6d. to 40s. 6d.; west coast, 38s. 6d. to 39s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 8d. to 8½d.; North, 8d.; 50-90 per cent., casks included, London and North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article remains in practically the same position, though there were a few inquiries towards the close; but this has not tended in any way to improve the market. To-day actual Beckton is quoted at £11 17s. 6d. Outside makes upon Beckton terms are £11 10s.; Hull, £11 13s. 9d. to £11 15s.; Liverpool, £11 15s. to £11 16s. 3d.; Leith, £11 17s. 6d.; and Middlesbrough, £11 15s. to £11 16s. 3d.

The Richmond Gas Stove and Meter Company, have opened a permanent show-room for the display of their varied manufactures at 4, Colquitt Street, Liverpool, not far from the offices of the Liverpool United Gaslight Company. The building has a commanding appearance; while the interior is fitted up with every modern convenience, and is lighted throughout by high-pressure lamps.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is quiet, and the full output is moderately well taken up; so that prices show ease occasionally. Best Northumbrian steams are from 11s. 1½d. to 11s. 3d. per ton f.o.b.; second-class steams are 9s. 9d. to 10s.; and steam smalls are from 5s. 9d. to 6s. 9d. The collieries are now generally working well; and there are fair exports. In the gas coal trade, the demand is moderate at present—this being the season of the lowest home demand; but the quantity that is being sent abroad is about an average. Durham gas coals vary in price. The usual classes are, according to quality, from 9s. 3d. to 10s. 3d. per ton f.o.b.; while for "Wear specials," about 10s. 9d. is now quoted. There have been contracts settled at about 16s. 3d. to 16s. 6d. per ton, delivered at Genoa, for about 25,000 tons of best gas coal, over the next two months; but the prices for the coal at the colliery will vary with the sea freight, though it is thought that they will work out a little less than current quotations. Further contracts for Berlin and for a Belgian town are in the market; and it is expected that there will now be other sales that have been held back, and which should be given out now that the larger contracts have settled prices to some extent. Gas coke is quiet, though there is a moderate output; and prices vary from 13s. to 13s. 6d. per ton f.o.b. for good quality.

Scotch Coal Trade.

Trade has been fairly active. The demand for ell has improved, and splint is in good request. Washed stuffs and small sorts are also in demand. The prices now quoted are: Ell, 9s. 3d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. to 10s. 3d.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 323,962 tons—an increase of 37,723 tons upon the previous week, and of 8297 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,267,259 tons—an increase of 666,341 tons upon the corresponding period.

In the "JOURNAL" for the 16th of March last year, we described and illustrated a useful little arrangement in the shape of a support suitable for gas-meters, which was being introduced by Messrs. D. Hulett and Co., Limited, of High Holborn. It is an arrangement for which a patent was taken out on Aug. 7, 1908, by Mr. G. A. Dallas, of Hoxton, and noticed in our "Register of Patents" about a year later. We have received from Messrs. Hulett a pamphlet showing various applications of the support, which can be easily fixed on an ordinary brick wall with two nails or screws. In addition to its use for a meter, it can be utilized for boiling rings, grillers, &c. On the title-page of the pamphlet is a reproduction of a photograph showing three 56 lb. weights held by a support fastened to a brick wall with only two 2-inch wire nails.

Public Lighting and Water Supply of Leigh-on-Sea.

At a meeting of the Incorporated Association of Municipal and County Engineers (Eastern District) held at Leigh-on-Sea on the 28th ult., the Engineer and Surveyor to the Urban District Council (Mr. John W. Liversedge, Assoc. M. Inst. C. E.) read a paper describing the municipal works of the town. In the course of it he stated that the whole of the public lamps are provided with incandescent burners. There are 230 lamps with single burners, for which the sum of £690 is paid per annum, or £3 per light per annum. The gas undertaking was dealt with in a paper by the author's Chief Assistant (Mr. C. F. Hunt); and it is given on p. 627. With regard to the water undertaking, Mr. Liversedge said that up to the year 1907 this was a municipal undertaking. In that year, however, owing to the difficulty experienced in obtaining an adequate supply of water to meet the growing needs of the district from the then existing well, and after receiving and considering reports from expert engineers on the matter, the Council came to an agreement with the Southend Water Company for them to take over the Council's undertaking, comprising a storage reservoir, well, and pumping plant, with the mains. The total amount expended on the works was £15,488, and the amount agreed upon and received from the Water Company was £2659; the Company taking over all liabilities. Though regrets were expressed at the works going out of the hands of the Council, the necessities of the case demanded the adoption of this course. Mr. Liversedge said the district is now admirably served with a pure and plentiful supply of water by the Company, who have sunk 22 wells in 98½ square miles in South-East Essex, and are sinking additional wells as the requirements of the district grow.

Suicide by Gas.—The Birmingham City Coroner (Mr. I. Bradley) held an inquest at the Victoria Courts, on Monday last week, on the body of George White (26), a manufacturer's carter. The evidence showed that deceased had been in bad health for some time, and had suffered from insomnia. On Friday, the 27th ult., he was found asphyxiated in a stable at Messrs. Parkinson's Stove-Works, where he had formerly been employed. He had attached one end of an india-rubber tube to a gas-jet turned on, and placed the other end in his mouth. The verdict was "Suicide while temporarily insane."

Hathersage Gas Company and the Chapel-en-le-Frith Gas-Works.—For a long time past there has been an agitation for gas-works in the growing district of Chinley. Various schemes have been before the public; but the whole matter has now been settled by the Hathersage Gas Company, who, it is reported, have agreed to purchase the Chapel-en-le-Frith Gas-Works, together with the proprietor's Provisional Order. They will therefore be able to extend their mains so as to supply Chinley at an early date; but it is understood to be their intention to build gas-works at Bugsworth, and supply the whole district of Bugsworth, Chinley, and Chapel-en-le-Frith, and probably extend to Dove Holes.



The "EUREKA School Cooker."

The use of Gas for Cooking being now so generally prevalent, our earnest efforts are directed to getting it adopted in Schools,

So that—

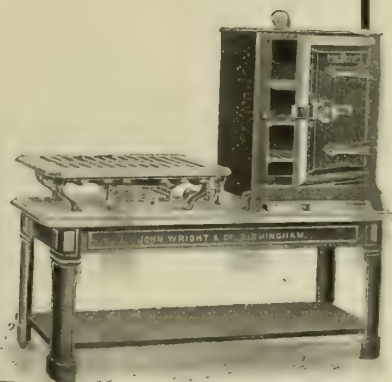
Young folk may early have opportunities of becoming acquainted with its advantages, so that when they have homes of their own they will not be content with any fuel but Gas for their Cooking.

This is REAL PIONEER WORK, which cannot fail to greatly aid Gas Progress in future years.

With this view, we specially designed and introduced the "EUREKA School Cooker" which stands alone in its perfect adaptation to the teaching of Cookery in Schools.

May we send you Particulars?

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.



High-Pressure Gas Lighting at Newtownards.

New Technical Schools at Newtownards (Co. Down) were formally opened last Tuesday by the Marquis of Londonderry. A special feature is the lighting of the premises, which was referred to by Mr. Fletcher, of the Board of Technical Education for Ireland. The building is fitted up with gas supplied at 60 inches pressure. The large art room is lighted by a single burner of about 2000-candle power—thus doing away with a multiplicity of shadows which are always caused by a number of smaller units. The effect was most striking, and drew forth special eulogies from the Right Hon. W. D. Andrews (the retired Lord Chief Justice) and Lord Londonderry. It is believed that this is the first public building in Great Britain to be lighted by a system of high-pressure gas supplied direct from the works. The Technical School and some private establishments in Newtownards have been most successfully illuminated in this way since last January; and arrangements are being made so that the whole of the large mills and practically two-thirds of the town will have facilities for adopting the system. Great satisfaction is expressed by the Urban District Council and the inhabitants generally at the success of the venture, which was made at the suggestion of the Gas Manager (Mr. W. H. Roberts).

Coventry Gas Undertaking.—The result of the working of the gas undertaking of the Coventry Corporation in the past financial year is a net profit of £17,000, which is a record, and an increase of more than £14,000 compared with the previous year. The Committee and the Engineer and General Manager (Mr. Fletcher W. Stevenson) may be heartily congratulated.

Sales of Shares.—At the White Lion Hotel, Westboughton, last Thursday, some £10 "A" shares in the Westboughton Consumers' Gas Company were sold by auction by Messrs. John Thornley and Sons at £16 6s. and £16 10s. each; and one £10 "B" share fetched £12 10s. At the Duke of York Hotel, York Town, Messrs. Sadler and Baker recently offered for sale by auction 600 additional ordinary £10 shares in the Frimley and Farnborough District Water Company; and they fetched an average price of £15 5s. each; the total amount realized by the sale being £9151 5s.

Metropolitan Water Board.—The newly-constituted Board met last Friday for the first time. On the motion of Sir Melvill Beachcroft, Mr. E. Barnard was again appointed Chairman and Mr. W. H. Elliott Vice-Chairman. The Finance Committee presented a return, prepared by the Accountant (Mr. A. Newton), showing the result of the collection of the water-rate for the half year ended March 31. The return showed a total actual collection of £1,043,908, or 89·16 per cent. of the possible total. There was written off on account of bad debts, empties, and reduced rates, £84,797, or 7·24 per cent.; while the arrears carried forward amounted to £42,136, or 3·6 per cent. of the total of £1,170,841. The net sum written off on account of empties was £70,424, or 6·01 per cent. of the total.

Stourbridge Gas Undertaking.—At the last monthly meeting of the Stourbridge Urban District Council, the annual report on the gas undertaking was presented; and Mr. W. R. Selleck, the Chairman of the Gas Committee, referred to it as showing the flourishing condition of the works. During the past year, the quantity of gas sold was 197,989,000 cubic feet—an increase of 7,431,200 cubic feet over the preceding year, in which an increase of 724,500 cubic feet was shown compared with 1907-8. The extra amount of gas made, as compared with 1908-9, was 3,825,000 cubic feet; so that the additional sales had been largely sales of gas which had been saved. Whereas in 1906 the percentage of gas unaccounted for was 11·94, last year it had been reduced to 7·31 per cent.—representing a saving of nearly 8 million cubic feet, which, under conditions ruling previously, would have gone to waste, and in the making of which nearly 800 tons of coal would have been used. He felt bound to say the saving was due to the ability and attention of the Manager. The report was approved.

Public Lighting Difficulty at Morteboe.—The most important business at the last meeting of the Morteboe Parish Council, at Woolacombe, North Devon, was connected with a difficulty which has arisen in regard to the street lighting. The Woolacombe Bay Gas Company was formed last year to supply the village with petrol-air gas, and about a dozen street-lamps were erected in a defined area. The Council adopted the scheme for lighting the street at Woolacombe, and the late Overseers were deputed to levy a rate for it. This rate appears to have been incorporated with other rates in an irregular manner; and, owing to the opposition of a prominent local resident, and an appeal lodged by him with the Assessment Committee, the Overseers for the period in question will be compelled to refund the sums collected by the Council on this account. The matter, however, does not rest here, for the gentleman in question has, it appears, determined to carry the case to the Quarter Sessions on other grounds. According to one authority, there are at least ten legal points in connection with the dispute.

Relief of Rates Out of Profits.—The question of what return gas and electricity undertakings should yield to the rates was raised at the last meeting of the Coventry City Council. Among those taking part in the discussion was the present Chairman of the Gas Committee (Mr. W. H. Batchelor), who said that it was now generally recognized that 1 per cent. of the net profits was a fair amount to pay over in relief of the rates from concerns of the description named. Indeed, in the case of the owners of gas undertakings who had of late gone to Parliament for powers, it had been stipulated that they should not allocate more than the amount mentioned. There was one undertaking in the country—at Widnes—which must not contribute anything towards the rates; and the result was that gas was sold there cheaper than in any place in the country. The system adopted in regard to the gas and electricity undertakings at Coventry was to reduce the price to the consumers; and this had proved the right policy, because the demand had kept up. He understood that it was proposed to make a further reduction; and he hoped this would be done.

GAS FURNACE EXPERTS—



INDUSTRIAL WORK.—The above illustration is of our Patent Dipping Furnace, suitable for melting Lead or Soft Metals for Stereotypers, or other purposes. Also for Annealing, Tempering by Lead or Oil, Tinning, &c.

¶ Entirely New Principle.

Inventors and Patentees—

THE RICHMOND GAS STOVE & METER CO., LTD.,
WARRINGTON & LONDON.

Kitson Empire Lighting Company.

In the Chancery Division of the High Court of Justice on Monday last week, Mr. Justice Parker gave judgment in a debenture holders' action against the Kitson Empire Lighting Company, Limited. Mr. Romer, K.C. (Mr. Hunt with him), said judgment had been obtained in the ordinary way, a writ was issued in February, and a Receiver appointed, on the ground that the property was in jeopardy. The money had now become due, as the Company had gone into voluntary liquidation. His Lordship made the usual order, directing accounts and inquiries, on an affidavit being filed that the Company had gone into liquidation.

Uckfield Gas Company.—The annual general meeting of this Company was held on the 26th ult.—Mr. S. S. Avis in the chair. The report showed that the receipts for gas amounted to £1658, against £1656 before. The assets and liabilities account showed a balance of £1462; and the Directors recommended that this should be used in payment of a dividend for the year at a rate of 7s. per share, absorbing £630, that £150 should be placed to a reserve account, and that the balance should be carried forward. This was agreed to.

Failure of the Electricity Supply at Worthing.—The subject of the leading article in the "Worthing Gazette" for last Wednesday is a very justifiable complaint against the Electricity Supply Department of the Corporation for failure to supply current on the very night when it is most required in the office—viz., when the paper is being printed. On the last occasion, the lapse on the part of the Corporation came at a particularly unfortunate time, as the issue of the paper delayed was the one containing the local tribute to the late King. The "Gazette" advises power users to abandon electricity for gas, until the suppliers of the former are able to offer a really reliable power instead of the "most elusive agent" which they now place at the disposal of the public of the district.

Manchester Corporation Officials' Salaries.—The Manchester City Council at last Wednesday's meeting decided to defer all questions of salary until the Special Committee appointed in the early part of the year to deal with official salaries and conditions of service have presented their report. The task of this Committee is one of great magnitude; and the members have asked for another three months to complete their work. The scheme of the Committee involves the fixing of maximum salaries, minimum salaries, salaries between the two, and compulsory retirement at a certain age. Rumour has it that the majority of the Committee favour a maximum of £1000 per annum, with better pay for the chief assistant in each department; retirement at the age of 65; and drastic alterations as to the salaries now paid to those holding what may be termed subordinate positions in the different departments and getting at present from £200 up to £500 per annum. The aggregate amount of the advances recommended by the several Committees is £2700 per annum.

New Water-Works for Poole.—Gas-generating plant plays an important part in the extensive scheme for new water-works just completed for the Poole Corporation, which, with the land, &c., has involved an outlay of about £53,000. The pumping machinery comprises two independent sets, consisting of gas-engines, well pump, and high-lift pump. The gas-engines have 18½-inch cylinders with 27-inch stroke, and run at about 170 revolutions per minute. The gas for driving the engines is produced by two independent generators adapted especially for burning anthracite coal, but also capable of producing gas from coke or a mixture of both. Each set can supply gas to either engine, and it has its own scrubber and circulating water-tank. The contract for the pumping machinery was for £6950. The works are to provide water for the borough of Poole, the present population of which is 33,500; and they have been designed to furnish a supply 25 years hence, when it is estimated the average consumption of water will have increased from 535,000 gallons to about 864,000 gallons per day. The formal opening of the works took place last Tuesday by the Mayor (Mr. L. D. Ballard), who subsequently entertained the Corporation at dinner. The supply of water is obtained from the Corfe Hills, near which the works are built on the banks of the River Stour, some four miles from the town, about which four capacious reservoirs have been constructed.

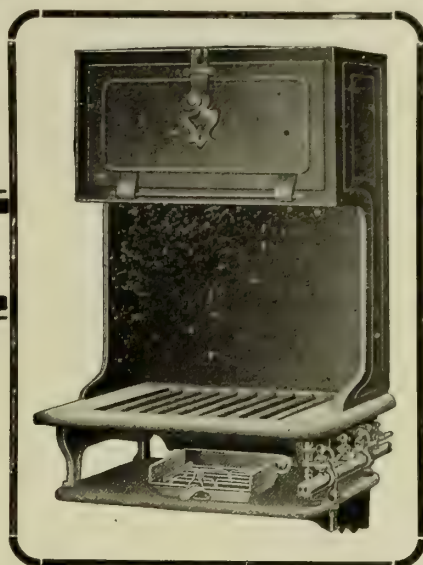
The Wokingham Town Council have approved of a recommendation made by the Gas Committee that plant should be laid down, at an estimated cost of £385, for the manufacture of sulphate of ammonia at their works.

On the past year's working, the Heywood and Middleton Water Board had a deficiency of £10,823—about the same sum as for the preceding twelve months. Heywood's share in the loss is £5587, and Middleton's, £5235. This money has to be found out of the rates.

Some of the members of the Poole Town Council are decidedly in favour of gas from an illuminating point of view as well as in other respects. A large school has just been erected; and the suggestion was made that the Council could consider having either electricity or gas. It was declared that the electric light would cost more than gas; and several speakers pointed to the fact that the latter had the advantage of increasing the warmth in a place. By a substantial majority, gas was decided upon.

The call by the Admiralty upon the Fareham (Hants) Rural District Council to provide an ample supply of water to the Coastguard cottages at Portchester was debated at the meeting of the Council last Tuesday. The Inspector reported that he had been to the property with a view of obtaining samples of water for analysis; but as the wells had been battened down for several months, it was futile to analyze the water. The Council resolved to inform the Admiralty that, as the occupiers of the property were securing their supply of water from the Portsmouth Water Company's mains at Paulsgrove, the matter was out of their hands.

NEW DESIGNS IN HOT CLOSETS AND ENAMELLED BACK PLATES AND PLATE RACKS.

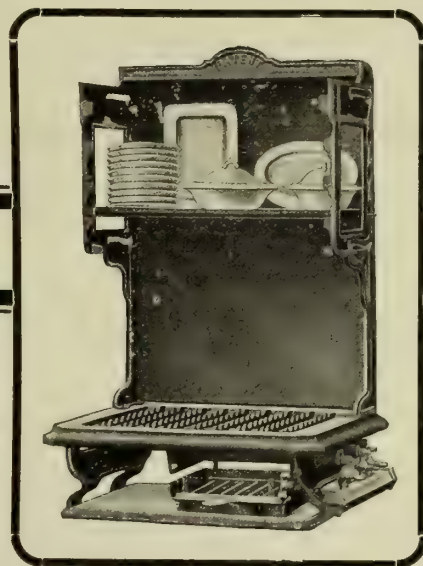


HOT CLOSET and PLATE WARMER

For fitting above Cooker.

Substantially constructed throughout.

Heated by Heat after being used in Oven and also by the Hot Plate Burners.



In this Design the Rack can be used Horizontally (as shown) or Vertically.

INEXPENSIVE, CLEANLY and CONVENIENT.

Invaluable adjuncts to the Cooker.

See Special List for other designs in Back Plates and Plate Racks.

THE PARKINSON STOVE CO., LTD.

(Incorporating Maughan's Patent
Geyser Co.),

STOUR STREET, SPRING HILL, BIRMINGHAM.

&

129, HIGH HOLBORN, LONDON.

Mr. John Shirley, aged 38, a retired naval officer, who had recently been discharged as unfit for service, was a few days ago found dead in his bed-room, at a private hotel in Kennington Park Road. Death was due to coal-gas poisoning; and it seemed that deceased had connected one end of a piece of flexible tubing to a gas-jet, and placed the other end in his mouth under the bed-clothes.

We learn that an amalgamation has been arranged between the firms of Messrs. Graham, Morton, and Co., of Leeds, and Messrs. R. H. Longbotham and Co., Limited, of Wakefield, and that in future the business will be continued under the style of Messrs. Leech, Goodall, and Co., at Hunslet, Leeds. The new firm have secured a large contract from the Lambton Collieries, Limited.

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Orders for Alterations in, or stoppages of, **PERMANENT ADVERTISEMENTS** should be received by the **FIRST POST** on **SATURDAY**.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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CHIEF CLERK., Cheltenham Gas-Works.
CLERK., Bridlington Gas Company.
JUNIOR WORKS ASSISTANT. No. 5247.
EXPERIMENTAL DEPARTMENT (GAS-STOVE MAKERS).
No. 5249
WORKING FOREMAN. No. 5250.

Situation Wanted.

DISTRIBUTING DEPARTMENT. No. 5248.

Plant, &c. (Second Hand), for Disposal.

GOVERNOR AND CENTRE VALVE, &c. Devizes Gas Department,
PIPES, BENDS, &c. Chesterton Gas-Works,

Plant, &c. (Second-Hand), Wanted.

GASHOLDER. No. 5245.
GASHOLDER, &c. W. Hughes, Liphook.

Patent Licences.

SPIRALLY WOUND TUBES AND MACHINE FOR MAKING SAME. Lloyd, Wise, and Co., 46, Lincoln's Inn Fields, W.C.
WASHING AND COOLING GAS. Cruikshank and Fairweather, Chancery Lane, W.C.

Stocks and Shares.

ASCOT GAS AND ELECTRICITY COMPANY. June 14.
BRENTWOOD GAS COMPANY. June 14.
BROADSTAIRS GAS COMPANY. July 6.

Stocks and Shares (continued).

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. June 18.
EAST GRINSTEAD GAS AND WATER COMPANY. June 14.
GUILDFORD GAS COMPANY. June 14.
NEWPORT (MON.) GAS COMPANY. June 17.

TENDERS FOR

Benzol.

LEIGH GAS AND WATER DEPARTMENT. Tenders by June 11.

Coal and Cannel.

ATHERTON GAS DEPARTMENT. Tenders by June 15.
BRIDGNORTH GAS DEPARTMENT. Tenders by June 18.
BROADSTAIRS GAS COMPANY. Tenders by July 5.
COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by June 18.
LEIGH GAS AND WATER DEPARTMENT. Tenders by June 11.
LIMERICK GAS DEPARTMENT. Tenders by June 13.
NEWBURY GAS DEPARTMENT. Tenders by June 18.
NEWCASTLE-UNDER-LYME GAS DEPARTMENT. Tenders by June 21.
SALISBURY GASLIGHT COMPANY. Tenders by June 9.
SPALDING GAS DEPARTMENT. Tenders by June 17.

Coal and Cannel (continued).

STOKE-ON-TRENT COUNTY BOROUGH. Tenders by June 13.
ULVERSTON GAS AND WATER DEPARTMENT. Tenders by June 18.
WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by June 13.
WORKINGTON GAS DEPARTMENT. Tenders by June 20.

General Stores (Lead Piping; Vitriol, Lime, &c.).

LEIGH GAS AND WATER DEPARTMENT. Tenders by June 11.

Pipes, &c.

LEIGH GAS AND WATER DEPARTMENT. Tenders by June 11.

Tar and Liquor.

BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by June 20.
GOOLE URBAN DISTRICT COUNCIL. Tenders by June 22.
GUILDFORD GASLIGHT COMPANY. Tenders by June 17.
NEWCASTLE-UNDER-LYME GAS DEPARTMENT. Tenders by June 21.
READING GAS COMPANY. Tenders by June 20.
STOKE-ON-TRENT COUNTY BOROUGH. Tenders by June 13.

"LUX"

Gas Purifying Material.

Further Reduction in Cost of Gas Purification.

TRY IT.

Purifier changes are less by over one-half when using "LUX" as compared with Bog Ore, and it requires considerably less turning than Bog Ore for revivification.

As a labour saver, this speaks for itself, but in addition there is lessened risk, worry, and anxiety for the management.

"LUX" is easily charged with Sulphur 55/60%. Once used, always used, is the verdict of many Gas Engineers in this country who have tried it during the past 18 months.

Descriptive Circular and Laboratory Sample free on Application.

WRITE FOR PRICES.

SOLE AGENTS for England, Wales, and the Colonies—

THOS. DUXBURY & CO.,

16, DEANS GATE,
MANCHESTER.

Telegrams: "DARWINIAN MANCHESTER,"
"DUXBURYITE LONDON."

Telephones: 1806 CITY MANCHESTER,
4026 CITY LONDON.

OXIDE OF IRON.**O'NEILL'S OXIDE**

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S**"VOLCANIC" FIRE CEMENT.**

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old
Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.

Correspondence invited.

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"SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telephone: No. 248 Holborn.

SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKE-
FIELD.

FIDDES-ALDRIDGE**SIMULTANEOUS Discharging-Charger.**

The one Machine which Discharges and Charges

at One Stroke.

See Advertisement, May 10, p. II. of Centre.

ALDRIDGE AND RANKEN,

39, VICTORIA STREET, WESTMINSTER, S.W.

Telegrams: Telephone:

"MOTORPATHE, LONDON." 5118 WESTMINSTER.

W. EDGAR,

GAS APPARATUS MANUFACTURER.

BLENHEIM WORKS, HAMMERSMITH, LONDON, W.

Telegrams: Telephone:

"GASOSO LONDON." 14 HAMMERSMITH.

SULPHURIC ACID.**SPECIALLY prepared for Sulphate of**

AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, and STAFFORD.

Address Correspondence and Inquiries to OLDBURY,

WORKS.

Telegrams: "CHEMICALS, OLDBURY."

HYDRATED OXIDE OF IRON.**PREPARED from Pure Iron.**

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

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GAS LIGHTING ENGINEERS AND

CONTRACTORS,

18 & 20, FARRINGTON ROAD, LONDON, E.C.

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**KRAMERS AND AARTS WATER-
GAS PLANT.**

K. & A. WATER-GAS COMPANY, LTD.

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WARNER & VAN DER BIESEN,

ZWOLLE, HOLLAND.

DIGGERS AND SUPPLIERS OF THE

FINEST DUTCH BOG-ORE.

(Natural Oxide of Iron.)

Best Percentages. For lowest quotations to any Port,

Station, or direct into Works, please apply to—

LONDON OFFICES: 6, LEATHER LANE, E.C.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORKS.

Telegrams: "CHEMICALS."

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and

54 & 47, Westminster Bridge Road, LONDON, S.E.

WET AND DRY GAS-METERS, PREPAYMENT

METERS, STATION METERS, AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 815 Oldham, and 2412 Hop, London.

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"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

DUTCH OXIDE OF IRON.**SPENT OXIDE PURCHASED IN ANY DISTRICT.****THE First Dutch Bogore Co., Ltd.,**

NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, and WAKEFIELD.

TAR WANTED.

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS,

Albert Chemical Works, BRADFORD,

MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent

Naphtha, Carbolic, Sulphate of Ammonia.

"HALLITE" Asbestos High-Pressure

Sheeting.

HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street,

LONDON, E.C.

J. E. C. LORD, Ship Canal Tar Works,

Weaste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

**BRISTOL RECORDING GAUGES
AND THERMOMETERS.**

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
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GAS TAR wanted,

BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, and WAKEFIELD.

AMMONIA.

Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORKS.

GAS-WORKS requiring Extensions

should Communicate with FIRTH BLAKELEY,
SONS, AND CO., LIMITED, Dewsbury, who make a
Speciality of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
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CAST-IRON Pipes. Spigot and Socket

or Flanged. Special Quality—9 feet or 12 feet
Lengths. When buying, Write us.

A. Lowcock, Limited, SHREWSBURY.

GAS OILS.**MEADE-KING, ROBINSON, & CO.**

Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

AMMONIA Waste Liquor Disposal.

Purification Plant.

Results Guaranteed. No Working Costs.

JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

GAS PLANT for Sale—We can always

offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering; elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,

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F. BOYALL, Contractor for Painting

GASHOLDERS, OIL-TANKS, ROOFS, and all
kinds of LOFT and other PAINT WORK.

70, Balcombe Street, Well Street, HACKNEY, N.E.

OXIDE OF IRON.

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SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.

SULPHURIC ACID.**SPECIALLY prepared for the Manu-
facture of SULPHATE OF AMMONIA.**

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated Wm. PEARCE & SONS, LTD.

86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

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"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
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Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.

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IT is Worth Your While to Buy Direct.

The RELIANCE LUBRICATING OIL COMPANY
supply the best value in NON-CORROSIVE LUBRI-
CANTS—viz., Motor Waggon Oil, 1s.; Motor Car Oil,
2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil,
10d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;
650 T Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas
Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;
Renown Engine Oil, 11d.; and Astral Disinfectant,
2s. 6d. per gallon. Barrels free, carriage paid. Solidified
Oil, 25s. cwt.

THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20,
Water Lane, Tower Street, LONDON, E.C.

**JOHN RILEY & SONS, Chemical Manu-
facturers,**

Hapton, near Accrington, are MAKERS
of Special SULPHURIC ACID, for Sulphate of Am-
monia Making. Highest percentage of Sulphate of
Ammonia obtained from the use of this Vitriol, which
has now been used for upwards of 50 Years. References
given to Gas Companies.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Re-
pairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,
BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 0848.

APPOINTMENTS.—Ambitious Men of

Parts invited to write—

HERBERT GREATORIX,

APPLICATION SPECIALIST,

BEECHWOOD, MATLOCK.

Specimen of many results:—

"Have got the job. Quite a good start.

To you the credit is due, and I think your

fee the best Investment I ever made."

BUSINESS IS REVIVING. WRITE NOW.

MR. G. STANLEY COOPER, B.Sc.,

F.C.S., Consulting Gas Engineer and Chemist.

CORRESPONDENCE CLASSES IN GAS EN-

GINEERING for City and Guilds Certificates. Success

Guaranteed. Lowest Fees. Single Lessons given on

Special Subjects.

Address, 12, HARBOUR VIEW, FOWEY, CORNWALL.

YEYMOUTH GAS MANAGER.**CANDIDATES are Thanked for their**

Applications.

TO GAS ENGINEERS AND MANAGERS.

(DISTRIBUTING DEPARTMENT.)

**APPOINTMENT required by Adver-
tiser,**

who is well up in Mains and Service
Laying, Most up-to-date Methods of Indoor and Out-
door Lighting, Cookers, Gas-Fires, and Fittings. Last

Appointment as Distribution Superintendent. Age 26.
Energetic, Teetotaler, Satisfactory Reasons for Making
Change. Excellent Testimonials.

Address No. 5248, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, a Junior Works Assistant.

South of England. Good Chemist and Draughts-
man. Progressive Company. Age 22 or over. Com-
mencing Salary, £80.

Apply, by letter, stating Education and previous Ex-
perience, with Three copies of Testimonials, to No. 5247,
care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MAN Experienced in the Manufacture

of Gas Appliances wanted for Experimental
Department in Works of a well-known Firm of Gas-
Stove Manufacturers.

Please state Age, Experience, and Wages expected to
No. 5249, care of Mr. King, 11, Bolt Court, FLEET
STREET, E.C.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

WANTED, a Chief Clerk for the Central
Gas Offices. Age not exceeding 35. Commencing
Salary, £230.

Apply, by letter, stating Age, Experience, and full
Particulars, to R. O. PATERSON, Manager, Gas-Works,
CHELTENHAM.

WANTED, as Working Foreman, a
Man with a thorough knowledge of Carburetted
Water-Gas Plant. Make, about 4 Millions per diem.
Age, about 30 Years. Wages to commence, £2 15s. per
Week.

Address No. 5250, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C. Applicants who replied to No.
5215 need not Apply again.

WANTED, an additional permanent
CLERK, used to the Routine of a small Gas
Company's Office, and especially to Outdoor Collecting.
Must be Expert at Accounts, and of Good Address.
Age between 25 and 45.

Salary, £120 per Annum; weekly payments.

JOHN KELLY,
Secretary.

Bridlington Gas Company,
May 31, 1910.

WANTED, a 20,000 Cubic Feet Capacity
Second-Hand GASHOLDER, with Connections
Complete.

Write, with full Particulars, to WALTER HUGHES,
Estate Agent, The Square, Liphook, HANTS.

GASHOLDER Wanted (Capacity 20,000
to 30,000 Cubic Feet) erected Complete. Second-
Hand not objected to, but must be in Good Condition.
Send full Particulars and Price, to No. 5245, care of
Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—about Five Tons of 12-inch
and Five Tons of 10-inch new Socket and Spigot
Cast-Iron PIPES—£4 per Ton; also 12-inch and 10-inch
BENDS, TEES, COLLARS, and CAPS—£8 per Ton.
State Requirements to the MANAGER, Gas-Works,
Chesterton, STAFFORDSHIRE.

GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete to
Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can be
seen temporarily erected. Re-erected Cheap for
immediate Sale.

FIRTH BLAKELEYS, Thornhill, DEWSBURY.

DEVIZES URBAN DISTRICT COUNCIL.

THE Gas Committee of the above
Council have for DISPOSAL the following Second-
Hand GAS PLANT: One Parkinson 5-inch Single Cone
GOVERNOR, complete with Air-Float and Three 5-
inch Valves, all in excellent Condition; also One
Cockey's 10-inch Double Cover CENTRE VALVE for
Three Purifiers.

Apply to J. W. HOLLOWAY, Manager, Gas-Works,
DEVIZES.

BOROUGH OF NEWCASTLE-UNDER-LYME.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for
the Supply and Delivery of 9000 Tons of GAS
FUEL during the Twelve Months ending June 30,
1911.

Forms of Tender may be had from the undersigned.
Tenders to be sent to the Town Clerk on or before
June 21, 1910.

The Committee do not bind themselves to accept any
Tender.

E. P. BASKEYFIELD,
Manager and Secretary.

Newcastle, Staffordshire.

NEWCASTLE-UNDER-LYME CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee of this Corporation
are prepared to receive TENDERS for the Pur-
chase of their Surplus TAR and AMMONIACAL
LIQUOR produced at these works for Twelve Months
ending June 30, 1911.

Tenders, endorsed "Tar and Liquor," to be sent to
the Town Clerk on or before June 21, 1910.

The Gas Committee do not bind themselves to accept
the highest or any Tender.

The Tar and Liquor to be taken in Boats.

E. P. BASKEYFIELD,
Manager and Secretary.

Newcastle, Staffordshire,
June 3, 1910.

SPALDING URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council invite Tenders for
the Supply during the period ending June 30,
1911, of any Quantity, not exceeding 5000 Tons, of GAS
COAL or NUTS, delivered f.o.b. Tyne, Keadby, Goole,
or Pit, or by Rail at Spalding Station.

Forms of Tender and other Information can be ob-
tained on Application to Mr. H. R. WIMBURST, Engineer
and Manager, Gas-Works, Spalding.

Tenders, on the prescribed Form, sealed and en-
dorsed "Gas Coal," must be received by me the un-
dersigned on or before the 17th of June, 1910.

The Council do not bind themselves to accept the
lowest or any Tender.

H. H. HARVEY,
Clerk to the Council.

Council Offices, Spalding,
June 1, 1910.

GOOLE URBAN DISTRICT COUNCIL.

TENDERS are invited for the Purchase
of the Surplus TAR made at the Council's Gas-
Works for a period extending from the 1st of June,
1910, to the 31st of May, 1911.

Further Particulars may be obtained on Application
to the Gas and Water Manager, Gas-Works, Doyle
Street, Goole.

Tenders, endorsed "Tender for Tar," to be received
by me not later than Noon on Wednesday, the 22nd of
June, 1910.

ROBERT TYSON,
Clerk to the Council.

Council Offices, Goole,
June 1, 1910.

CITY OF LIMERICK, IRELAND.

TENDERS FOR GAS COAL.

THE Gas Committee are prepared to re-
ceive TENDERS for the Supply of 10,000 to
12,000 Tons of Best Screened GAS COAL, to be de-
livered at the Gas-Works, Dock Road, Limerick, as
required by the Engineer and Manager, during the
Twelve Months ending June 1, 1911.

Full Particulars and Form of Tender can be had
from the undersigned.

Tenders, endorsed "Coal," addressed to the Chair-
man of the Gas Committee, to be delivered at the Gas
Office, William Street, Limerick, not later than Five
p.m. on the 13th inst.

The Committee do not bind themselves to accept the
lowest or any Tender.

By order,
H. HAWKINS,
Engineer and Manager.

BOROUGH OF NEWBURY.

(GAS DEPARTMENT.)

THE Gas Committee of the Newbury
Corporation invite TENDERS for the Supply of
6000 Tons of GAS COAL or NUTS during the period of
Twelve Months between July 1 next and the 30th of
June 1911, to be delivered free to Newbury Station on
the Great Western Railway, in Quantities as may be
agreed.

Tenders to be endorsed "Tenders for Coal," and ad-
dressed to the Chairman of the Gas Committee, Gas-
Works, Newbury, and delivered not later than the 18th
of June next.

The Committee do not bind themselves to accept the
lowest or any Tender.

Forms of Tender from the undersigned.
WM. RD. DAVEY,
Manager.

Gas-Works, Newbury,
May 31, 1910.

READING GAS COMPANY.

TENDERS FOR TAR.

THE Directors of the Reading Gas Com-
pany invite TENDERS for the Purchase of their
Surplus Coal-Gas TAR and Carburetted Water-Gas
TAR, for One Year, commencing on the 1st of July
next.

Specifications for the Contract will be forwarded on
Application to the Engineer and Manager, Mr. Douglas
H. Helps, Assoc. M.Inst.C.E.

Under the Conditions of the Contract, an allowance
will be made for all water that may be found in the Tar
in excess of 5 per cent.

Railway and River Communication direct to the
Works.

Tenders, endorsed "Tender for Tar," and addressed to
the undersigned, must be delivered not later than
Monday, the 20th inst.

The Directors do not bind themselves to accept the
highest or any Tender.

A. CANNING WILLIAMS,
Secretary.

159, Friar Street, Reading,
May 31, 1910.

COUNTY BOROUGH OF STOKE-ON-TRENT.

TENDERS FOR SUPPLY OF GAS COAL.

TENDERS are invited for the fol-
lowing:

The Supply and Delivery at the Fenton Gas-Works of
9000 Tons of GAS COAL, BURG, NUTS, or BEANS.
The Supply and Delivery at the Stoke-upon-Trent
Gas-Works of 12,000 Tons of GAS COAL.

The Supply at the pit mouth of 7000 Tons of WASHED
BEANS and NUTS, for the Longton Gas-Works, during
the Year ending June 30, 1911.

The above Quantities are approximate only.
Specification and Form of Tender can be obtained
on Application to the Managers of the respective Gas-
Works.

TENDERS FOR PURCHASE OF TAR AND AMMONIACAL LIQUOR.

Tenders are also invited for the Purchase of the
Surplus TAR and AMMONIACAL LIQUOR made at the
Burslem Gas-Works, the Fenton Gas-Works, and the
Stoke-upon-Trent Gas-Works, during the above
period.

Price to be stated per Ton at the Works in the cases of
Fenton and Stoke-upon-Trent. In the case of Burslem,
the Price to be stated per Ton at (a) Canal Wharf,
Longport, (b) Longport Railway (N.S.R.), the Con-
tractor providing Railway Tanks or Canal Boats, and
the Council reserving the option to load by Canal or
Railway.

The Council reserve the right of accepting the whole
or any part of a Tender, or of dividing same as they
may consider desirable.

Neither the lowest nor any Tender will necessarily
be accepted.

Further Particulars may be obtained from the Gas-
Works Managers on Application.

Tenders must be sent in to reach the undersigned by
Twelve noon on Monday, the 13th day of June inst., en-
dorsed "Tender for Coal," or "Tender for Residuals,"
as the case may be.

EUSTACE JOY,
Acting Town Clerk.

Stoke-upon-Trent,
June 1, 1910.

THE Urban District Council of Atherton
invite TENDERS for the Supply of about 7000
Tons of Screened GAS COAL or NUTS from the 1st
of July, 1910, to the 30th of June, 1911.

Forms of Tender and further Information may be
had from the undersigned, to whom Tenders should be
Delivered on or before Wednesday, June 15 inst.

W. GARNETT,
Clerk.

Town Hall, Atherton,
June 1, 1910.

BRIDGEWATER COLLIERIES COKE-WORKS.

(THE EARL OF ELLESMERE.)

TENDERS are invited for the Tar pro-
duced at the above Works for a period of Six or
Twelve Months from the 1st of July, 1910, delivered
into Contractor's Tanks at the Bridgewater Colliery
Siding, Wharton Hall, on the Pendleton and Hindley
Branch of the Lancashire and Yorkshire Railway; or
at the Brackley Siding, Little Hulton Mineral Branch
of the London and North-Western Railway.

The estimated quantity is about 2600 Tons per Annum.
Tenders, endorsed "Tender for Tar," to be addressed
to Mr. THOMAS M. BROWN, Bridgewater Coal Offices,
4, Chapel Walks, MANCHESTER, not later than the 20th
of June.

Manchester, May 31, 1910.

URBAN DISTRICT COUNCIL OF COLWYN BAY AND COLWYN.

TENDERS FOR GAS COAL.

THE Council invite Tenders for the
Supply of Screened COAL or NUTS suitable for
the Manufacture of Gas.

Conditions of Contract and Form of Tender can be
obtained on Application to the undersigned.

The Council reserve to themselves the right to divide
the Quantity required into two or more Contracts, and
do not bind themselves to accept the lowest or any
Tender.

Sealed Tenders, endorsed "Tender for Coal," to be
sent in addressed to me, the undersigned, not later than
the 18th day of June.

By order,
JAMES AMPHLETT,
Clerk to the Council.

Council Offices, Colwyn Bay,
June 3, 1910.

GUILDFORD GASLIGHT AND COKE COMPANY.

TO TAR DISTILLERS.

THE Directors of the above Company

invite TENDERS for their Surplus TAR (for
Disposal) for Twelve Months, from the 1st of July, 1910,
at per Gallon, delivered into Contractor's Tanks or
Barrels free on Rail Guildford Station.

Buyers to find either Road and Rail Tank or Barrels.
Coal carbonized, about 13,000 Tons per Annum.

Tenders, endorsed "Tar," to be sent to Ferdinand
Smallpiece, Esq., J.P., Chairman of the Gas Company,
on or before Friday, June 17, 1910.

The Directors do not bind themselves to accept the
lowest or any Tender.

By order,
WILLIAM TITLEY,
Secretary.

Gas Offices, Guildford,
May 28, 1910.

BOROUGH OF WORKINGTON.

TENDERS FOR GAS COAL.

THE Gas Committee of the Workington
Corporation invite TENDERS for the Supply of
about 10,000 Tons of Good GAS COAL, to be delivered
free, in Quantities as required, at the London and
North Western Railway Station, in Flat Bottomed
Waggons, or at the Quay Side, Workington, from the
1st of July, 1910, to the 1st of July, 1911.

Sealed Tenders, specifying Description and Quality
of Coal offered, Analysis of same, and Pit in which it
was raised, and the Terms for net Monthly Payment,
are to be sent before noon on Monday, the 20th of June,
1910, to the undersigned, endorsed "Tender for Coal."

Any other Information required may be obtained on
Application to Mr. E. George Hutchinson, Gas Manager,
Gas-Works, Workington.

The Committee reserve the right to divide the above
Quantity into two or more Contracts.

The lowest or any Tender not necessarily accepted.

JOHN WARWICK,
Town Clerk.

Town Hall, Workington,
June 4, 1910.

BOROUGH OF LEIGH.

(GAS AND WATER DEPARTMENTS.)

THE Gas and Water Committee of the
above Corporation are prepared to receive
TENDERS for the Supply of the following GOODS:

- (1) 14,000 Tons of Screened and Unscreened GAS
COAL, NUTS, and SLACK.
- (2) LEAD PIPING (Gas and Water.)
- (3) VITRIOL.
- (4) LIME.
- (5) BENZOL.
- (6) WROUGHT-IRON TUBES AND FITTINGS.

Forms of Tender may be had on Application from
the undersigned, to whom all enquiries must be ad-
dressed; and all Offers must be made on the Official
Forms, or they will not be considered.

Sealed and endorsed Tenders must be delivered to
Mr. Stanley Wilson, Town Clerk, Town Hall, Leigh,
Lancashire, on or before Twelve o'clock noon on
Saturday, the 11th day of June, 1910.

The Corporation do not bind themselves to accept the
lowest or any Tender, and reserve to themselves the
right to divide any Tender.

JAMES GIBSON,
Engineer and Manager.

Gas and Water Offices, Leigh,
Lancashire, May 24, 1910.

COAL.

THE Salisbury Gaslight and Coke Company invite TENDERS for 1000 to 4000 Tons of GAS COAL, delivered f.o.r. Salisbury, as required over the next Twelve Months.

Tenders to be sent on or before June 9, to Mr. N. H. HUMPHREYS, Gas Engineer, SALISBURY.

BROADSTAIRS GAS COMPANY.

THE Directors of the above Company invite TENDERS for the Supply of about 6500 Tons of Best Durham or Yorkshire GAS COALS, to be delivered between the 1st of July, 1910, and June 30, 1911.

Sealed Tenders, endorsed "Gas Coal," addressed to the Chairman of the Company, Gas Offices, Broadstairs, to be sent in not later than the 5th of July, 1910.

The Directors do not bind themselves to accept the lowest or any Tender.

Further Particulars and Form of Tender may be obtained from

F. HIGGINSON,
Engineer, Manager, and Secretary.
Gas Offices, Broadstairs,
June 3, 1910.

ULVERSTON URBAN DISTRICT COUNCIL.

TENDERS FOR COAL AND CANNEL.

THE Gas and Water Committee are prepared to receive TENDERS for the Supply of Best Screened GAS COAL, LARGE NUTS, or Unscreened GAS COAL, and CANNEL, for a Period of One, Two, or Three Years.

Parties Tendering must give full Particulars of the Coal and Cannel they propose to Supply, and name the Pit from which the same will be raised.

Further Information and Forms of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas and Water Committee, to be sent in not later than the 18th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

JNO. SWAN,
Engineer and Manager.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the Supply of 50,000 Tons of Clean Dry, Unscreened, Fresh-Wrought GAS COALS, delivered f.o.b. to the Company's Steamers at any suitable Port during the Year ending the 31st of May, 1911.

The deliveries to be in about equal monthly Quantities throughout the Year.

Payment in Cash Monthly.

Parties desiring to Tender for more than One Year must state separately the Price and Quantity offered for each Year.

Further Particulars may be obtained from the Engineer, Mr. H. O. Carr.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Tender for Coals," to be addressed to the Chairman and delivered at the Company's Offices, as under, not later than the 13th of June inst.

By order,
CHAS. W. BRAINE,
Secretary.

Fairfield Street, Wandsworth, S.W.,
June 1, 1910.

BRIDGNORTH CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee are prepared to receive sealed TENDERS for the Supply of Screened GAS COAL or Washed GAS NUTS, including Carriage to the Bridgnorth Railway Station, for One Year from, or soon after, the end of July next.

Evidence as to quality of Coal must accompany each Tender.

The Coal or Nuts must be well Screened or Washed, free from Bats, Binds, and other Refuse, and be freshly got at the time for delivery.

Quantity required, about 2600 tons in proportionate deliveries as directed—say 70 per cent. during Winter months, and 30 per cent. during Summer months.

Sealed and marked Tenders must be sent to the undersigned not later than Saturday, the 18th of June.

The Committee reserve to themselves the right to divide the Quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Official Forms for Tender are not furnished.

By order,
J. H. COCKSEY,
Town Clerk,
Secretary.

Bridgnorth, May 27, 1910.

NEWPORT (MONMOUTHSHIRE) GAS COMPANY.

SALE BY TENDER OF £16,000 CONSOLIDATED (5 PER CENT.) STOCK.

(MINIMUM PRICE, £112 PER £100 STOCK.)

THE Directors invite Tenders for the Purchase of the above-mentioned CONSOLIDATED STOCK of the Company, in Lots of £100 each, to be paid up in full on or before June 30, 1910.

The Stock bears a Maximum Dividend of £5 per Cent. per Annum.

Full Maximum Dividends have been paid by the Company for upwards of Fifty Years.

Sealed Tenders must be delivered not later than Ten o'clock a.m. on Friday, the 17th of June, 1910, to the undersigned, from whom Particulars and Conditions of Sale may be obtained.

By order,
T. H. HAZELL,
Secretary.

Gas Offices, Newport, Mon.,
May 19, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

order of the Directors of the
ASCOT DISTRICT GAS AND ELECTRICITY COMPANY.

NEW ISSUE OF 350 £10 NEW ORDINARY SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BRENTWOOD GAS COMPANY.

NEW ISSUE OF £3000 ADDITIONAL STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GUILDFORD GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK,
AND
£2500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
EAST GRINSTEAD GAS AND WATER COMPANY.

NEW ISSUE OF 400 £10 "C" SHARES,
AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

NEW ISSUE OF
£2000 CONSOLIDATED ORDINARY STOCK AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

BROADSTAIRS GAS COMPANY.

NEW ISSUE OF £3500 ORDINARY "D" STOCK,
IN 175 LOTS OF £20 EACH.

THE Directors of the Broadstairs Gas Company give Notice that they will be prepared to receive, not later than Eleven o'clock on Wednesday morning, July 6, 1910, sealed Tenders for £3500 ORDINARY "D" STOCK, in 175 Lots of £20 each.

Full Particulars and Forms of Tender may be obtained from the undersigned.

F. HIGGINSON,
Engineer, Manager, and Secretary.
Gas Offices, Broadstairs,
Kent, June 1, 1910.

THE Owner of Patents No. 90, of 1906, and No. 14,189, of 1906, relating to "Improvements in Tubes made of Spirally Wound and subsequently Soldered Metallic Strips and Process of Manufacturing the same," and "Improvements in Machines for the Manufacture of Tubes from Metal Strips," desires to Negotiate with Manufacturers with the view of Granting LICENCES under them upon Reasonable Terms. For Information, Apply to LLOYD WISE AND CO., Chartered Patent Agents, 46, LINCOLN'S INN FIELDS, W.C.

THE Proprietor of Letters Patent No. 12,751 of 1907, relating to "Apparatus for Washing and Cooling Gas," desires to DISPOSE of the Patent, or to Grant LICENCES to interested Parties on Reasonable Terms, with a view to the adequate Working of the Patent in this Country.

Enquiries to be addressed to CRUIKSHANK AND FAIRWEATHER, LIMITED, International Patent Agency, 65-66, Chancery Lane, LONDON, W.C.

BRITISH COALITE COMPANY, LIMITED.

£100 REWARD.

WHEREAS Libellous Statements concerning the British Coalite Company, Limited, are being Circulated anonymously amongst Newspaper Editors and Others.

THIS IS TO GIVE NOTICE THAT A REWARD OF £100 will be paid by the Company to any Person giving such Information as will lead to the identification of the Author of the said Statements.

By order of the Board,

ACTON PHILLIPS,
Secretary.

3, London Wall Buildings,
London, E.C., May 31, 1910.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the Company, so far as they relate to DEBENTURE STOCK, WILL BE CLOSED from the 14th to the 21st of June, 1910, both days inclusive.

The Interest for the Half Year to June 30, 1910, will be payable on the 1st of July to the Proprietors Registered on the closing of the Books.

By order of the Board,

E. TOPLEY,
Secretary.

Chief Offices of the Company:
639, High Road, Tottenham,
June 4, 1910.

KOPPERS' PATENT
CHAMBER OVENS.

Results obtained which have never been Surpassed by any other System of Carbonization.

Plants at Work and under Construction for the production of **18,000,000** cubic feet of Gas per Day.

See our large Advertisement appearing in alternate issues of the "JOURNAL."

The KOPPERS'
COKE OVEN AND BYE-PRODUCT CO.,
301, Glossop Road, SHEFFIELD.

ARMSTRONG'S
PATENT

CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, $1\frac{1}{2}$ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

THOMAS TURTON
AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF

FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
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ANVILS, VICES,
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TROTTER, HAINES, & CORBETT,
BRETTTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

MIRFIELD GAS COAL.
UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAYENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER
Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND
ALL OTHER GAS APPARATUS.

Inquiries Solicited.

Telegrams: "DARWINIAN, MANCHESTER,"
Telephone 1806.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

ALL the
BOYS CALORIMETERS

which have been in daily use in
all the Official Testing-Stations in
London for the last Three Years

WERE MADE BY
JOHN J. GRIFFIN & SONS,
— LIMITED —
KINGSWAY, LONDON, W.C.

Those desiring to obtain Gas Calorimeters
as used in the Official Testing Places
should see that the apparatus bears the
name of the Original makers.

Descriptive Catalogue on Application.

BIRTLEY IRON COMPANY,

ESTABLISHED 1820,

Owners of the Birtley Iron Works and
Pelaw Main Collieries,

GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNEC-
TIONS for Gas, Water, Steam, Electrical,
Sanitary, and other purposes; also TANKS,
COLUMNS of every description, Hydraulic,
Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of
our manufactures, on application.

Works: BIRTLEY, CO. DURHAM.
Newcastle-on-Tyne Offices: MILBURN HOUSE.

HEATHCOTE GAS COAL

from the

GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

CAST-IRON PIPES FOR GAS, WATER, & STEAM,
also VALVES of all descriptions.
R. LAIDLAW & SON, LTD.,
ALLIANCE FOUNDRY, 147, MILTON STREET, GLASGOW,
And LAMBHILL FOUNDRY, GLASGOW.
OFFICE: 147, MILTON STREET, GLASGOW.

SPLENDID CARBONIZING RESULTS.

HIGHEST RESULTS in GAS MADE and COKE SOLD per Ton of Coal
Carbonized, obtained where improved Klönne Retort Settings, constructed by
us, are in operation.

Reference can be given to several Works where Regenerators are still working after a life of 10 to 15 Years.

THOMAS VALE & SONS, LTD., CONTRACTORS, STOURPORT.

KLÖNNE SETTINGS A SPECIALITY. High-Class Work only.

GASHOLDER TANKS. MAINLAYING. BUILDINGS.

ASHMORE, BENSON, PEASE & CO., LTD.,
STOCKTON-ON-TEES.

Telegrams:
"GASHOLDER."

MANUFACTURERS AND ERECTORS OF
Gasholders, Purifiers, Condensers,
Washers, Steel Mains, Roofs,
AND ALL OTHER GAS-WORKS PLANT.

Munich Inclined Chamber Furnaces.

Plants already built and under Construction :

Total capacity: 45,000,000 c.ft. of pure Coal Gas per 24 hours.

The following Cities have adopted { Munich Chamber furnaces: { Berlin, Hamburg (second order), Paris, Munich, Kierstein, Moosach, Leipzig, Rome, Hanau, Regensburg.

For Particulars and Tenders apply to :

The Coke Ovens and By-Products Co., Ltd.,
St. Stephens House, Westminster, S.W.

ADDITIONAL REVENUE FOR GAS-WORKS.

COKE SELLING . . AT 11/6 A TON

COALEXLD SELLING AT 20/- A TON

IN THE SAME TOWN.

COALEXLD, LIMITED.
LANCASTER.

LARGEST MANUFACTURERS in the UNITED KINGDOM

of GAS-RETORTS,

Horizontal or Inclined;
also Makers of Segmental
Retorts of all Sections.

PATENTEES OF

Machine-Flanged
RETORTS.

DIBDALE WORKS,

DUDLEY.

SPECIAL BRICKS
& BLOCKS of every
description for GENE-
RATOR and REGENERATOR
FURNACES.

Large Stocks of Bricks of all sizes,
Burr, Boiler Seating Blocks and Covers,
Plain and Rebated Tiles, &c., &c.

Telegraphic Address:
MACHINE, LOWER GORNAL

B. GIBBONS, JR., LD.
Retorts and other Fire-Clay
Goods carefully packed for export.

FOREIGN AND HOME COPIES OF ILLUSTRATED
CATALOGUES ON APPLICATION.

"ABC" Code and UNICODE used for Telegrams and Cablegrams.



OUR DISCOUNT SYSTEM GAINS
GROUND DAY BY DAY.

Greatly increases Sale of Gas.

Particulars and fullest description on
application.

T. G. MARSH,
28, Deansgate, MANCHESTER.

CLAYTON SON & CO.
LIMITED
Pepper Rd. Branch, Hunslet, Leeds.



Interior View of Works
Employed in the Manufacture of
WELDED STEEL MAINS
for WATERWORKS Etc.

SAML. CUTLER & SONS, MILLWALL, LONDON,

And at 39, VICTORIA STREET, WESTMINSTER, S.W.

CARBURETTED WATER-GAS PLANT.

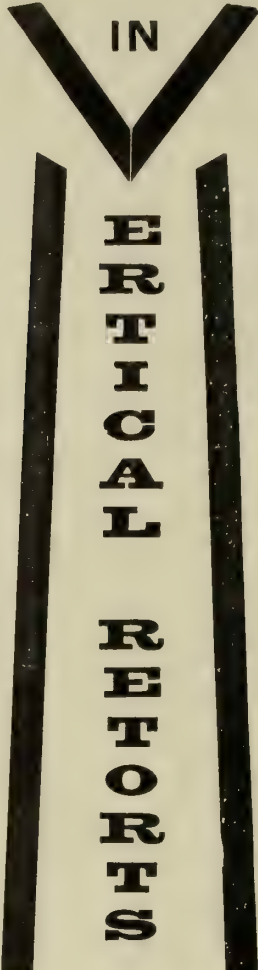
MAXIMUM EFFICIENCY GUARANTEED.

Inspection of Working Plants Invited.

CONTINUOUS CARBONIZATION

**GLOVER-WEST
PATENTS.**

IN



**VERTICAL
RETORTS**

*Description and
Particulars of Tests
will be forwarded
on request.*

COST OF LABOUR

REDUCED TO

2 $\frac{3}{4}$ d. PER TON OF COAL CARBONIZED.

See "JOURNAL OF GAS LIGHTING," Nov. 2, 1909.

WEST'S GAS IMPROVEMENT CO., LTD.,

104, QUEEN VICTORIA STREET,
LONDON, E.C.

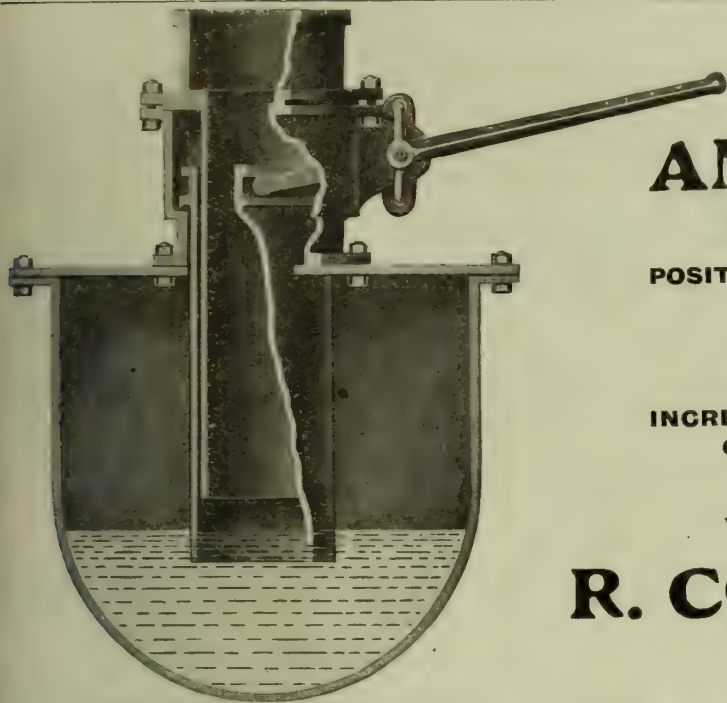
Engineers,

Telegrams—"STOKER, MANCHESTER."

"RADIARY, LONDON."

Telephones—Nos. 1339 and 5520 Manchester (Central.)
No. 14,406 London (Central).

MILES PLATTING, MANCHESTER.



CORT'S

PATENT

ANTI-DIP VALVE.

IMPORTANT POINTS:—

POSITIVE IN ACTION,
ABSOLUTELY SAFE,
ALWAYS FULL BORE.

WE GUARANTEE

INCREASED MAKE PER TON,
GREATER ILLUMINATING POWER,
SATISFACTION, &c.

Write for fullest Particulars to—

R. CORT & SON, Ltd.,
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BARRY, HENRY, & CO.,

— LIMITED. —

Specialities:

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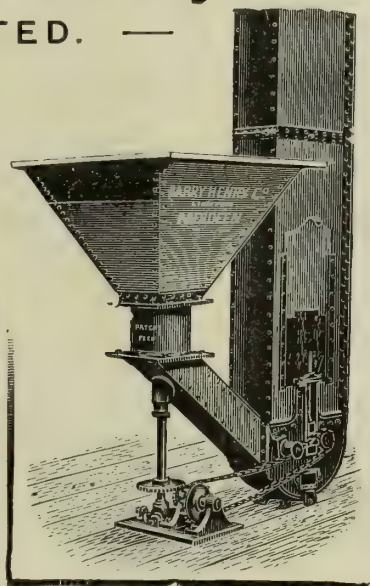
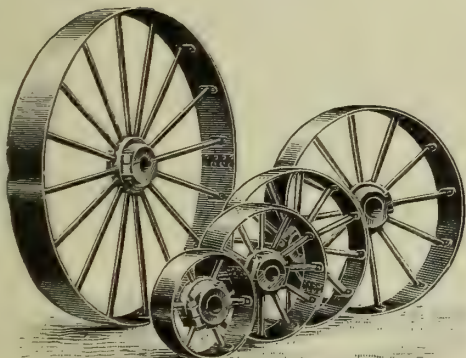
OF

POWER.

Rope & Belt Pulleys,
Spur & Bevel Wheels,
Shafting & Couplings,
Pedestals & Fixings.

WORKS

ABERDEEN,
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Specialities:

TRANSMISSION

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MATERIALS.

Conveyors,
Elevators,
Grinding Machinery,
Motors.

AND

64, MARK LANE,
LONDON, E.C.

RETORT HOUSE GOVERNORS.

THESE Governors are made to prevent fluctuation in the Pressure or Exhaust in the Hydraulic Main by controlling the Gas entering the Governor, notwithstanding the constant varying quantity of Gas coming from the Retorts. This enables the Seal of the Dip Pipes to be reduced to a minimum with perfect safety, and an increase in the make of Gas per Ton of Coal is thereby assured.

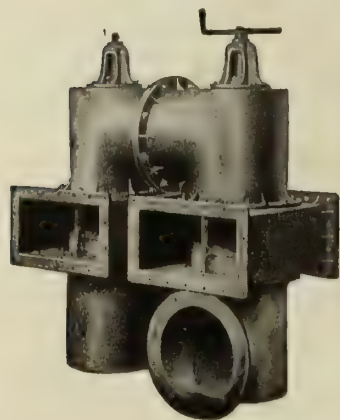
There is absolutely no possibility of any sticking, due to deposits of Tar or Pitch, with this Governor, as the Cone is quite free to pass through the Seat. The Regulation by means of a long Parabolic Cone is recognized as the most exact method that can be employed. A great improvement, first introduced by Messrs. JAMES MILNE & SON, LIMITED, is the simple arrangement by which a smaller Cone and Seat can be easily fitted, thus ensuring delicate adjustment during a period of small makes.

PRICES AND SIZES ON APPLICATION.

JAMES MILNE & SON, LIMITED,

EDINBURGH. LONDON. GLASGOW. LEEDS.





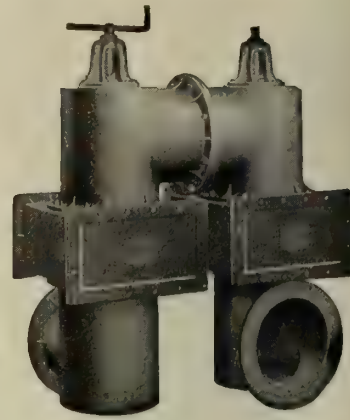
MILBOURNE'S PATENT Purifier Valves

fixed inside or outside the Purifiers.

C. & W. WALKER, LTD.,

110, Cannon Street,
London, E.C.

MIDLAND IRON-WORKS,
DONNINGTON, SALOP.



EVERITT'S Patent TAR-FOG EXTRACTOR AND NAPHTHALENE REMOVER.

SOLE MAKERS:
ROBERT DEMPSTER & SONS,
ROSE MOUNT IRON-WORKS, LTD.,
ELLAND, Yorks.

ARROL-FOULIS Stoking Machinery HYDRAULIC COKE PUSHERS

(HUNTER and BARNETT'S PATENT).
WILL DISCHARGE A RETORT IN ONE OPERATION
LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

[See Illustrated Advertisement, May 10, p. 352.]

SIMMANCE-ABADY PATENT RECORDER

For Steam, Gas, Water, or Air Blast.

In Hundreds of Ranges
FOR

PRESSURE

AND

EXHAUST.

ENGLISH MADE.

"PRECISION" ACCURACY.
INCORRODIBLE.



ALEX. WRIGHT & CO., LTD., WESTMINSTER.

SILICA MACHINE MADE RETORTS.

TRADE "C.O." MARK.
REGISTERED.

THE NEW RETORT

Will withstand high temperatures and is **Guaranteed**
not to Contract or Soften under Heat.

GREATER CONDUCTIVITY THAN ANY
FIRE-CLAY RETORT.

For Particulars and prices apply—

JOSEPH MORTON, LTD.,

Cinder Hills Fire Clay Works,

Telegrams: ESTABLISHED 1783. **HALIFAX.**
"MORTON, HALIFAX." Tel. No. 134.

London Agents: DOW & WILSON, 32, Fenchurch Street, LONDON, E.C.

Memo.

MOBBERLEY & PERRY OF STOURBRIDGE LIMITED,

are receiving large repeat orders for Home and Abroad for
their special quality of Gas Retorts, Fire-Bricks, &c.

Welsbach

LIGHT

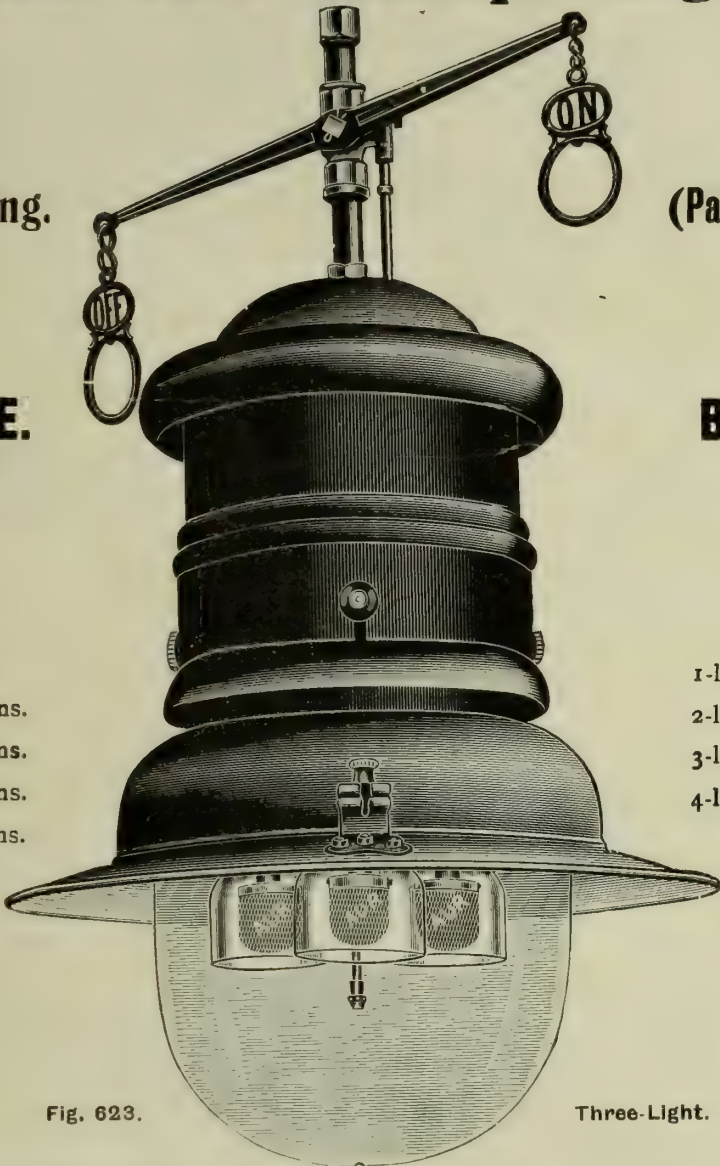
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 8 ins. |
| 2-light | . . . | 2 ft. 4 ins. |
| 3-light | . . . | 2 ft. 4 ins. |
| 4-light | . . . | 2 ft. 7 ins. |

Width over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in. |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

| | Gas per hour. | C.P. | Steel. | Copper Case. | | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
| 2-light | 8 feet | 260 | 47/6 | 6/- extra. | 4-light | 16 feet | 550 | 72/6 | 9/- extra. |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

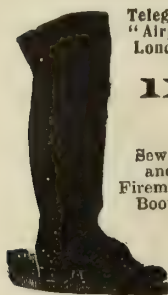
RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

| | 1-Light. | 2-Light. | 3-Light. | 4-Light. | | 1-Light. | 2-Light. | 3-Light. | 4-Light. |
|-------------------------------|----------|----------|----------|----------|----------------------------|----------|----------|-------------------|----------|
| Clear Glass Globes, each | 2/3 | 5/9 | 5/9 | 9/- | Wired Globes, extra | each | 2/- | 2/- | 2/9 3/6 |
| " " " In Case lots per dozen. | 19/6 | 57/9 | 57/9 | 93/- | Parabolic Reflector, extra | " | 3/6 | 6/- | 7/6 |
| Case contains | 80 | 18 | 18 | 12 | Welsbach Mantles, each | | 6d. | subject as usual. | Not made |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.
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Telephone 2410 NORTH.



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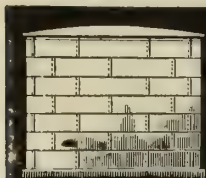
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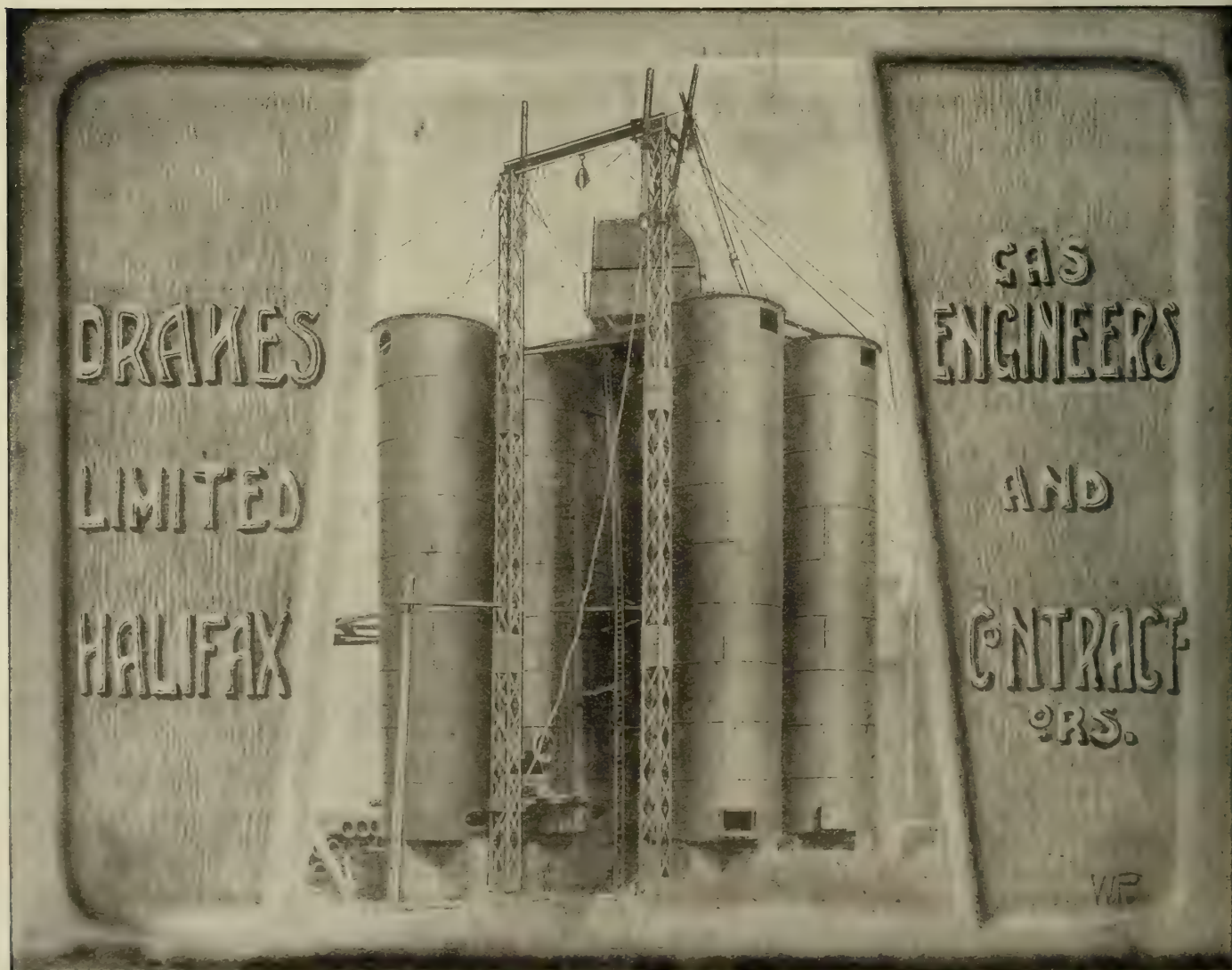
ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820'20.

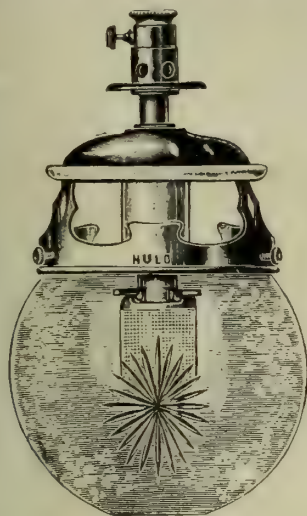
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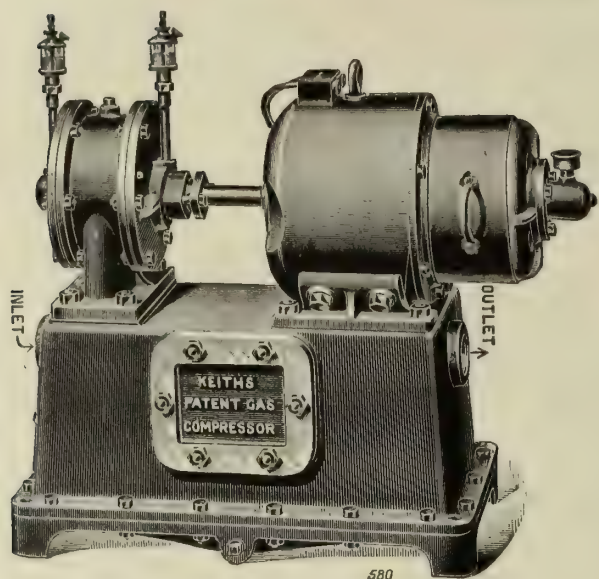
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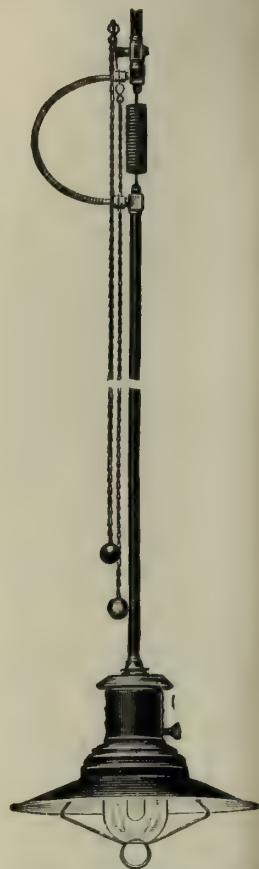
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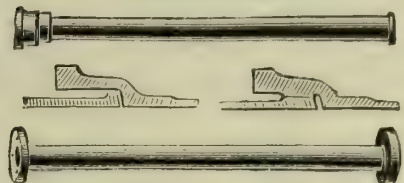
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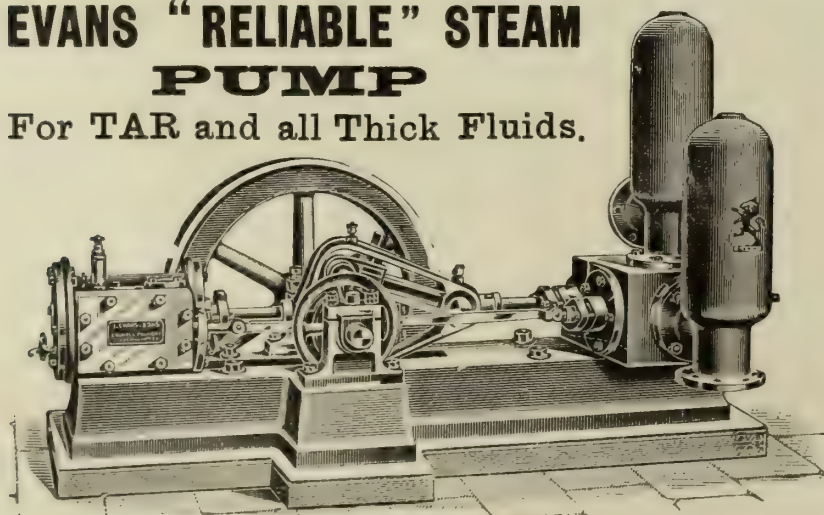
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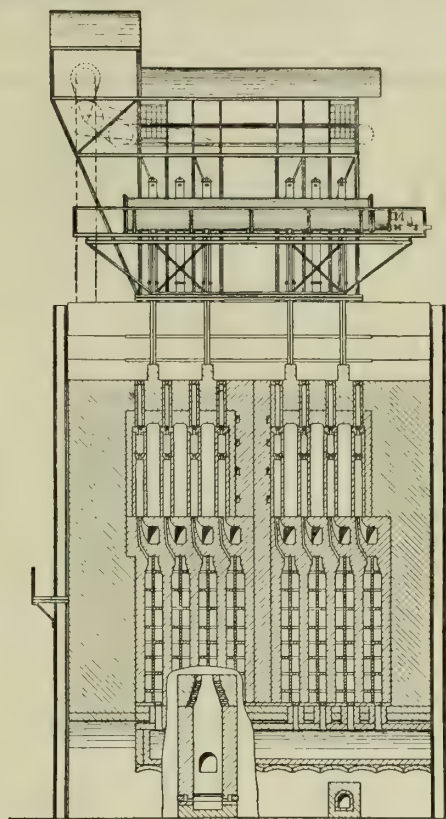
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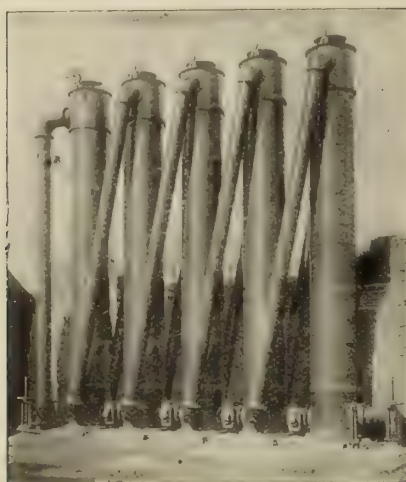
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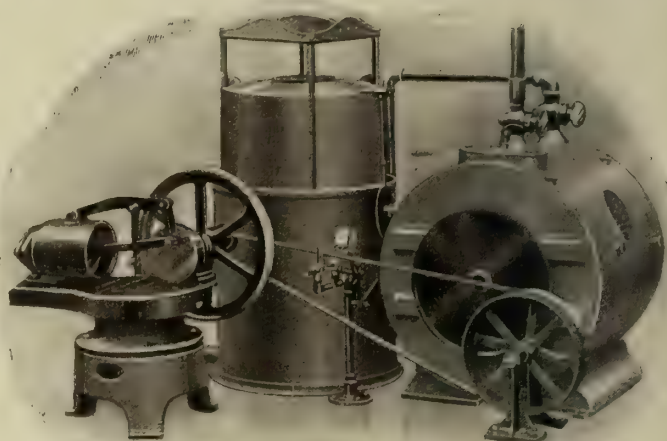
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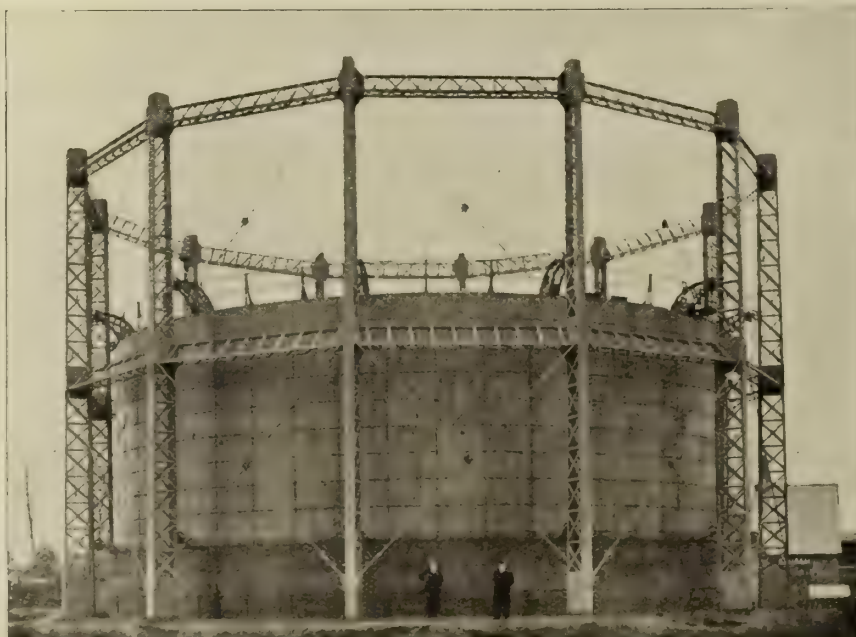
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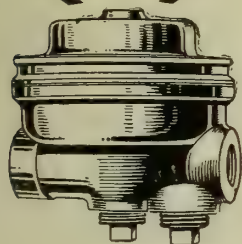
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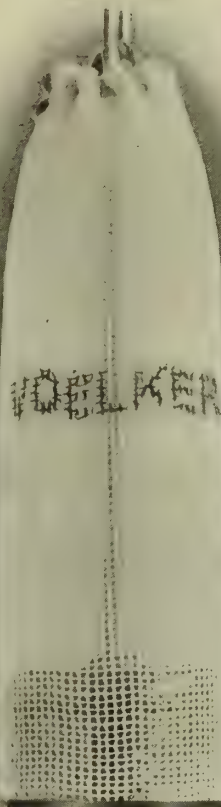
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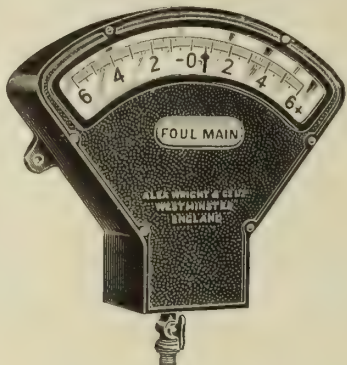
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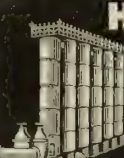

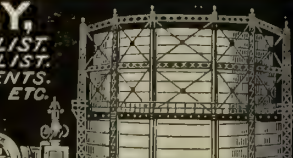


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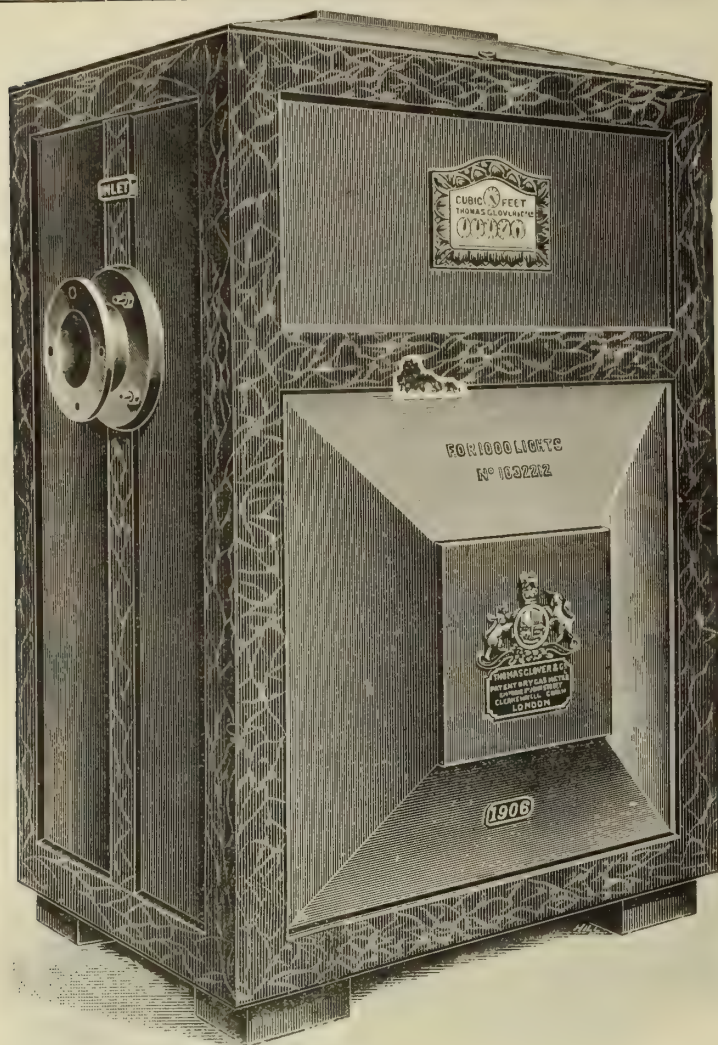
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VOL. CX., No. 2457.—TUESDAY, JUNE 14, 1910.

EDITORIAL NOTES—GAS, &c.

The Attempt to Wreck the Standard Burner Bills.

THE would-be wreckers of the Standard Burner Bills have already commenced their malign operations. Notices were on the House of Commons paper for last Thursday in the name of Mr. R. D. Holt, that the Bills be read that day three months; and, in the event of the second reading being agreed to, he had a further proposition to submit, that it be an instruction to the Committee to omit the Liverpool Gas Company from the first schedule to No. 1 Bill. The same day Mr. George Roberts also gave notice that, on the order for second reading, he should move that the Bills be read that day three months. On the order for the second reading being introduced, several members objected, and the matter was postponed until to-day. The objection of several members shows that the opposition has been hard at work, organizing (as predicted last week) unreasonable hostility to the measures in the House itself, with the view to their overthrow rather than allow them to go before a Committee, and give the parties most intimately concerned an opportunity of obtaining judgment on the statement of their relative cases. It is interesting to note that Mr. Holt, in whose name the first motions stand, is a shipbroker of Liverpool, and is the member for the Hexham division of Northumberland. The appropriateness of his association with this matter is only traceable to his business relations with Liverpool, and not directly as a parliamentary representative; he having been twice rejected when a candidate for a seat in one of the divisions of the city. Mr. Roberts is a Labour member, and one of the representatives of Norwich, in which city he is prominent as a leader of the Socialist party.

The joint opposition to the Bills was initiated in, and engineered from, Liverpool; and the enormity of a number of companies combining to show cause for the granting of a common object has lately been sounded, from the same quarter, in many council chambers in the country, though the councils have no concern in the matter, other than the very remote one of fearing that such combined applications to Parliament will, in some mysterious way, be inimical to their interests. This very case illustrates the groundlessness of any such fear, inasmuch as the opponents have themselves shown a fine facility and capacity for combination, and the procedure before Committees gives them every opportunity not only for the presentation of their hostile case, but for the investigation of individual grievance. As to Mr. Holt's second notice of motion, instructing the Committee to omit the Liverpool Gas Company from the Bill, it would not alter the opposition in the House on the second reading one iota if the Company were to withdraw. The opposition would proceed just the same. It will be remembered that, before the House of Lords Committee, Liverpool was adopted as the pivot for the ineffective opposition case; but if, apart from the question of a uniform standard for testing quality, a large part of the strength of the case for the Standard Burner Bills lies in the changed circumstances of the gas industry and the modes of utilizing gas to-day, then the greater reason why what the promoting Companies are asking for should be conferred upon the Liverpool Gas Company.

We hope that Gas Companies generally (whether or not participating in the promotion), with Members of Parliament as shareholders, have followed our advice of last week, and have communicated with the latter, showing reasons why they should support the second reading of the Bills, and not allow them to be defeated without a proper hearing, in view of the strong case existing for a common standard testing-burner, and in view of the endorsement of Parliament of the adoption of this particular burner during the past five sessions. Any officials of Gas Companies who desire any information in regard to the matter should, without delay,

put themselves in communication with the Parliamentary Agents for the Bills (Messrs. R. W. Cooper and Sons, of 5, Victoria Street, S.W.). It may be well to mention, so that there may be no misapprehension, that though the order for second reading is entered for to-day, messages now to gas-shareholding Members of Parliament will not be too late, as the probability is that all that will be done at this sitting will be to fix an evening for the discussion and division. Let it be remembered that this antagonism to these Bills is a matter that concerns not only the promoting Companies, but the whole gas industry, and the future of the industry. It is therefore hoped that a strong case will be submitted, and that it will have a big numerical backing in the House in opposition to the motions for wrecking the measures. Nothing that can be done must now be left undone to ensure their victory over the machinations of the obstructionists to our industrial progress. The Parliamentary Agents are doing their part well in this connection; but the support that any Gas Company—however small it may seem to be—can render will all go to strengthen this fight for right.

There is all the more reason for stout resistance in the fact that the opposition, numerically, has been considerably weakened since the transfer of the measures from the House of Lords to the House of Commons; and this gives an inkling as to one of the reasons for the tremendous effort that is being made by the remnant of the opponents to destroy the Bills. When the Bills were in the House of Lords, the number of local authorities concerned who took up a passive attitude in regard to them was in excess of those who opposed; and we calculate there are a dozen less of the Companies opposed in the House of Commons. The numerical strength, too, of the opponents (this is especially noteworthy as an indication of changed feeling) has declined at least one-half; and—let this be particularly marked—three parts of the still active opponents are owners of electrical undertakings. This is significant. Indeed, it is not too much to say that this is not purely a fight in defence of local interests; it is a case of the municipal directors of local trading undertakings taking advantage of their administrative position to make war upon their competitors and upon private enterprise, and to endeavour to secure some unfair advantage from it. Therefore we ask every Gas Company, loyal to the common interests of the industry, with any influence—large or small—to take the hint, and use that influence in persuading to an active resistance against this effort to put a further spoke in the wheels of progress of the gas industry.

The Tale of the "Analysis."

FROM the compiler (Mr. George Orford, the Assistant-Accountant of the Gaslight and Coke Company) we have received a copy of that standard work "Field's Analysis of the Accounts of the Principal Gas Undertakings of England, Scotland, and Ireland." Turning to the title page, it comes almost as a shock to be reminded that this is the forty-first year of the publication of the indispensable "Analysis;" and the fact of the flight of time induces one to retrospection. The years covered by the publication of the "Analysis" have been progressive and prosperous on the whole; but interspersed here and there have been some critical periods. The statistical work itself, started by the late Mr. John Field, has greatly expanded; and the quantitative representation in money, materials, gas, and so forth, that is found in the volume last issued by Mr. Orford must, in respect of the comparable undertakings, have been altogether undreamed of when the originator issued, in the one introductory volume, his analytical work for the years 1869-70-71, relating only to the London Gas Companies. The work has since been extended to the Suburban and the principal Provincial undertakings.

Reaching down from the shelf upon which it has long

reposed the first issue of the "Analysis," it is seen that the accounts of thirteen Companies, and all London ones, were then dealt with; now, and for many years, there have only been three Gas Companies in London. In 1869, when this work was inaugurated, the London Companies sold only 9,885,857,000 cubic feet of gas; in 1909, the three Companies sold no less than 38,290,723,000 cubic feet. The figures for the first year do not disclose how much gas was made per ton of coal carbonized; but the quantity sold was only 8438 cubic feet per ton. Last year the gas made per ton was 11,404 cubic feet. These few figures are more eloquent than any words could be as to expansion and prosperity, within the technical confines of the industry and beyond where the industry has to trade and make way with active competitors at its heels. Every figure in the new issue of the "Analysis" has an interest; and one is tempted to dwell on at any rate the totals, for every total carries a tale. Quoting only three of them, we have told, with the finest brevity, the tale of the great extension of the industry's service to the community. The customers of the London Gas Companies last year numbered 1,029,468, of whom 383,919 were ordinary, and 645,549 prepayment consumers. These are remarkable figures.

Can a Wrong be Right?

FROM time to time, we have taken the Hastings Corporation to task regarding the administration of their electricity supply undertaking and their public lighting policy, in respect to both of which we have contended, and there has been confirmation by the strictures and the attitude of the Local Government Board, that the interests of the ratepayers have been made subservient to those of the electricity concern. It appears that the Corporation have at length—not in this one connection, but generally in regard to their administration—awakened to their own deficiencies, for a Special Committee has been appointed to inquire separately into the administration of the various municipal departments. These departments are administered by Committees composed of members of the Corporation; and to the Council collectively these Committees have to report and obtain ratification of their proceedings. Therefore, no more than the appointment of the Special Committee is required to prove to all onlookers that the Council have become conscious of their own deficiencies as administrators. We are glad of this, because there is hope that the investigation will have the excellent effect of stirring the Council first to a recognition of the simple fact that, if their management of other departments has been faulty, it is just possible it may be so in connection with the Electricity Department. If the Council can be brought to this frame of mind, they may the better see things from the point of view of their critics, whose accusations and arguments are supported by many thousands of pounds of deficiency on the electricity undertaking, by the heavy cost for public electric lighting, and by the annual robbing of the public purse for the purpose of converting further gas-lamps to electricity, without achieving the slightest good. Such persistent financial impropriety, such want of economy, and such waste of public funds, show to anyone of ordinary intelligence that there must be maladministration somewhere. Hastings does not stand alone in this matter of bad management; but even among municipal electricity undertakings, Hastings has obtained an unenviable notoriety.

The "Hastings Observer," which puts its back up to support the electricity policy of the Corporation, is applauding heartily all attempts at economy in other departments. It says, in effect, the policy that is right in connection with electricity is very wrong in connection with other departments. We cannot understand this attitude. Referring to a recent comment in these columns on Hastings electricity affairs, our contemporary cannot deny the facts stated; but, curiously, it finds the facts amusing reading. In the same issue is a comment on the report of the Special Committee on the Cemetery Department; and the document indicates that large economies can be effected in its working. Upon this our contemporary remarks: "It may be conceded that the Town Council cannot be accused of actual wrongdoing in the past in connection with this department, because its sanction to the excessive expenditure was given in ignorance. But now that the light of knowledge has been thrown on the matter, this is all altered; and the Council has no more right to continue to waste the ratepayers' money on what it knows is excessive expenditure

"than any of its members has to enter a ratepayer's house and purloin his goods." Apply this pregnant statement to the position in which the Electricity Department and the public lighting affairs are in to-day. It cannot be claimed that the Council are persisting in their present policy in ignorance. They have been warned time and again—not only in the public press, but by the Local Government Board, and by the financial results of their fatuous policy. They may therefore fairly be accused of persisting, in this respect, in a course of actual wrong-doing. To continue a policy in the Electricity Department that imposes burdens on the ratepayers is, to say the least, dishonourable; and to make conversions of public lamps by drawings from the public rates without going into the matter of efficiency, is a monstrous abuse of trust. There is the authority of the "Observer" for saying that "the Council has no more right to continue to waste the ratepayers' money on what it knows is excessive expenditure than any of its members has to enter the ratepayer's house and purloin his goods." The whole article in our contemporary is an impeachment of the administration of the Council, included in which is an insinuation (which, it may be confessed, we do not understand, and have no special knowledge upon) as to the bribing of voters "by keeping them or their friends in positions in which they are not wanted, but for which they are paid by money extracted from the ratepayers." It would seem that what is wrong in one department of municipal administration is considered right in another. Also that, while it is desired to effect economies in all other departments, it is perfectly legitimate to allow extravagance in one. We cannot understand thoughts and arguments that are revolutionary merely to serve a purpose while circumstances have similarity. What has been said here in reference to Hastings will, as readers are all too well aware, fit other towns; but Hastings offers an apposite illustration.

Prospects of Gas-Engine Improvement.

HAVE we reached a standard in the design of town gas engines beyond which any remarkable changes are improbable? An article appeared in the "Daily Telegraph" recently, by the "Engineering Correspondent" of that paper, in which he expresses the opinion that we have; but there is a safe refuge perhaps in the term "remarkable." In our opinion—regarding the question generally, and not placing too much emphasis on the qualifying word—the knowledge available is as yet a little too unsettled and limited to speak with any degree of positiveness as to finality in progress on the present lines. No one was satisfied with the efficiency of the gas-engine (say) a decade ago. But extraordinary strides were made at the beginning of this century; so much so that the British Association Committee on Gaseous Explosions were able last year to report that the advances in indicated thermal efficiency had brought us to the point of 36·8 per cent. With gratifying and substantial achievements so close in our rear, we are not inclined to such confidence as to commit ourselves to any dogmatic assertion as to the end of efficiency having been reached. It is preferable to regard the matter from the point of view of the British Association Committee. The facts that the Committee have taken in hand (purely in the cause of progress) a colossal work with the view of sifting out and co-ordinating knowledge on the subject of the internal combustion engine, and that, after all the work that has been done, there is confession on the part of the greatest authorities that there has been failure to obtain complete knowledge of the fundamental essentials to further progress in the working efficiency of internal combustion engines, are sufficient for withholding judgment at the present time on the point upon which the "Engineering Correspondent" makes a somewhat categorical pronouncement.

It is quite true that Mr. Dugald Clerk has warned (this was only last year) against any expectation as to a considerable increase in indicated thermal efficiency under the existing circumstances, and has intimated that the possibility of increase will depend mainly upon considerable alterations in the actual cycle used—any substantial additional development being unlikely on the old lines of increasing compression. In saying this, Mr. Clerk does not indicate finality, nor any personal opinion as to the impossibility of effecting departures that will produce even greater efficiencies than those at present obtained as the reward of persistent work on the part of the manufacturers and investigating specialists. The "Engineering Correspondent"

of our contemporary takes a somewhat loose general guide upon which to form his judgment as to marked improvement by making comparison of the different machines by the different manufacturers; and he finds that it requires something more than a casual glance to distinguish one make from another. We do not think this is an instance in which the criterion is a sufficient or safe one. There has been too much irregular movement in regard to the investigation of the problems and phenomena surrounding the gas-engine; and the makers have shown philosophic attributes in practising that eclecticism which has produced for their machines the best efficiencies under present conditions, and which has made their engines so alike that one has to take something more than a casual glance to distinguish one make from another. We do not say that the "Engineering Correspondent" is wrong in his contention; but there is a preference on our part for postponing judgment until a better base than that which at present exists is before us upon which to found it. If we read him aright, he looks to bigger advances being made in producer and other power-gas engines, and in crude or residue oil engines. Why there should, in this particular matter of prospective improvement, be any discrimination between town-gas and producer-gas engines (taking the engines by themselves, and not including the auxiliary producing plant), we fail to see.

Unsolicited Testimony from Above.

Testimony as to the efficiency of modern gas lighting for street purposes has come from many council chambers and other mundane quarters; but till last week there had never been, to the best of our knowledge, a testimonial—unsolicited or otherwise—from above. An unsolicited one has come; and our electrical friends will please note that there was no special preparation for the occasion that gave rise to it. Rather more than a week ago, one of the British Army airships made a night journey of some 70 miles—from Farnborough, encircling St. Paul's Cathedral, and then home again. On board were Colonel J. E. Capper (Captain), Lieut. Waterlow (at the helm), and Mr. T. Ridge, the Assistant Superintendent of the Army Balloon Factory (Engineer). The "Daily News," yesterday week, published an account of an interview with Mr. Ridge, in the course of which he said: "The lights of London were a great guide; and, after Fleet Street, Whitehall struck one as being a particularly well-lighted thoroughfare. The Houses of Parliament were another easy landmark to pick out; and we could see the dial of Big Ben as we passed not very far from it." Fleet Street, Whitehall, and the vicinity of the Houses of Parliament illustrate high-pressure gas lighting by various systems.

Further Shrinkage in the City Arc Lighting.

Where high-pressure gas-mains are carried, work for them quickly follows. The high-pressure mains from Fleet Street have been continued from Ludgate Circus to Blackfriars Bridge; and, in a day or two now, New Bridge Street will be illuminated with 1500-candle power high-pressure lamps of the type of those now in Fleet Street. One refuge lamp will be of rather lower illuminating power. In the case of Fleet Street, the lamps are suspended from brackets attached to the walls of the buildings; but in New Bridge Street, workmen have been busy the last few days erecting substantial columns, carrying swan necks, from which the lamps will be suspended. New Bridge Street has been ill-lighted for many years by old pattern electric arc lamps; and those who use this busy thoroughfare will be pleased with the pending change. In this position, too, the gas-lamps will have a better opportunity than in Fleet Street of displaying their powers, as here, unlike Fleet Street, there are no newspaper offices and shops vying with each other in making the most dazzling outside illumination, and offending by so doing the eyes of pedestrians and those in charge of vehicles.

Nottingham and its Gas Engineer.

Reference was made in our last issue to a proposal by the Nottingham Gas Committee to increase the remuneration of their Engineer (Mr. J. H. Brown) by £200 a year, thus bringing his salary up to £1200; and it was pointed out how thoroughly well deserved this recognition was. As will be seen from the "Miscellaneous News" columns to-day, when the recommendation

should have come before the Council, the Mayor (who is also Chairman of the Gas Committee) announced that it would be deferred until after the presentation of a report which a Special Committee of the Council are to prepare with reference to the questions of "one day's rest in seven" and "a minimum wage of sixpence per hour" for the Corporation employees. But it was made quite clear that the matter has only been deferred, and that the recommendation will be brought forward when the time fixed upon arrives. In fact, the Mayor told the Council plainly that if it was desired to have the gas undertaking managed efficiently they would have to act as other large concerns of a similar character did, and give fair remuneration. Here the matter of the material reward rests for the present; but Mr. Brown must meanwhile feel keen satisfaction, which we share with him, at the cordial acknowledgments of his services that were made by members of the Council when the report on the past year's results from the gas-works came up for consideration. In the first place, the Mayor said he thought it would be agreed that the undertaking was now being managed in the best and most economical manner possible; and Alderman Sir Edward Fraser followed with the remark that from 1902 down to the present time there had been a steady improvement in the returns. The gross profit, he pointed out, had risen from £75,000 to £110,000 over this series of years, which was most creditable to the Gas Engineer and those under his control. The improvement had not been sudden or spasmodic; and the returns showed very conclusively to his mind that "the agitation which was got up some years ago was not in the interests of the undertaking, but for extraneous purposes." Dr. Milner, too, while speaking in terms of praise of the "gas inquiry," was nevertheless constrained to admit that the improvement in the working had been gradual since Mr. Brown's appointment.

A Claim for Compensation.

Once more the House of Lords has been called upon to give a decision on a dispute arising out of the workmen's compensation enactments; and in this instance it was the provisions of the 1897 Act—the one, of course, under which most of the litigation has arisen—which had to be dealt with, inasmuch as the accident occurred some three months before the 1906 Act came into operation. The facts were simple. The complainant while at work met with a mishap which practically destroyed the sight of one eye; and he was awarded by the County Court Judge 15s. a week compensation. On appeal, however, it was decided that the claim was insufficient, because the amount claimed was not specified; and the Court of Appeal therefore found in favour of the respondents. This decision has now been reversed by a unanimous judgment of the House of Lords, who have come to the conclusion that there is nothing in the Act of Parliament, and nothing in the authorities, constraining them to arrive at a decision which, if arrived at, would deprive the appellant of the remedy to which otherwise he was undoubtedly entitled; and thus the workman is saved from what would, it seems, have been somewhat of a hardship. It was pointed out by the Lord Chancellor in his judgment that the Act says "the claim for compensation" must be made within six months of the accident; and he could not see why the Court of Appeal should hold that, unless the amount claimed had been specified, there had been no "claim for compensation." The argument for the respondents was that, unless a sum was named, the employer was deprived of an opportunity of settling the claim and so avoiding proceedings under the Act; but surely, said the Lord Chancellor, if he wanted to know he could ask the question, or he could make an offer himself. Lord Mersey also pointed out that the Act contained no words which required the workman to mention a sum of money. It was, he said, a strong thing to read into an Act of Parliament words which were not there; and it should not be done unless there was absolute necessity for it—which was not the case here. Though the action was under the 1897 Act, it may still be worth while to draw attention to it, as it appears that in previous cases under the same Act it had been decided—but not by the House of Lords—that a claim for compensation, to be good, must mention the sum claimed.

Suffocating Fumes from—Where?

London streets and railway stations were placarded on Friday by the halfpenny evening sensationals with a statement that members of seven families in Long Acre had been rendered

unconscious and nearly suffocated by gas. People jumped to the conclusion that it was coal gas; and for several hours the gas supply was under the odium of having been responsible for a discreditable piece of business. Representatives of the Distribution Department of the Gaslight and Coke Company responded with alacrity to a call to the scene; and they had not much trouble in fully satisfying themselves that the cause of the occurrence was not escaping gas, and that their system thereabouts was quite blameless. Representatives of the Charing Cross (West End and City) Electricity Supply Company were also promptly on the scene; but there is not a tittle of evidence available as to their assurance of the innocence of their system of participation in the affair. The fumes (according to one paper) were "suggestive of copper and rubber;" and the "fumes" could be seen as well as smelled and tasted, for they rose in a "thick volume, like smoke." This looks as though it would not be wrong to fix the responsibility on to electrical fusion and the burning of bitumen insulation. And not an inconsiderable length of electric cable has been relaid since the occurrence! Gas may turn aside, and allow the stigma to rest in another quarter.

The Resignation of Mr. Herring.

Writing on Saturday, our Scotch Correspondent said: The intelligence of the impending resignation of Mr. Herring from the position of Engineer to the Edinburgh and Leith Gas Commissioners, given in the "JOURNAL" last week, was not known to the public in Scotland till Wednesday afternoon, when an evening newspaper came out with the story. There were general expressions of surprise that Mr. Herring should relinquish a certain income and a comparatively easy life, to again enter the vortex of professional competition. Only those in a position to know were aware that when Mr. Herring was last granted an advance of salary, he undertook to give his services to the Commissioners for five years; and that the five years expire in November. There can be no one more conscious than Mr. Herring of the fact that, the special work of his Edinburgh stay being now virtually completed, there is positively no prospect of further advance in the way of remuneration. A longer stay in Edinburgh would have meant remaining a disappointed man, to the extent that betterment was impossible, and that all the time connections which would have been available had he been resident in London were passing into the hands of others. On various grounds, then, there is appropriateness in Mr. Herring returning South at this juncture. That he will be missed from the councils of the gas managers of Scotland, will be admitted by everyone. That he will be missed by municipalities and gas companies, is equally true; for he has been a tower of strength in engineering matters. There is reason to believe that, apart from his great work at Granton, his experience in Scotland will have been beneficial to Mr. Herring, in the sense that it has widened his knowledge of men and matters. The Granton Gas-Works will be his monument in Scotland. By their success will his reputation be judged. In their hey-day there is, and can only be, but one judgment—that the works have been a gigantic success. Among Press men, I can testify, Mr. Herring has been a great favourite, on account of his willingness at all times to meet them and to supply them with whatever information they desired, as well as on account of the form of his communications, which were so professionally perfect that they were capable of reproduction almost as received—requiring no labour in the matter of sub-editing. A special meeting of the Gas Commissioners has been called to consider Mr. Herring's resignation.

Personal.

Mr. W. M. DOWNIE has resigned the position of Gas Engineer and Manager of the Omagh District Council, who, as will be seen from our advertisement columns, are inviting applications for the appointment.

Mr. JAMES PATERSON, the Engineer and General Manager of the Redhill Gas Company, was on Friday last the recipient of a silver-mounted inkstand of handsome design, which was presented by the Secretary (Mr. Horace Long), on behalf of the officials and workmen at the gas-works, with many appreciative remarks and farewell wishes, on his leaving for Cheltenham.

We learn from a Dundee paper that Mr. A. Yuill, the Corporation Gas Engineer, has appointed Mr. J. MITCHELL, Assistant Gas Engineer at Ardrossan, as his Assistant, in succession to Mr. A. M. Fyfe, who, as already announced, has obtained the position of Engineer and Manager of the Nelson Corporation Gas-Works. Mr. Mitchell's father was at one time Manager of the Edinburgh Gas-Works.

The cosmopolitan character of the population of New York City is illustrated in a remarkable way in "Gas Logic" for the past month, on the opening pages of which are reproductions of advertisements in six out of the fourteen foreign languages in which the Consolidated Gas Company endeavour to show to the newspaper readers of various nationalities that New York's gas service is the best in the world.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 710.)

BUSINESS last week on the Stock Exchange was on a restricted scale and devoid of animation. The tone wavered irregularly from time to time; but some leading markets showed strong spots. It was account week, but the settlement was not remarkably heavy nor threatening to develop difficulties. The opening was dull and heavy under the influence of the tone at the close on the previous Saturday, and nothing made any headway. Gilt-edged were all poorer, although Consols closed firm. Railways declined, the Foreign Market was uneasy, Americans were shaky, and the fancy speculations did not attract much. There was more strength, but not more activity, on Tuesday. Consols gained $\frac{1}{2}$; and Americans recovered sharply and then fell down again. Business was still at low pressure on Wednesday; but the tone in the leading departments was fairly good. Consols rose $\frac{1}{2}$, and Railways hardened. On Thursday, Consols gained another $\frac{1}{8}$, Railways were firm, and Americans less distressed. The settlement was completed on Friday. Consols were scarcely so firm. But other gilt-edged issues were strong, and Rails were steady. The speculatives were in better demand, and Americans had a pause. Saturday was duller. Consols fell $\frac{1}{8}$. Rails were irregular, and Americans gave way again. Rubber and Oil were popular. In the Money Market, there was a good demand, but no tightness. Discount rates were lower. On Thursday, the Bank of England rate was further lowered to 3 per cent. Business in the Gas Market showed a considerable falling off in point of volume; the week's transactions representing a paucity unequalled for some time past. Changes were few and very slight; and, but for some shrinkage in one or two Provincial issues, they tended upward. The activity in Primitivas was again a feature. In Gaslight and Coke, the ordinary was very moderately dealt in at prices ranging from 103 $\frac{1}{2}$ to 104 $\frac{1}{2}$. The secured issues were quite quiet; the figures for the maximum being 89 $\frac{3}{8}$ and 89 $\frac{3}{4}$, for the preference 105 to 105 $\frac{3}{4}$, and for the debenture 82 $\frac{1}{2}$. A few dealings were marked in South Metropolitan, ranging from 121 to 122; and the debenture changed hands once at 81 $\frac{1}{2}$. In Commercial, there were transactions in the 4 per cent. at 107 and 107 $\frac{3}{4}$ (a rise of 1), and in the 3 $\frac{1}{2}$ per cent. at 103 $\frac{1}{2}$ and 104 $\frac{1}{2}$. Among the Suburban and Provincial group, British was marked at 44 $\frac{1}{2}$ and 44 $\frac{1}{4}$, South Suburban at 122, Tottenham "B" at 114 $\frac{3}{4}$, ditto debenture at 100, and Wandsworth "B" at 140 and 140 $\frac{1}{2}$. On the Local Exchanges, Liverpool "A" was done at 220 (a fall of 3), and Newcastle at 103—a fall of 2. In the Continental companies, Imperial had only two bargains; the figures being 178 $\frac{1}{2}$ and 179. Union marked 96 and 97 *ex div.*, and ditto preference 138 $\frac{1}{2}$ and 139 *cum div.*, and 135 and 135 $\frac{1}{2}$ *ex div.* Among the undertakings of the remoter world, Bombay realized 6 $\frac{3}{8}$, Monte Video 12 $\frac{5}{8}$ and 12 $\frac{3}{4}$, Primitiva from 7 $\frac{1}{4}$ to 7 $\frac{7}{8}$, ditto preference from 5 $\frac{1}{4}$ to 5 $\frac{7}{8}$, ditto debenture 98, and San Paulo 15 $\frac{5}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Jandus Evasion and Refusal—Candle Power Readings—Electricity Failures and Newspaper Production—New Literature for Householders.

WE are grievously disappointed in Mr. A. Denman Jones, the Manager of the Jandus Arc Lamp Company, Limited. From an interview and letters published in the electrical press, we had been led to regard him as a courageous individual, who would be prepared to back his generalizations (when asked) by solid facts. We sought of him, in the "Memoranda" for May 24, solid facts; and he answers by a little vapour—not courteously and boldly in our columns, but in the columns of the "Electrician." It will be remembered that he told electricians through our contemporaries that the regenerative arc lamps in which he is interested have secured "several victories over the latest forms of gas." We naturally expected that the "latest forms" referred to the new high-pressure gas-lamps, giving, at a pressure of (say) 54 inches, 60 candles per cubic foot of gas consumed, with gas of about the ordinary southern qualities. But in his letter he does not quote a single instance of a victory by the Jandus lamp over the "latest forms" of high-pressure gas-lamp. He merely refers to the changes of ordinary street gas-lamps to electric lighting in municipal-electricity-controlled Hampstead, Harrogate, and Yarmouth. This is weak indeed. He says nothing about Westminster, Bethnal Green, or Hackney. It seems now that Mr. Jones is only anticipating "victories" over the "latest forms" of high-pressure gas lighting, as he now "regrets that it is not our practice to publish beforehand where the regenerative lamps will be installed." Why not, if the victories have been won? But we are promised opportunities soon of seeing localities lit by the regenerative arcs that have displaced high-pressure gas. It is to be hoped, for the sake of Mr. Jones's veracity, that the displaced high-pressure gas-lamps will prove to be of the "latest forms," as between the old high-pressure gas-lamps and the new the difference in efficiency is such as not to be despised even by electricians in the commercial competition of the times. Mr. Jones also stated that he would be pleased to supply electrical engineers with tabulated information as to the relative costs of gas and electric lighting, taken from authoritative sources. Being taken

from authoritative sources, it was thought that Mr. Jones would have no hesitation in supplying the figures to us. But, alas! his courage breaks down again here; and though we thought that it might be possible to tickle him into compliance by unctuous terms, there has been failure. The "Electrician" speaks of Mr. Jones's letter as "a reply to our criticism." What a strange misuse of the term "reply"!

Mr. Jones quotes, presumably to show the unreliability of our attributed efficiency of 60-candle power per cubic foot of gas consumed per hour of the newest form of Keith lamps, Mr. Herring's figures "of the Scottish National Exhibition" (we know what Mr. Jones means, but there is a looseness about the statement), which, he asserts, are usually quoted by gas people. They are not, and for a very simple reason which Mr. Jones fails to appreciate. He states that Mr. Herring's highest reading gives an efficiency of 73·6-candle power per cubic foot; the measurement being taken at an angle of 20° below the horizontal. The gas that was being used at Edinburgh in testing the lamp had an illuminating power about 25 per cent. greater than the gas in London; and the calorific power of the gas is also higher. The illuminating efficiency of an incandescent gas-burner does not increase *pari passu* with the illuminating power of the gas *per se*. Then he states that Professor J. T. Morris has found an efficiency of only 48 mean hemispherical candle power at the makers' works, which fell to 31·6 and 27·5 candles when tested on East London gas. These tests were made two years ago (June, 1908), when the lamp was new; and before there had been the experience that has produced improvements in the lamp. The experiments of Professor Morris giving the lower results were made prior to his tests at the works of the makers; and here he obtained a maximum candle power per cubic foot per hour of 52·5 candles. But he was only consuming 23·8 cubic feet of gas per hour, against the rated consumption of 25 cubic feet. The 1250 candles would have been more than 1300 candles at the 25 cubic feet consumption rate. Professor Morris does not satisfactorily explain the causes of the considerable difference in the maximum candle powers obtained in the two districts. He seems to attribute it not to the lamp, but to the difference (which he does not quote) in the calorific power of the gas in the two districts. The difference (according to the official returns) in calorific power is not a sufficient explanation—even in the case of the lamp as made in 1908.

In the discussion on photometry at the meeting of the Illuminating Engineering Society last March, Professor Morris had some good words to say for the Keith high-pressure inverted gas-lamp. He said that "his experience with these lamps was that the intensity of the beam was considerably steadier than that of the electric arc lamp, so far as rapid changes were concerned."

Regarding flame carbon lamps, they were not capable of giving such constancy of results, as could be seen by the way the observations were peppered about on the diagram." On the same occasion, Professor Sumpner said "it was a difficult matter to get the actual mean spherical candle power in the case of an arc lamp." Therefore what an amount of unreliability there must be in the published information (as the "Electrician" was recently pointing out) regarding the illuminating values of electric lamps of the different types! Then Mr. Jones says Mr. Bradley in his report "to the City of Westminster," gives figures varying from 38·4 to 23·6; the candle power being taken at 20° to 50° below the horizontal. Now is this fair of Mr. Jones to quote these figures in conjunction with those for the Keith high-pressure inverted lamp? The last report that we received from Mr. Bradley does not contain a single test of this form of lamp; and we know, at the time the report in our possession was issued, Mr. Bradley had not tested the lamps in Fleet Street. We should like to point out that, if our statement is correct [it is open to verification by Mr. Jones], the 38·4 refers to an upright burner with the gas supplied at (say) 8 to 10 inches pressure, and not at upwards of 50. With this 38·4-candle power before him for an upright burner and a comparatively few inches pressure, what becomes of Professor Morris's figures for an inverted burner and a pressure five times higher? Perhaps Mr. Jones will endeavour to escape from the *impasse* he has created for himself, by pointing out that Professor Morris's figures cited by him represent the mean hemispherical power, while the others represent something else. But that will not be a sufficient explanation in this instance. As a passing shot on this question, Mr. Jones asks, "Do the 60 candles usually run down to 30 in actual practice?" What a silly question for the Manager of a regenerative arc lamp company who claim several victories over the "latest form" of high-pressure gas-lamp. If those are not chimerical victories, the answer should, of course, be in the affirmative. But if he has been boasting without sufficient cause, then we should advise him to wait, and see the terrible way in which the 5s. fines per lamp per night will total up in Westminster. Those fines will be booked for something much less than the 50 per cent. drop in illuminating power referred to in Mr. Jones's question. Meanwhile a few trial lamps, of different candle powers in Aldwych, may interest our friend.

The electrical world do not look complacently on the heavy fines to be imposed in the case of Westminster for deficiencies in the illuminating power of the street-lamps. It is feared the plan of fines will not stop at Westminster; but that there will be many local authorities following suit. The electrical people have visions of a terrible account being set against them in respect of their wholesale extinctions when the supply of current collapses. Lamps in large areas are suddenly extinguished; and only 100 lamps at 5s. a time would represent £25. Mr. Bradley has had

something to say about what he has learnt regarding the illuminating power of electric arc lamps through his peripatetic testing. Talking of electrical failures, there is sympathy with the plaint of the Editor of the "Worthing Gazette" over the disappointment, loss, and worry he has sustained through putting his trust in electric driving for his printing machinery. He is to-day a sadder and a wiser man than when he gave place to the electric motor. And while the "Electrical Review" has been advocating in special articles the adoption of electricity in printing-works, the Editor of the "Worthing Gazette," after suffering four failures of electrical energy, when his paper has been on the machine, says "if we were asked for our advice in such a matter, we could not conscientiously advise anyone to adopt electricity as a motive power—indeed, our advice to all so situated would be to have recourse to gas." The Editor has found that the eccentricities of electricity supplied from a central station mean to him as a customer loss of time, money, and prestige; and he ventilates his feelings in a full column of his paper. He is not the only one who has repeatedly suffered in Worthing. At such places of public resort as the theatre and the Winter Gardens, inconvenience and loss have been occasioned by these failures; and there have been bitter things said as the result. But there is no solatium to be obtained from the Corporation for wounded feelings, pecuniary loss, and inconvenience. The Corporation, knowing the vagaries of electricity supply from a central station, have a clause in their contracts absolving them from all responsibility for damage, loss, inconvenience, or moral and intellectual damages, arising from any interruption or discontinuance of the supply. If they had not, there is the Loughborough case behind which they can obtain cover. That was a case in which works had to be closed, and the operatives thrown out of employment through the failure of electrical energy. But there was no redress. Such failures are especially annoying in ordinary newspaper offices, where late production may seriously affect circulation, bring the advertisers humming round the harassed proprietors' heads, and cause people to wonder what the proprietors are about in dropping into such erratic ways. While, too, the electricity suppliers are free from anxiety on the score of damage, the printer may not get off scot free for any time-infraction of his contract. It's a one-sided world.

Dropping the editorial "we" for the nonce, the writer has received, at the place where he endeavours to take an interest in affairs apart from gas and electricity, a little circular with four folds from the local electricity suppliers. The circular is one of the products of the Electricity Publicity Committee, to which reference was made in the "Memoranda" on the 31st ult. On the front of the circular is the lady ironing a garment on a pretty and highly polished table without the protection of an ironing cloth, and with her head in dangerous proximity to a pair of electric incandescent lamps. Above the picture are the words (which do not coincide with our notions of the truth) "Electricity for all domestic purposes." On the first inside page, the writer is requested to send a postcard, on receipt of which a representative will call, and advise how to obtain the best light at the lowest cost. That is a rash promise, as the representative has no alternative but to advise the use of inverted gas-burners. On the next page, the reader is told that electricity can be used for warming the rooms by electric radiators, and that "a genial warmth is immediately obtained by merely turning a switch." There is an omission in not stating the number of radiators required for obtaining an immediate genial warmth. On the next page is the statement that electric cooking apparatus is obtainable in every variety at a reasonable cost. All householders are not so opulent that they will regard the prices as "reasonable." Then on the succeeding page the intimation is given that electric lighting requires some auxiliary aid to keep the house in a sanitary condition. The reader is informed that: "Wherever electric light is installed, the air in the rooms can be kept fresh and pure by means of electric ventilating fans"—in fact, they are "indispensable for keeping the house healthy." Is the appearance in the circular of this truth as to the indispensability of ventilating-fans in electric lighted houses an accident? It surely must be.

At St. John's Church, Roundhay, Leeds, last Wednesday, the wedding was celebrated of Miss J. E. Ethel Pickering, only daughter of Mr. J. R. Pickering, of "Crestmead," Roundhay, and Mr. D. Alborn Clapham, eldest son of Mr. and Mrs. W. S. Clapham, of "Rookcliffe," Keighley. The father of the bride is one of the Directors of Messrs. Clayton, Son, and Co., Limited, of Hunslet; the bridegroom's father being a member of the Board of Messrs. Clapham Bros., Limited, of Keighley. Following the wedding, a reception was held at the Mansion, Roundhay Park; and later Mr. and Mrs. Clapham left for North Wales.

It may be remembered that at the recent meeting of the Association of Water Engineers in York, the members received a cordial welcome from the Right Honourable the Lord Mayor (Alderman James Birch, J.P.). They will doubtless be pleased to learn that, having recently had conferred on him the freedom and livery of the Plumbers Company, he was last Tuesday formally admitted also as a freeman of the City of London. Sir Joseph Dimsdale, the Chamberlain, in enrolling him, said it was without parallel that a Lord Mayor of York should have been invested as a citizen of London during his year of office. The Lord Mayor of York, in acknowledging the compliment, said York was proud thus to be further linked with the City of London and its historic guilds.

THE INSTITUTION OF GAS ENGINEERS.

ANNUAL MEETING, JUNE 14 to 16, 1910.

PRESIDENTIAL ADDRESS

OF

MR. JAMES W. HELPS, M.Inst.C.E., of Croydon.

The first place in our thoughts to-day, in opening our annual meeting, is naturally given to the shadow which still lies heavy on our hearts, through the national, and may I say personal, loss occasioned by the death of our late beloved King. Surely no more spontaneous tribute has ever been paid to the memory of any monarch than the universal acceptance of the title of "Peacemaker" as the most fitting description of one who, to the full extent of his powers, worked earnestly and ceaselessly in the cause of peace and goodwill between man and man, and between nation and nation. Nor has this tribute been confined to words alone; for of him, indeed, it may be truly said "His works do follow him." Who can deny the existence, at the present moment, of an almost universal tendency towards the possibilities of agreement alike in the fields of industry and in the wider paths of political strife and national relationship? Surely in no more fitting way can the memory of the great dead be perpetuated.

As gas engineers, too, our thoughts this morning are with the family of one who bore an honoured name in our profession, and whose face will be seen no more among us. The death of Alfred Colson has robbed our industry of one whose presence could ill be spared, and has added another name to the memorial tablet of those stalwarts of the profession who one by one have lately passed away. Of conspicuous ability, unostentatious and retiring in disposition, he exercised a great personal and professional influence in all directions, and was ever-ready to extend a helpful hand to any colleague in need of friendly advice or assistance. The work which Mr. Colson did in furthering the interests of our industry, and in solving problems of interest to his professional brethren, are too well known to need description, while the important share he took in the working of our organizations, of one of which—namely, the old Institution of Gas Engineers—he was President in 1894, is doubtless fresh in the memories of all. Need I say that the sincere sympathy of all present, and of everyone connected with our industry throughout the civilized world, is extended to the bereaved relatives of him whom we mourn.

I have for some time past been wondering how, with the memories of so many excellent presidential addresses constantly before me, I could hope to bring before the Institution anything worthy of the high position in which you have placed me. Wherever I turned, I found that matters dealing with the engineering side of our profession were being discussed, not only in the frequent addresses of Presidents in all parts of the country, but in papers read before technical societies, and in articles contributed to the Technical Press. These matters, too, were treated in such a complete and thorough manner that to say anything new about them seemed to me to present an almost hopeless task—more especially as it had not been my lot of late years to have been engaged on experimental work in those directions which have more particularly engaged the attention of our profession.

Take, for instance, carbonization—a subject which during the past few years has been approached from every possible standpoint, and which, in the language of our esteemed Past-President, is yet in the "melting pot." To attempt to deal usefully with this branch of our business could only result in a mere recapitulation of what has so far been done, with a possible summing up, in my own words, of the comparative merits of the many methods which have lately been introduced, and more or less put into practical use. Such a course could not have added anything useful to the store of information available to any one who will take the trouble to study all that has already been dealt with in the Technical Press by those far better qualified to discuss the subject than is the author of this address. The same can be said with regard to many other matters closely connected with the technical side of our profession.

Having so far realized and appreciated my position, I

decided that, although by your courtesy I am the elected President of an engineering society, I would take the bold step of, with but one exception, practically ignoring engineering subjects and of confining myself to the consideration of certain points connected with our industry, upon the true appreciation of which depends, in my opinion, the extent to which there are to be engineering matters to interest our profession in the future.

CHANGED CONDITIONS.

Everybody must, I think, realize that the conditions under which the gas industry of to-day exists differ vastly from those which surrounded it even fifteen or twenty years ago, and that the question as to how we shall dispose of a thousand cubic feet of gas at a reasonable profit is now even more important than the consideration of the most economical way in which that quantity of gas can be produced. It is a truism that, unless a gas company can find a profitable market for the commodities it produces, it will avail it little to study improved methods of manufacture and production. That the difficulty of finding a profitable market presents an ever-increasing problem, it is useless to deny, more especially when the lighting market is considered.

Let me for one moment compare the conditions which existed in my own Company (say) in 1889 with those of the past year.

| | 1889. | 1909. |
|---|--------|--------|
| Number of ordinary consumers | 6,270 | 17,923 |
| „ prepayment consumers | 21 | 17,721 |
| Total | 6,291 | 35,644 |
| Average consumption | 59'107 | 34'891 |
| Cost of distribution, after deducting rents | 0'77d. | 3'18d. |

These figures are very striking, and would not be only striking, but somewhat alarming, if another side of the picture were not available.

| | 1889. | 1909. |
|---|-------|--------|
| Gas-cookers on hire | 557 | 18,884 |
| Percentage of cookers to meters | 8'8 | 53'0 |
| Gas-fires on hire | 200 | 5437 |

The figures relating to gas-fires are a little misleading, as they take no account of the very large number of fires in use which have been purchased outright or on the hire-purchase system.

The increase in the number of gas-engines, hot-water circulators, gas-coppers, &c., which have been supplied of late years is also very satisfactory.

The fact that our average consumption per consumer has not decreased to a greater extent than the figures I have quoted show, is due to the enormous efforts that have been made in pushing our business by the establishment of show-rooms, the appointment of canvassers and cookery demonstrators, and the introduction of specially qualified fitters for dealing with our maintenance systems and the wants of our customers generally.

Companies recognize that their greatest, if not their only, chance of profitable existence is to teach the consumer to adopt such methods of using the gas supplied to him as will enable him to obtain required results as economically as possible, and at the same time to prove to him that there is no other agency by which he is able to obtain such results as efficiently and as cheaply. It is certain, nevertheless, that these methods cannot be successful unless the old-fashioned ideas of *laissez-aller* "go by the board," and a drastic change made in the whole organization of our concerns, especially in the distributing department.

What are the two consequences of the change referred to? First, a great increase in the expense of dealing with our customers; and, secondly, a rapid rise in the number of men employed in the outside department, with a consequent increase in its relative importance.

The following table—giving the increase which has taken place in the number of men employed in producing the gas

and in dealing with it after it leaves the works—is sufficient proof of the changes which have been brought about in connection with the Company which I have the honour of serving.

| | 1889. | 1909. | Increase. Per Cent. |
|--|-------------|---------------|------------------------|
| Average weekly number of men in manufacturing department . . . | 112 | 189 | 68·75 |
| Average weekly number of men in distribution department . . . | 33 | 241 | 630·30 |
| | Cub. Ft. | Cub. Ft. | |
| Gas sold | 386,541,000 | 1,257,204,000 | 225·24 |

It is also a significant fact that, whereas the average weekly number of men employed in both departments in the winter months of 1899 was 180, as against 121 in the summer, an increase of 49 per cent., yet in 1909, 431 men were employed in the winter, compared with the slightly larger number of 434 in the summer.

RELATIONS WITH LOCAL TRADESMEN.

It is no good disguising the fact that gas companies have now, more than ever, become shopkeepers, and that work which was in the old days principally confined to ironmongers has, to a very large extent, drifted into the show-rooms and workshops of gas companies. Is it wonderful that ironmongers should, as a rule, even now have failed to appreciate the significance of the change which has taken place, when it must be acknowledged gas companies themselves have but lately learnt the lesson? Gas-fitting is only one, and often not a very large, part of an ironmonger's business; and though it is true that some have appreciated the changed conditions to the extent of seeing that at any rate a certain number of their employees are trained in the proper handling of modern devices, still I think they have themselves really come to the conclusion that, without entirely altering their methods, they cannot hope to keep abreast of the constant changes which are being made in gas apparatus and in improvements of lighting and other devices.

I feel, however, that the terms upon which gas companies undertake work for consumers and supply them with apparatus and materials might well, with no loss to themselves, be such as will allow any ironmonger or local tradesman who is wise enough to qualify his staff for this particular class of business, to compete with a reasonable chance of profit. I am afraid, however, that an exception from this principle must be made with regard to the maintenance of incandescent burners, and that gas companies must, in order to secure satisfaction to their consumers, do this work on terms in themselves unremunerative even to the extent of giving labour free, and charging only at a reasonable profit for all material used.

I will not labour this point, but will content myself by saying that, while I appreciate the importance of reducing the selling price of gas as much as possible, I think the anxiety to do this can be carried too far. I feel sure it would be easy to prove that in some cases a penny taken off the price would really have been better employed, in the interests of both the consumer and the company, if it had been applied to giving the customer better attention to his wants and requirements.

IMPORTANCE OF THE DISTRIBUTION DEPARTMENT.

Assuming that gas companies have realized the importance of the work that falls upon the distribution department, are they taking such steps as will ensure that those entrusted with the work of the department are properly qualified for administering it? It is true, no doubt, that in gas-works up to a certain size the engineer or manager has sole charge of, and actually attends to the details of, the outside department, and that even in larger works such work is carried out (as it should be) under his personal supervision. I think, however, that the importance of making, as far as practicable, a separate department of distribution, and of placing at its head a man qualified not only by his technical knowledge, but by his general education and manners, to deal with consumers and possible consumers, must soon be recognized. And what is necessary with the head of the department is necessary, though possibly in a lesser degree, in the inspectors, fitters, maintenance men, and others working under his direction.

TRAINING OF FITTERS, ETC.

I have spoken before now, and others have done the same, on the importance of technical and scientific training; but I

fear that as a rule all of us have had in our minds chiefly the training of those who are employed, or are looking forward to being employed, in the higher branches of the strictly engineering department. What is becoming every day more and more evident, however, is that if gas companies are to continue their successful career, very special and very decided steps must be taken towards scientifically and practically educating, to the extent necessary, all those engaged in dealing with the distribution and use of gas. Distributing engineers are the product of the last fifteen or twenty years; they did not really exist before, because there was no actual necessity for them. The necessity has now arisen; and they are gradually, but surely, forthcoming. At the present day the importance of their position is assured, and it is to them that gas companies look for discovering, in consultation with their chiefs, the best means of dealing with their gas, as economically and as efficiently as possible, so that its uses may increase, and its consumption grow to such an extent as to keep engineers and managers busily engaged in devising improved methods of manufacture and purification, and of handling residual products.

I am afraid that, so far, many companies have been content with that description of training for fitters, maintenance men, &c., which consists in securing the services of certain reliable and competent men, who, in course of time, impart to their assistants such knowledge and skill as enable them, as business increases, to qualify for more important positions, and, in turn, to take their part in the education of their own assistants and mates. Now while I have nothing to say against such a system (which is perhaps a most natural one), I do suggest that it is the duty of every company in these days to provide a training ground in which beginners can obtain direct instruction in their special business, and in the principles which underlie it, and to see to it that this training ground shall not consist alone of the houses and premises of our consumers. I am of opinion that, although so much attention has been paid to the wants of the consumer of late years, yet much of its good effect has been nullified through the practice of occasionally sending improperly qualified attendants to deal with such wants. It has been, I am glad to say, the custom of some companies to offer facilities to their employees to attend suitable classes at the Technical Institutes in their towns, and to make arrangements for the holding of such classes. But even this is not sufficient unless it is so correlated to their daily work as to make it part of a carefully arranged and properly supervised scheme.

QUALIFICATION OF GOOD FITTERS, &c.

In order to become a satisfactory fitter, much more is required than the knowledge of how to properly pipe a house, and to fix the brackets, burners, stoves, &c. The fitter must know something of the theories which govern the successful and economical heating of water for household purposes, and must recognize the fact that a deviation from proper and correct methods—be it ever so slight an extent—makes all the difference between economy and waste, and consequently between use or disuse on the part of the customer. He must be familiar with the principles of combustion, and be able to apply his knowledge to the discovery of faults and failings in the behaviour of atmospheric burners for lighting, heating, and cooking, to remedy them when they occur, and, better still, to so arrange and fix such burners and stoves that faults and failings shall not be forthcoming. But a knowledge of these and other principles is not alone sufficient. The fitter must have opportunities given him for examining and studying the construction and working of every kind of stove and every description of burner and other piece of apparatus which his superior officers deem worthy of recommendation for use among the public, before he is called upon to deal with such apparatus in his district.

TRAINING SCHOOLS.

I lately had an opportunity of visiting the shops of instruction which have of recent years been opened by the Gas-light and Coke Company, and which have been so well described in the May number of "System and Modern Business." Into these, boys of a certain age are taken and given specified instruction in the use of tools and in the practical side of the gas-fitting trade, while at the same time they attend special classes in approved technical subjects held at a neighbouring Technical Institute. I recognize that such a complete system is possible only in the case of very large gas companies; but much can be done in the same direction by holding classes of instruction on the companies' premises, and by giving demonstrations as to the construction and use

of the latest forms of apparatus coupled with periodical lectures by practical experts on such subjects as water heating and circulation, atmospheric burners, &c.

A good incandescent burner, or a good fire, in satisfactory condition, will form the best possible advertisement for gas; a bad burner, or a bad fire, or even good ones not in working order, are directly the opposite. To secure the former condition, and to avoid the latter, it is absolutely necessary that those entrusted with the carrying out of our maintenance systems should not be allowed to gain their experience at the expense of the consumers, but should receive proper instruction in the most approved methods before being actually employed in attending to their wants.

In this connection, I should like to draw attention to the praiseworthy work which the members of the Manchester District Institution are doing in the direction of improving the education and practical training of the plumbers and fitters in the towns they represent, and to acknowledge the spirit of loyalty to the parent body in which they are approaching the matter.

I have always felt that the affiliation of District Associations to the main body (now happily accomplished) would enlarge the scope of usefulness of such Associations, and materially assist the work of our Institution. That such a belief is well founded is proved by the increased activity of the various Associations in many directions, and in none more distinctly than in the particular work now under the consideration of the above Association.

QUALITY OF GAS REQUIRED BY CONSUMERS.

It will be remembered that, at the outset of my remarks, I stated my intention to leave engineering matters severely alone. I made the reservation, however, that it was to be with one exception; and this exception deals with a matter so closely allied to the interests of the consumer that I do not think it is in any way inconsistent with the task I set myself.

Before we can reasonably hand over the work of supply to our distribution staff, we must have taken every care that the article with which we ask them to deal must be in every way suited to the requirements of the consumer. The two principal conditions which it appears to me have to be observed are: First, that the gas should be of such a quality as will enable the consumer to obtain the very best results at the lowest possible rate, and that both its quality and composition, and the pressure at which it is supplied, should be kept as constant as practicable; second, that it shall be of a character such that it can be used without causing that deposition of solid hydrocarbon which in former years produced, and occasionally at the present time produces, so much inconvenience to the users, and trouble and expense to the suppliers, under the name of "short supplies" and stopped service-pipes.

Now with regard to the first condition, I do not think that there is any one connected with our industry who will deny that the gas which is required at the present day is one which possesses a reasonable and constant calorific power, quite independent of what its illuminating power may be; and the duty of every engineer, therefore, is to adopt such methods in the process of manufacture at his works as will enable him to place at the disposal of consumers a gas which is calculated to give the very best results under the changed conditions of modern-day requirements, and which can be supplied to the users at the very lowest possible price. There is no doubt whatever that Parliament has recognized this position, and has, I think, appreciated the fact that companies fully recognize that it is to their own interests to avoid taking advantage, for their sole benefit, of the relief that has of late years been afforded them in the matter of illuminating power standards, and that it would be a suicidal policy on their part to attempt to supply an article which would prove unsatisfactory to the customers, or would force them to use such an increased quantity of it as would give them an opportunity of making unfavourable comparisons with the cost of obtaining like results by other means.

ILLUMINATING POWER *v.* CALORIFIC POWER.

When I speak of the relief granted of late years in the matter of illuminating power, I allude, of course, not only to the granting of reduced statutory standards, but also to the legalizing of the No. 2 burner, which, while removing an injustice under which gas companies have suffered for many years, allows them to describe their gas as possessing an illuminating quality which it is in the power of every con-

sumer to obtain from it. I am aware that, in the present state of affairs, I may be treading on somewhat dangerous ground; but the whole question seems to me so simple, and the justice of the case for the power to use the improved burner so apparent, that I do not hesitate to deal with it.

In common with most of my professional brethren, I look forward to the time when Parliament will recognize the fact that for all the purposes to which gas is at present applied, its illuminating power is a factor of the most trivial importance, and will, in consequence, eventually decide to abolish the illuminating power standard in favour of one indicative of its heating value. The retention of both the illuminating and the calorific tests would be, in my opinion, not only useless but likely to result in imposing such conditions on the industry as would prove a serious bar to the introduction of improved methods in the carbonization of coal, and in the after-treatment of the gas. It is, I believe, a recognized fact that the calorific value of gas as produced under the most modern methods does not always vary in direct proportion to its illuminating power, and in many cases which have come under my notice I have found—especially with vertical retorts and with horizontal retorts with what is known as full charges—that it is possible to decrease the illuminating power while actually increasing its calorific value. I have no hesitation, therefore, in expressing the opinion that the dual standard would have the effect of making it more difficult for gas companies to produce that quality of gas best suited for the use of the public and of adding appreciably to the cost at which it could be supplied.

It has sometimes been urged that the introduction of the No. 2 burner would result in the supply of a gas which would force the consumer to use a much larger quantity in order to get results similar to those he had previously obtained. Well, all I can say is that figures which have been supplied to me by companies who have been using the No. 2 burner for some time, prove that such an allegation is not borne out in practice; and in spite of the large increase in the use of gas cooking and heating stoves, the average consumption per consumer has shown no increase, but rather the reverse, as compared with the periods when the No. 1 argand was in use.

At the time of writing, the result of the Joint Bill before Parliament having for its object the granting of the use of the No. 2 burner in the case of some 47 companies is not known; but I can hardly imagine that the Legislature will refuse to grant in this case what has been given in so many previous instances, and what after all is simply restoring a state of affairs which Parliament recognized as just more than thirty years ago.

PREVENTION OF NAPHTHALENE DEPOSITS.

I must now ask you to bear with me while I deal with the second condition to which I have alluded—viz., that the gas supplied should be of such a character as will not cause trouble through stopped service pipes. It may appear to some that I am dealing with ancient history, or that I am flogging a dead horse; but this opinion can only be held by those (and I know there are many) who have successfully adopted means whereby this difficulty has been overcome. That there are still some who have as yet failed to bring this about is proved by the number of inquiries that I receive on the subject from time to time. To such, my experience may not be uninteresting. I have so far been almost afraid to mention by name the solid deposition which is responsible for the trouble I refer to. Only a few years ago, it was almost impossible for a meeting of a District or other Gas Association to conclude without some part of the discussion being devoted to the question of naphthalene deposits, and the fact that this is not now the case is, of course, a clear proof that the trouble experienced from this bugbear is not so acute as formerly, and this notwithstanding that of late years—at any rate, until the introduction of heavy charges of coal—the conditions of carbonization have been more favourable for its production.

THE CONDENSER PLANT AT CROYDON.

I do not claim that there is anything novel in the system that has been adopted at Croydon. It is simply the result of carefully noting the accounts of what has been done elsewhere and of taking advantage of the information gathered from the investigation of the subject carried out, under the guidance of Dr. Colman, some time ago by the Southern District Association. I may at once say that when designing the new section of our works, I recognized that in one

part of our district the naphthalene difficulty had already been overcome. This district was supplied from a main the gas in which had been treated by the "Hastings" or "Botley" process, which had proved so successful that, while we were getting somewhat numerous complaints in other parts of the town, we were absolutely free in the district referred to. I was, however, face to face with the knowledge that the position at which the Botley apparatus was placed—viz., on the outlet of the governors—did not allow of its exerting any influence on the gas prior to that point, and that therefore the trouble experienced in the mains and apparatus on the works was not affected. My object, therefore, in arranging the plant of our new section was to introduce some system which would come into successful action as soon as the gas left the retort-house.

After leaving the retort-house at a temperature of about 140°, the gas passes through either one of two "Cyclones," or is split up into two streams, half passing through each "Cyclone." Here 90 to 95 per cent. of the tar remaining is thrown down. It then passes forward into a Livesey washer, the bottom part of which is filled up with brick-work to within about 10 inches of the bottom of the troughs. At this point the gas is still at a temperature varying between

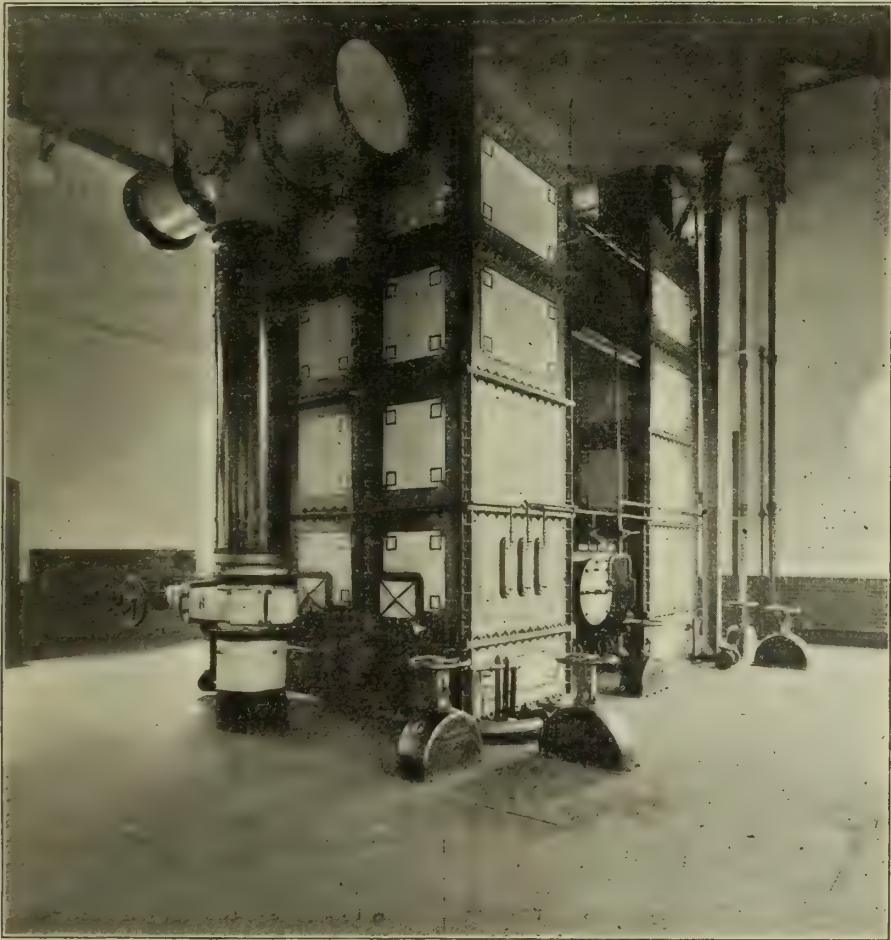
105° and 125°, according to the quantity passing and the atmospheric conditions. Into this washer carburetted water-gas tar is run in a regular stream throughout the twenty-four hours; the quantity varying according to the gas made. This tar is heated to a temperature of about 90° to 100° Fahr. by a steam coil running on the top of the brick-work. By this means a considerable quantity of the naphthalene is absorbed, and, what is more important, nearly the whole of the light oils in the tar used are released. The amount so released, and therefore carried forward by the gas, may be judged from a reference to the following tables of tests by Dr. Colman:—

TABLE I.

| Light Oil Vapours in the Purified Gas. | Old Section. | | New Section. | |
|--|---------------------|----|---------------------|--|
| | C.c. per 100 C. Ft. | | C.c. per 100 C. Ft. | |
| Liquids boiling at 100°-130° C. . . | 3'4 | .. | 8'7 | |
| " " " 130°-170° C. . . | 3'2 | .. | 7'3 | |

TABLE II.

| Naphthalene in Gas at Scrubber Outlet. | Grains per 100 C. Ft. | |
|--|-----------------------|--------------|
| | Old Section. | New Section. |
| Maximum | 22'6 | 8'9 |
| Minimum | 15'7 | 2'9 |
| Average | 19'8 | 6'3 |



The Reversible Gas Condensers at Croydon.

TABLE III.—Composition of Tar Going into and Coming out of Hot Washer.

| Specific Gravity at 60° Fahr. . . . | In. | Out. |
|-------------------------------------|----------------------|-------|
| | 1'028 .. | 1'097 |
| | Per Cent. by Weight. | |
| Light oils, up to 170° C. | 13'3 | 1'9 |
| Middle oils, 170°-270° | 27'9 | 24'9 |
| Heavy oils, 270°-350° | 20'7 | 24'3 |
| Pitch, above 350° | 37'6 | 48'5 |

Table I. gives a comparison of the amounts of the vapours contained in the purified gas made in the new section and those contained in the old section on the same gas simultaneously treated, but where it passes direct from the foul main to the condenser. Table II. gives the amount of naphthalene present in the gas at the scrubber outlets at both sections. Table III. gives the composition of the water-gas tar before entering and after leaving the Livesey washer. After leaving the Livesey washer, the gas is drawn through the water-tube condensers made to our own special design

by Messrs. Clapham Bros. The peculiarity of these condensers consists in the fact that the two units, each capable of dealing with 2,000,000 cubic feet per 24 hours, are divided vertically into three entirely separate compartments, each having its own gas and water inlets; so that when the condensers are being worked at, or near, their full capacity the gas and water are split up into six distinct currents, the flow in each being regulated by means of valves. A reference to the drawing will explain how this is done, and will also show that the two units can be worked either in parallel or in series, and also that the inlets and outlets are reversible. When first these condensers were started, it was found that their action was far from satisfactory, as it was impossible to reduce the gas to the proper temperature, or to regulate the temperatures in the various sections. An occasional examination of the interiors showed this to be due to a deposition of a mixture of tar and naphthalene on the exterior of the water-tubes, varying in amounts in different parts of the apparatus. After trying by various means to do away with this difficulty, we determined to try (on the suggestion of my Chief Assistant) the effect of introducing at

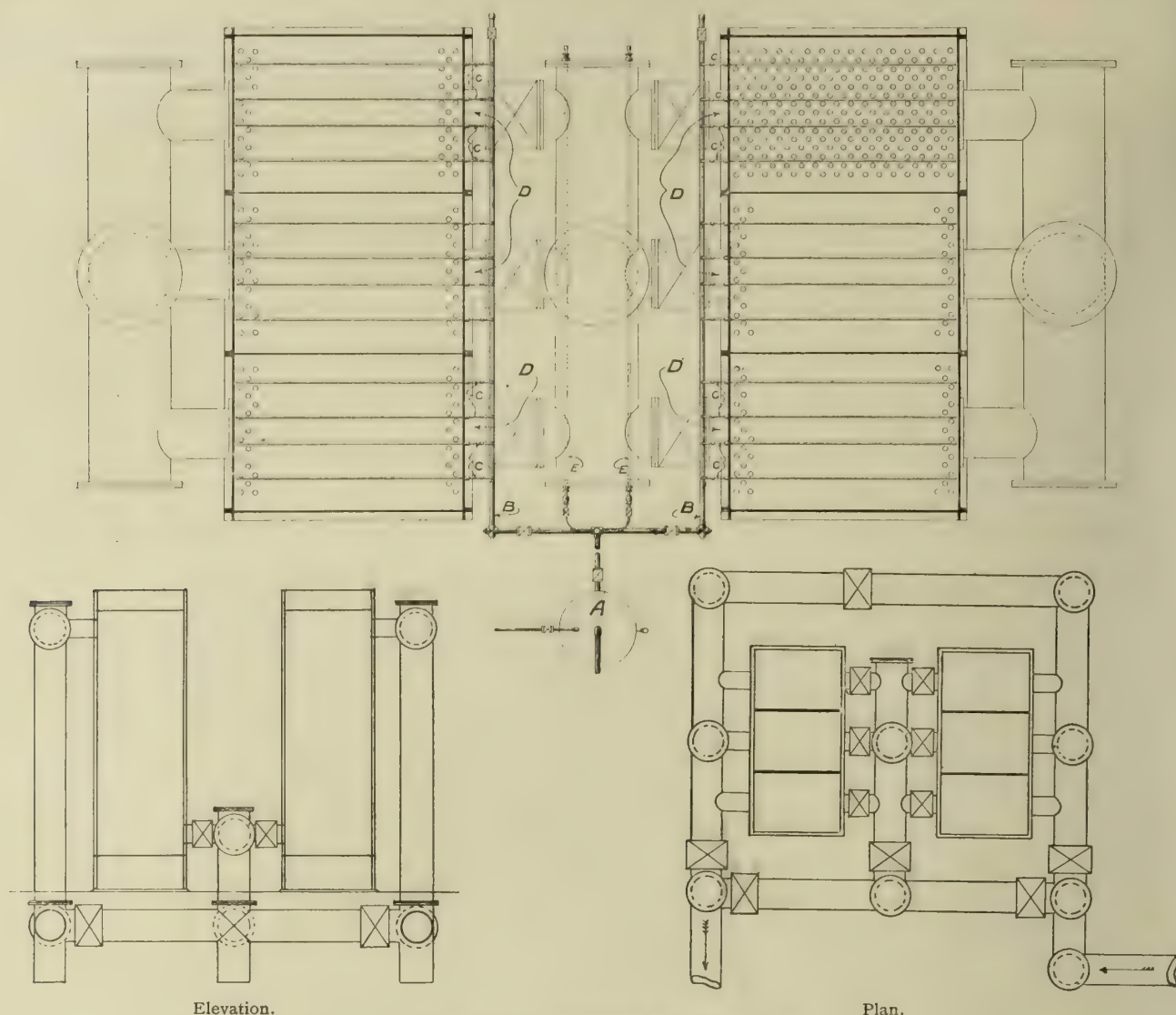


Fig. 1.—The Water-Tube Condensers at the Croydon Gas-Works.

intervals at the top part of each section a quantity of water-gas tar. The result was so promising that we fitted the necessary pipes for carrying out the system on regular and systematic lines. Since doing so, we have had no difficulty in reducing the temperature of the gas in the various sections to a point only a few degrees above the temperature of the incoming cooling water.

A reference to the plan (fig. 1) will show how the pipes were arranged. A is a vessel which is filled with water-gas tar, and has its outlet connected up to the pipes B, from which run a series of smaller pipes C, which pass through the top part of the outer casing of the condensers and between the vertical water-tubes. These pipes are perforated on their sides, slightly above the centres, by holes increasing in size from 1-32 inch just inside the condenser to 1-16 inch at the far end.

At stated intervals—generally twice during the day—the tank A is filled with water-gas tar, and put under a pressure of 80 lbs. per square inch, by means of the compressor plant used for raising water from our artesian wells. When this pressure is obtained, the cock on the outlet of the tank is opened, and the tar is forced through the openings in the pipes C, and sprayed over the outer surfaces of the water-pipes down which it runs, thus keeping them perfectly free from deposit of any sort. After some time, it is found that the temperature of the outlet gas begins to rise, and the flow of gas and water is then reversed. It should be said that we obtain the best results when admitting the gas at the outlets, and allowing it to pass downward to the inlets with the water flowing, of course, in the opposite direction. The reversed action is allowed to continue for about four hours, when the original conditions are reverted to. It is found that some deposit occasionally forms at the bottom of the tubes and in the short inlet pipes D, and that this accounts for the rise in the temperature. At the time of reversing, therefore, a stream of water-gas tar, put under pressure in the manner before described, is sprayed into the inlet cylinder through the pipes E, perforated opposite the gas inlets which are turned

round during the operation. By this means the inlets are effectively cleared, as are the bottoms of the water-tubes. The operation of reversing and spraying takes place as a rule about twice a week.

When working in the manner first described, the naphthalene was effectually removed from the gas; but the tar which was thrown down was so rich in naphthalene that this hydrocarbon crystallized out in the colder portions of the apparatus, and thus formed an efficient non-conductor that prevented the proper cooling of the water from being obtained. For the success of the method, therefore, it is essential that some means similar to those described above should be adopted to prevent the accumulation of the pasty mass to any appreciable extent. This mass, though pasty when cold, becomes quite thin and liquid when slightly warmed, and is found to contain very little free carbon.

A glance at the following table will show the efficiency of the condensers as a whole.

Condenser Temperatures.

| Year. | Month. | Gas Inlet Temp. | Gas Outlet Temp. | Difference. | Inlet Water Temp. | Outlet Water Temp. | Remarks. |
|-------|--------|-----------------|------------------|-------------|-------------------|--------------------|-------------------------|
| 1909 | April | 104° F. | 63° F. | 41° F. | 53° F. | 64° F. | One condenser at work. |
| | May | 112 | 68 | 44 | 58 | 75 | " |
| | June | 112 | 73 | 39* | 65 | 79 | " |
| | July | 120 | 75 | 45 | 64 | 79 | " |
| | Aug. | 117 | 76 | 41 | 66 | 81 | " |
| | Sept. | 114 | 74 | 40 | 68 | 83 | " |
| | Oct. | 113 | 73 | 40 | 66 | 83 | Two condensers at work. |
| | Nov. | 112 | 67 | 45 | 59 | 79 | " |
| | Dec. | 108 | 63 | 45 | 56 | 73 | " |
| 1910 | Jan. | 103 | 61 | 42 | 56 | 73 | " |
| | Feb. | 110 | 61 | 49 | 54 | 80 | " |
| | Mar. | 103 | 60 | 43 | 56 | 70 | " |

* Tar sprays choked and fresh sprays put in during this month.

It will be noticed that the difference in temperature between the outlet gas and the inlet water is greater when one condenser is at work. This is due to the fact that at these times the condenser is passing a much greater quantity of gas than it was designed to deal with.

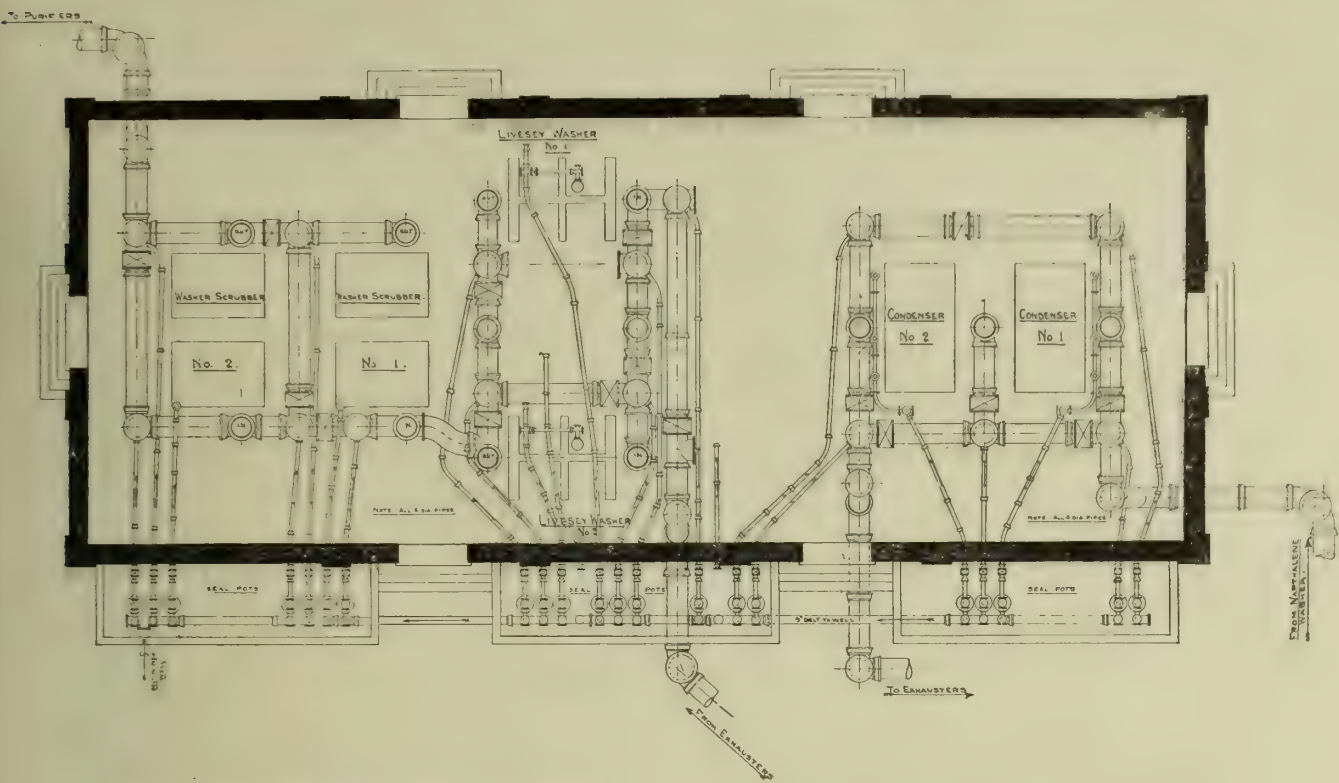


Fig. 2.—Arrangement of Tar Drains from Syphons, &c., to Seal-Pots for Mains in the Condenser and Washer House.

A reference to fig. 2 will show that the products of condensation, not only from the condensers, but from the whole of the scrubbing and washing plant run into receptacles, and from thence by gravity to the seal-pots, which are all placed outside the house, and subjected therefore to great variations of temperature. Many of the pipes leading to the seal-pots are of considerable length, and run in somewhat tortuous directions. We feared that they and the seal-pots might give trouble through getting stopped up, and we accordingly provided special means for dealing with such trouble if it arose. I can, however, honestly say that during the two-and-half years the section has been at work, the only time we have experienced any trouble from this cause was towards the end of one week during which we had to throw the Livesey washer containing the water-gas tar out of use. It will be noticed (see fig. 3) that the whole of the connections in the house are buried in the ground, the level of which is considerably higher than that of the yard outside. By keeping the connections just underneath the surface, we were not only enabled to adopt the plan of running the condensed liquid

to the seal-pots by gravity, and thus avoid all pumping of syphons, but also to provide easy means of cleaning the connections by placing removable covers at the points at which they intersect. These covers are all easily accessible on lifting the shallow tiled frames which are fixed immediately over them. All the valves are also arranged with specially constructed bonnets, with their joints flush with the ground, so that they can be removed when necessary.

I am glad to say that we have not yet found it necessary to make much use of these special arrangements for the purpose for which they were provided, as occasional examination by their means of the internal conditions of the connections has always shown them to be in a clean and satisfactory condition. The same can be said of the interiors of the "Standard" washer-scrubbers, the discs of which are as free from naphthalene deposits as the day they were first started. I may also mention that the interior of the rotary meter which is used for registering the whole of the gas made in this section shows, when opened for examination, no signs of naphthalene.

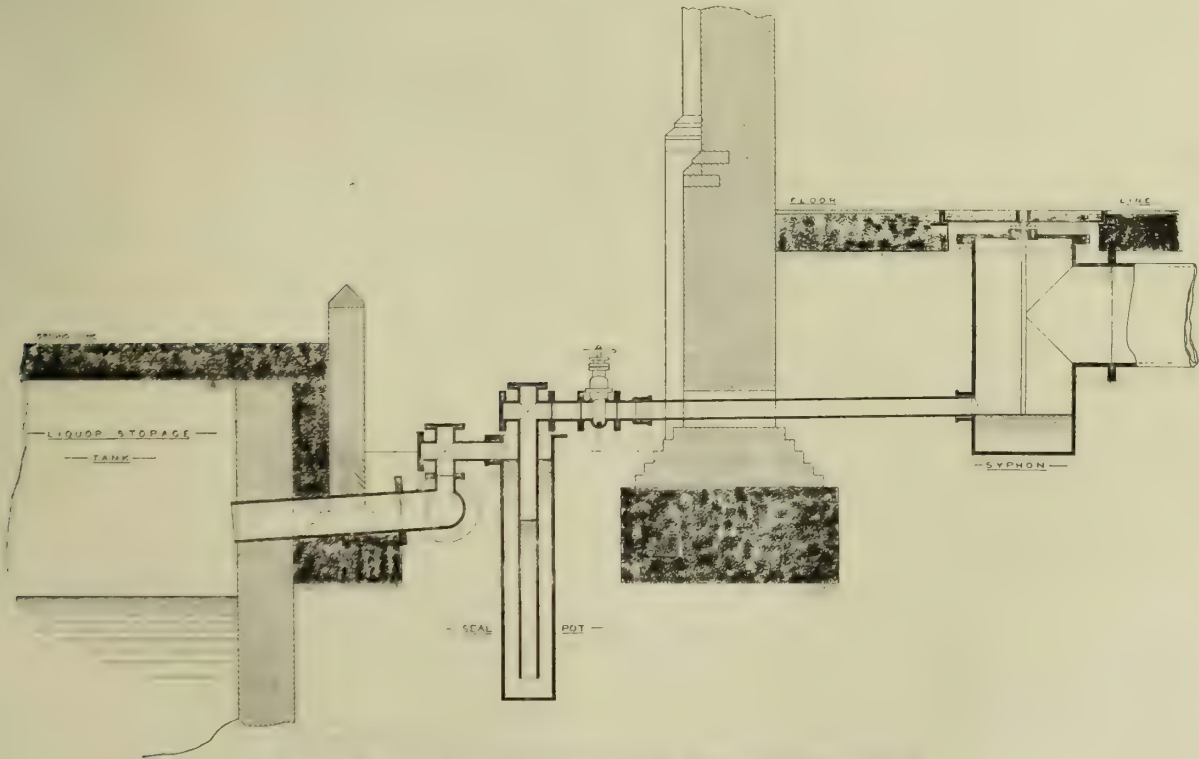


Fig. 3.—Method of Liquor Gravitation from Syphons to Storage Tank.

When the new section was first started, it was worked in conjunction with the old works, and advantage was taken of this circumstance to carefully test the gas made in both, and also to observe the conditions of the several connections. It may be said at once that the difference was most marked, as while the connections and plant in the new section remained (as they still remain) perfectly clear, those in the old works were frequently blocked, and had to be periodically opened for cleaning-out purposes; while the tables I have previously given of tests made by Dr. Colman indicate clearly the difference in the character of the two gases.

IMPORTANCE OF COMBINED ACTION.

And now I come to what to me forms the most important part of my remarks. I have already drawn attention to the great changes which have taken place in our industry during the past fifteen years—changes so smoothly, so insidiously, introduced that they have been almost unnoticeable, but yet so marked in their influence on our organization that if it were possible to reintroduce into the profession one who ceased all connection with it fifteen to twenty years ago he would find the position almost unrecognizable. Now have we, as an industry, so appreciated the changed conditions as to fully realize the necessity for altering our methods to suit them? Individually perhaps we have; but have we done so collectively; have we as an industry, representing a paid-up capital of more than £130,000,000, realized the importance of combined action in matters in which our mutual interests are concerned? I venture to say that there can be but one answer to such an inquiry, and that must be both negative and unfavourable.

It will be noticed that I am approaching this matter not from the standpoint of the individual or of the individual company or undertaking, but from the point of view of what should be a combined industry, composed of units not competing against each other, but all desirous of attaining the same end—namely, the production of the most suitable gas, and the introduction of the most suitable methods and appliances for economically making use of it.

The importance of adopting methods which will appeal to the consumer, and convince him that it is not only a gas company's duty, but its desire, to give him every possible attention and help, and not to harass him with undue and unbusinesslike restrictions and formalities, cannot be overestimated; and although it is the distributing engineer, his inspectors, and staff, who come more closely into contact with him, yet much depends upon the tact displayed in the secretarial department to which a dissatisfied or anxious consumer frequently applies when he is desirous of making arrangements for a supply of gas, or when anxious to ascertain the reason why such supply of gas, when secured, has resulted in the delivery of an account somewhat in excess of his anticipations. Look at it as we will, we must confess that more than ever the success of gas companies and the industry generally depends on the proper working of every department, and upon loyal co-operation on the part of the principal officials of each.

COMPETITION AND THE WAY TO MEET IT.

It is useless to disguise the fact that the competition with which we are faced to-day is powerful not only on account of its own innate strength, but also because of the methods which are from time to time adopted by those who cater for the public wants in competition with ourselves. It is, therefore, only by the most vigilant and up-to-date methods that we can hope to maintain our position. I say this in no pessimistic spirit, but because I deprecate the attitude which is sometimes assumed by companies who, because keen competition may not yet be felt in their own particular districts, are content, as they say, to "let well alone," and that other attitude—parochial in its nature, and perhaps more common still—which prompts directors of companies to refuse assistance to combined action because they consider that any money spent in propaganda work is thrown away unless it is spent in their own immediate neighbourhood.

PUBLICITY DEPARTMENT.

Undoubtedly, one of the principal directions in which combined action can make its influence felt on our industry is in connection with the subject of advertising. This has long been recognized by our colleagues in America, where a special association has been formed for dealing with this side of our business; and the subject is now, I am glad to say, receiving the careful attention of the Joint Commercial

Sections in this country, on the initiative of the Southern District Association.

You will all doubtless remember the masterly way in which this subject was dealt with by Mr. Goodenough, of the Gaslight and Coke Company, at the meeting of the Institution in Dublin in 1907. But it is evident that his remarks fell on unprepared soil; for until the effort of the Commercial Sections, to which I refer, no attempt has been made to deal with the matter in anything like a systematic way. Not that Mr. Goodenough has failed to put into practice the doctrines he himself preached. Supported by the Governor and Directors and the Head Officials of the Company he serves, a splendid system of advertisement has been instituted, having for its objects the education of the public in all matters dealing with the uses of gas for domestic and industrial purposes, and the dissemination of facts and figures regarding its advantages, and corrective of the many mis-statements which have from time to time been published as to its so-called disadvantages when compared with rival lighting and heating agents.

The advertisements and articles which during the past year or so have appeared in the Daily Press and the better class periodicals have been as far-reaching in their influence as they have been expensive to the Company responsible for them. I am aware also that much splendid work in the same direction has been carried out by the South Metropolitan Gas Company. Now I cannot believe it just or fair that the industry as a whole should practically stand aloof and allow the whole expense of such useful propaganda work to be borne by one or two broad-minded companies, while the benefits of their action are shared by undertakings all over the country. Surely the cost of such work should be paid from a fund to which every gas company in the kingdom should contribute in proportion to its size and importance. I confess to there being some difficulty in dealing with the question in the case of corporations owning both the gas and electric undertakings; but this difficulty should surely not be insurmountable.

IMPORTANCE OF SECURING SUPPORT OF DIRECTORS.

Now before there can be any hope for successful combination, directors and committees of gas companies and gas undertakings must have the assurance that the body or institution which sets itself the task of carrying on any organized work is thoroughly representative of the whole of the various interests of their several concerns. It is only when directors and committees appreciate the fact that they are so represented that they will gain sufficient belief and confidence in the work which is being done on their behalf as to induce them to give to it not only their moral but their financial support. Here it seems to me we are face to face with a serious question; and though many of us may be inclined to regard it from a somewhat prejudiced and selfish point of view, yet it is one which has got to be approached from a purely unbiassed and unselfish standpoint, if we are to look forward with any confidence to attaining the desired end.

IS THE PRESENT INSTITUTION REPRESENTATIVE OF THE INDUSTRY?

May I ask you to consider a question which I have often of late put to myself? Is an institution, the membership of which is confined to engineers and managers and their principal assistants—to those only, therefore, who are connected with the technical side of our business—really representative of our industry under the conditions which now exist? Whatever might have been the answer to this question even ten or fifteen years ago, there is, I think, only one possible answer to it to-day, and that in the negative.

It may seem strange that one who took a somewhat prominent share, only some eight or nine years ago, in bringing about the amalgamation of the two existing bodies, and whose main plea for fusion was the formation of an Association which should be fully representative of the industry, should so soon afterwards have to confess that the end that he and others desired had not been accomplished. Nevertheless, I have no hesitation or compunction in confessing to such a want of foresight as led me to believe that the then contemplated fusion would do all that was required in the direction of full representation. I am now bound to acknowledge that, looked at broadly, our action, successful as it was from the point which its promoters then had in view, in its result had somewhat of an opposite effect, for it robbed the new body of the presence of many practical men whose assistance

could not have failed to act beneficially on the interests then under consideration.

WORK OF THE SOCIETY OF BRITISH GAS INDUSTRIES.

I do not want it to be supposed that I regret the action which was taken at the time referred to, nor that I am intending to suggest any attempt at reviving the old conditions. The action of those engaged in the manufacture and supply of plant and materials in forming the Society of British Gas Industries renders such a suggestion unnecessary, even if I thought such revival was desirable. The way in which the Society has been worked, and the care and wisdom which have been displayed in the selection of its Presidents and Officers, fully warrant the belief that its formation will do more than fill any gap which the steps taken in connection with the amalgamation of 1902 may have caused. I need not relate in any detail the many instances in which the Society of British Gas Industries have shown their powers for good by joining with our Institution in promoting, by joint action, matters in which their mutual interests, and therefore the interests of the industry, have been concerned. I have quite come to the conclusion that co-operative methods rightly applied are likely to be productive of as much, if not more, benefit, than could result from any such system of combination as existed prior to the amalgamation. And this view is, I believe, shared by our colleagues in the Society of British Gas Industries.

The two bodies have ever shown themselves ready to combine for the consideration of matters affecting their interests, and I have every confidence in believing that this readiness will be even more marked and productive of more good in the future than has been the case in the past. If my views are sound, as I believe they are, there is every assurance that the practical and technical side of our work will be fully looked after and safeguarded. I maintain, however, that even with this condition assured, we are far from possessing such an organization as can be considered fully representative of the many sides of our business. It must, I think, be apparent to all—not only from what I have said, but from the knowledge which comes to anyone who will allow himself to fairly review the position—that the changes which have gradually but surely taken place in the conditions that govern the administration of gas companies and undertakings necessitate drastic changes in the methods of meeting them. One of the greatest of these changes must consist in a full appreciation of the fact that while in the olden days individual effort was as a rule found sufficient to maintain the position of gas undertakings throughout the country, it now becomes more and more apparent that, in order to maintain our position, organization and combination, with its resulting systematic treatment of matters of moment, must supplement (though not entirely supplant) the individual and sometimes haphazard methods of to-day.

SUGGESTED CHANGE IN CONSTITUTION OF INSTITUTION.

Now how can this combination be best secured? I have already stated that it is quite impossible unless we get the help and assistance of the heads of all the principal departments of our concerns, and through them the confidence and resultant support of the directors and committees under whom we work. Now it must I think by this time be apparent that I am about to suggest that any Institution claiming to represent the industry must include not only engineers and managers, but also the heads of the two other principal departments—the secretarial and the distribution. With regard to the last-named, it would appear from certain elections which have taken place during the past year or so that the Council have interpreted the clause in our Articles dealing with the qualifications for membership with sufficient generosity to admit several of those who are at the heads of the distributing work of large companies; and although I am of opinion that, when drawn up, the qualification was not perhaps intended to cover such cases, I am personally glad that such a course has been taken, as I feel sure that the only reason for so wording the Article in question as to require any broadening of interpretation was to be found in the fact that at the time of its construction the importance of the distribution branch was not sufficiently appreciated.

But although the question of the admission of such officials may have been satisfactorily dealt with under our existing Articles, yet it is certain that in no way can the qualification paragraphs be read as to allow them to include the election of those in charge of the secretarial and the ac-

counting departments. I am, therefore, convinced that, before this could be done, certain amendments of our Articles are absolutely necessary, and that such alterations must result in a considerable change in our constitution. And here I cannot refrain from mentioning an argument used by the secretary of a large and important company, when speaking to me of our constitution from a somewhat personal point of view. "Your Articles," he said, "permit of the election of managers of gas companies however small, but cannot be so interpreted as to admit the secretaries of even the largest companies. I should not feel that I had any cause for complaint if your Institution were content to deal with purely engineering and technical matters; but when, as is often the case, your body discusses matters of commercial and financial administration, and is unable under its rules to admit the presence and assistance in debate of those who are, by their experience, peculiarly qualified to add to the value of the discussion, then I think you are not only dealing unfairly with such men as myself, but you are detracting from the value of your debates, and to a certain extent alienating the sympathies of the concerns in the management of which we take no unimportant share." I could not honestly object to the soundness of this argument, nor do I think it would be easy for anyone present to find a suitable rejoinder.

AFFILIATED ASSOCIATIONS.

Another argument in favour of the enlargement of our constitution may be found in the growing importance of the Commercial Sections of Affiliated Associations, to which I have already alluded. It must, I think, be acknowledged that the useful work done by these sections is considerable, and that it will become much more so in the near future. Yet those sections which have so far taken the most prominent part in such work have admitted to membership secretaries and others who are not qualified for membership in their District Associations. Others recognize the position by providing for the occasional admission to their meetings, under certain restrictions, of officials who, while ineligible for membership of the Association itself, are considered, on account of their special knowledge, able to bring useful information to bear upon the matter under consideration at the time. This latter is surely a somewhat grudging and ungracious way of dealing with the difficulty, and one that is not likely to secure the useful co-operation of the officials concerned.

I want it to be distinctly understood that what I have so far said, and what I am about to say, is simply a statement of the conclusions at which I have arrived after a careful review of existing conditions. Though it is more than probable that my suggestions will not appeal to many of you, I think you will all agree with me as to the general principle which I venture to lay down, and which is that something is needed to strengthen our position and to secure for the work of an organization claiming to represent our industry a stronger financial position than can possibly be obtained by means of the annual subscriptions of some 850 members at a guinea each, and the amounts contributed to our Special Purposes Fund by the all too few broad-minded undertakings which recognize their responsibilities.

SUGGESTED PROCEDURE AS TO ENLARGEMENT OF CONSTITUTION.

Although I do not hesitate to state my opinion as to how the desired result can be arrived at, I am by no means wedded to my views; and if any member or members can suggest some method whereby the desired end can be better or more conveniently attained, I shall be quite willing to accept, as an alternative, any scheme which may commend itself to the members generally. If, however, my suggestions are thought worthy of further consideration, with a view to their possible adoption in some form or other, then it appears to me that there are two courses open to us—either, first, to so alter our present Articles as to allow of the admission of those officials to whom I have referred and who are now ineligible under our rules, and to allow the Institution to continue under its present title, or, secondly, to change the name of our body to (say) "The Gas Institute" and to divide it up into sections (as is done with the British Association) for the purposes of detailed work.

The former course is naturally the simpler; but I am afraid it is open to the objection that it would mean the continuation of a body under a title which must be considered a misnomer. The second course is the one I personally favour,

as it would I believe result in the formation of a powerful and numerically strong body, thoroughly representative of the various interests concerned, and therefore particularly well calculated to secure the co-operation of the various officials and the consequent confidence and financial support of the companies and undertakings they serve.

I do not want it to be supposed that I advocate the indiscriminate election of the officials at the head of the secretarial and distribution departments. Different methods of administration are adopted in various undertakings, and special care would have to be observed to see that only those should be deemed eligible whose positions and attainments were such as to fulfil certain necessary qualifications, which would have to be carefully considered and defined.

OBJECTION TO MULTIPLICATION OF SOCIETIES.

It may be urged by those who differ from my views, but who yet admit the soundness of my general principle, that a better way out of the difficulty would be to bring about the formation of another body, composed of those officials to whom I have alluded, which could co-operate with us on matters of finance and general administration. To such I suggest that already several bodies working in the same interests exist, and to add to their number, I cannot help thinking, would be most inadvisable. Personally, I would rather advocate the handing over to the enlarged body of the work now done by such societies as the Gas Companies Protection Association, and the Sulphate of Ammonia Committee. I am, however, bound to acknowledge that there are many difficulties in the way of this being done.

I am only too well aware that I am bringing this scheme before you in a very vague and general way. I, however, purposely refrain from entering into any details as to the best way of carrying it into effect, as I think that, should my suggestions eventually find any favour with you, it would be well to refer the whole question for the consideration and

report of the Council or else of a specially appointed Subcommittee.

SUGGESTED MEETING OF DIRECTORS.

I am perhaps a little sanguine in venturing to hope that the proposed widening of our constitution would in itself lead to a fuller appreciation on the part of directors and others of the good work which such an organization would, if accorded their moral and financial support, be capable of doing on behalf of the industry. It is indeed probable that it would be advisable to bring the matter more directly before them, at a meeting specially called for the purpose. This could be best brought about if a few prominent members of the boards and committees of gas undertakings who appreciate the position would so far interest themselves as to take the initiative in convening such a meeting. I believe that if this were done, and the whole matter patiently discussed and considered in all its bearings, the importance of combined action, and the necessity for providing the funds which would be required to render such action useful in the interests of the gas industry, would be readily realized and appreciated.

CONCLUSION.

In conclusion, may I say how fully I recognize the inconclusive way in which I have dealt with the task I set myself. I feel, however, that my endeavours, and your patience, will not have been entirely thrown away if anything I may have said will have the effect of awakening the members of our profession to the importance of putting on one side the old belief that dividends are made in the retort-house, and of causing them to realize the fact that the changed conditions of to-day render it more necessary than ever before that the sympathies and help of our directors and the knowledge and experience of the heads of all departments should be utilized in a combined effort to further the progress of the industry which we represent.

MODERN GAS-ENGINES AND GAS PRODUCERS.*

THE volume under review is yet another of the works on the gas-engine, on which subject American writers have of late become most prolific. It would seem as though the future of the gas-engine in the United States is likely to be a bright one if the number of available reference books is any criterion. American writers on this subject have one common characteristic, and that is in the matter of coal gas as a fuel for the gas-engine. Their knowledge of coal gas, both in the matter of its manufacture and its properties as a fuel for the internal combustion engine, is of the scantiest possible description. This is shown either in a total neglect of this important fuel or, where a few paragraphs are devoted to the subject, in the ignorant manner in which the details are strung together. Perhaps it is that American makers and users of the gas-engine, owing to the prevalence of natural gas and the cheapness of oil, have a small opinion of the commercial uses in their country of coal gas as a fuel. In any case, it speaks badly of the American gas engineer's enterprise that he allows the product of his manufacture to be passed over in this manner. Mr. Levin's book is no exception to the rule. But for the inclusion of a few elementary details coal gas might be an obscure type of gas whose existence was hardly known.

The book is almost entirely confined to the design of the gas-engine and the theory of its working. A user purchasing the book in the hope of improving his practical knowledge as to the best manner in which to run his engine will be doomed to disappointment. The reviewer is of opinion that the volume will be a useful one to the practical designer and the student studying the theory of the design and working of the gas-engine. It is full of useful formulæ, and, as the author puts it, it is often the formulæ which the designer requires most. But he goes further and claims that "any engineer who wants to know something about his engine needs them as much." Here the reviewer disagrees, and cannot admit that the user of the gas-engine, except, perhaps, on a very large scale, requires such formulæ as are given to anything like the same extent as the designer. No doubt a knowledge of the method by which the necessary strength of the various parts of an engine may be calculated is a very excellent acquirement; but the writer fails to see that a study of the subject would be of any great practical use to the ordinary engineer who has a good few gas-engines under his control.

In his preface the author very rightly points out that the extended use of the gas-engine will have the effect of conserving our coal resources, especially in the direction of using the inferior grades unsuited for purposes of steam-raising. In developing the gas-engine industry this important point must ever be kept to the fore. This same inferior type of coal, if suitable for the

producer, will also be suitable for the gas-retort as soon as the illuminating power bogie is finally dispelled, and will thus open up immeasurable possibilities in the way of cheap power and heating gas more suited and more economical for engines than producer gas with its 70 per cent. of useless constituents.

The author states that the information contained in the book consisted originally of a collection of notes which have now been, with the addition of the necessary elementary matter, extended to make them generally readable. The volume (which contains a mass of information) is arranged in fifteen chapters, with an Appendix. Chapter I. is devoted to "Thermodynamics," and is followed by chapters on "Design Constants and Formulæ," "Theoretical Analyses of the Gas-Engine Cycles," and one on "Power, Size, and Speed of Gas-Engines." The author then confines his attention to the various fuels in use, Chapter V. being entitled "Fuels Combustion;" and the two following are concerned with the best known spirits and gases in general use. From Chapter VIII., which deals with the "Features of the Practical Gas-Engine Cycle," the work gives in detail much information as to the design of fly-wheels, crank-shafts, governors, and other parts and auxiliaries of the internal combustion engine. The main features of a large variety of different makes of gas-engines are explained and illustrated in Chapter XIV. The final chapter deals with the important details of "Producer-Gas and Gas-Producers," and the necessary auxiliary plant.

The book is well written; and it is not difficult to gather, from the manner in which the subject is handled, that under the guise of the author may be seen a practical and experienced designer with a very thorough grasp of the theory of his subject.

Flow of Water in Curved Pipes.—In a paper on this subject recently read by Mr. John Eustice before the Royal Society, the author said that experiments were made on a flexible tube with the object of ascertaining the increased resistance to the flow of water which was due to the curvilinear motion of the water in coils of uniform radius. The tube, which was about 0.37 centimetre internal diameter in its normal condition, was sufficiently small to admit readily of experiments both below and above the critical velocity. In order to separate the effect of curvature and change of cross-section, special apparatus was employed to change the section of the straight tube from circular to oval form. Comparisons were made between the flow in the straight tube and the flow when the tube was coiled—both tubes being of the same form and area of section. The results obtained show that the flow in a straight flexible tube of circular section follows the laws of flow in metal tubes as investigated by Professor Osborne Reynolds, and that the velocity at which turbulence begins is given by his formula; and that the critical velocity, which is so well marked in the flow in a straight tube, appears to be entirely absent when the tube is coiled—that is to say, the index law for straight tubes does not hold for coiled ones.

* The Modern Gas-Engine and the Gas Producer. By A. M. Levin, M.E. New York: John Wiley and Sons. London: Chapman and Hall, Limited; 1910.

LARGE CANDLE-POWER HIGH-PRESSURE UNITS.

On View in London.

LAST week, in this office, a prominent gas and electricity administrator from America remarked in the course of conversation: "You have made some wonderful advances in high-pressure inverted gas-lighting in this country." The observation is true; and our visitor was in a position to realize it after years of absence better perhaps than we are able to do who have seen the advances tentatively introduced, and have been almost unconscious of the large expansion there has gradually been from the small beginnings. Not only was our American friend attracted and interested last week in the demonstrated progress of gas lighting, but it will be seen, from a paragraph in an earlier column, that the gas-lighted thoroughfares of Fleet Street, Whitehall, and Parliament Square, especially, among the lights of London, claimed the notice of the occupants of the Army dirigible that unexpectedly passed over sleeping London not many nights since. If the visitors to the Institution meeting this week can snatch an hour or two from pleasure after dark one night, they will have something worth inspecting at Aldwych, where some trial high-pressure, high-power Keith lamps have been installed—of higher power, in fact, in single units, than have ever been installed in London streets before. Then they can pass down Fleet Street, and see the high-pressure inverted lamps in use there; and, walking to Blackfriars Bridge Approach, there will be seen sample high-pressure lamps with raising and lowering gear, demonstrating to the City authorities that for the lighting and maintenance of high-pressure lamps ordinary or trolley ladders can be dispensed with if they prefer that City streets should be free of such impediments. The lighting of Blackfriars Bridge is worth inspection. Then a tramcar ride as far as Westminster Bridge will bring the visitors to the lighting of Parliament Square; and thence a walk through Whitehall will not fail to interest. That is by way of suggestion.

It is to the trial lamps that are to be seen in Aldwych for which special attention is desired, because they carry us to a point in the direction of high powers from a single source that has never yet been exceeded in the streets of London. Some local authorities will have high-power units in public places; and the gas industry, whatever may be thought as to the propriety from the scientific or other point of view, has to be prepared to provide what customers require. That is only common sense, and business. When the Westminster lighting contract was under discussion, and the Gaslight and Coke Company contracted, among other units, for some 3000-candle power ones, certain gratuitous electrical advisers and careless critics ridiculed the idea of a gas-lamp standing anything like that power. They had never seen (because they had not looked for it) such a lamp; they questioned the possibility even of such a lamp being made; and what the Gaslight and Coke Company had been thinking about to bind themselves to provide something that (in the electrical imagination) did not exist, was utterly inexplicable to the electricians. But here we are. Already the Gaslight and Coke Company, with the assistance of the James Keith and Blackman Company, Limited, have fixed high-power lamps in Aldwych, ranging from 4500 to 2000 candle power per unit. These lamps have been put up purely as specimens, first to convince all interested that they will be suitable for their destined purpose, both as far as illuminating value and design are concerned, and to give an opportunity for experimenting by the Company and the makers under actual street conditions. And the nocturnal electrical wanderers, with their photometers, will soon be swarming round these lamps to see what prospects there are of the Company being able, at the angles—20° and 50° below the horizontal—chosen by the Westminster City Council, to maintain their contract illumination.

Passing from the Strand into Aldwych, the first of the trial lamps to arrest attention is on the first refuge. This is one of Keith's nominal 4500-candle power (column pattern) lamps, fitted with three 1500-candle power inverted burners. Then on the left-hand side walk, there is a similar lamp containing three 1000-candle power inverted burners. Following on, there are two

lamps—one on the left-hand and one on the right-hand side walk—demonstrating the types of lamps for suspension from swan necks; these also containing three 1000-candle power inverted burners. Succeeding, there is the second refuge, the column on which carries a double-arm bracket; and depending from this are two lamps, each containing two 1000-candle power burners.

Based on the experiences of the past, a few new features have been introduced into the column form of lamp; and these it is of interest to note. In the first place, each burner has its own separate heater, forming one-third of the circle. Then each burner has its injector body so fashioned as to allow it to be fixed in a horizontal position, with the portion carrying the nipple slightly projecting beyond the outer enamelled casing, so that both the nipple and the burner body can be cleaned without in any way disturbing the lamp. The adjustment screws of each burner are also brought below the reflector; so they are readily accessible. The upper enamelled cased portion of the lamp is merely utilized partly as air and partly as exhaust ways. The lamps as now fixed are provided with automatic lighting devices—the column lamps being divided so that one control valve on one side arm

controls one burner and bye-pass, and a control valve on the other side arm deals with the other two burners. This convenience enables the lighting per lamp to be reduced to one or two burners at midnight, if desired. But this is not the system that will be in use in the Westminster district, as there the contract provides for the full power of the lamps being maintained throughout the lighting hours.

The photographic illustration of one of the column lamps shows a design that is not by any means unattractive, and yet it is of substantial build, and will, it is obvious, give a good account of itself under all the climatic severities to which

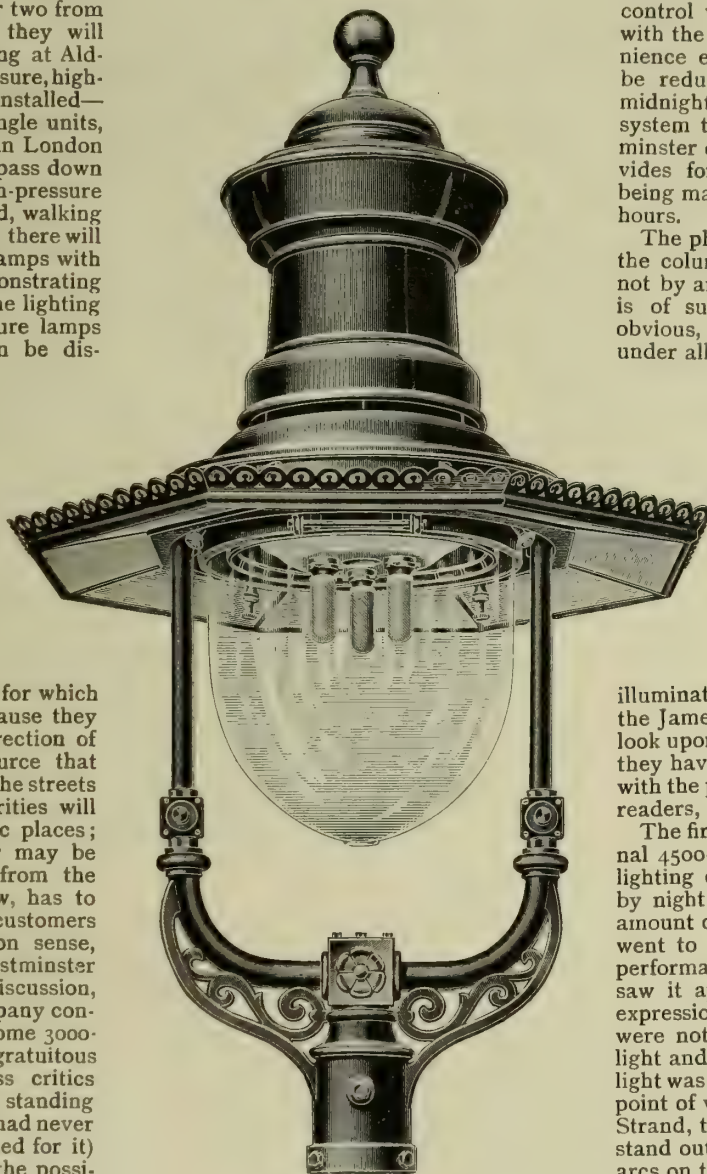
it will be exposed. It will be observed that the two side arms are attached to, and carry, a heavy cast-iron enamelled reflector, on which the whole of the lamp is built. Instead of being of the ordinary enamelled circular type, the reflector is made with a copper frame and opal glass glazing—the panes being quite outside the heat range, and at an angle that will best meet the

illuminating requirements. On the whole, the James Keith and Blackman Company look upon this design of lamp as the finest they have yet made; and in regard to it, with the photographic reproduction before readers, nothing more need be said.

The first of these trial lamps—the nominal 4500-candle power one—was put into lighting on Monday last week; and night by night it has attracted a considerable amount of attention, apart from those who went to view it specially to judge of its performance and general effect. All who saw it appeared to be pleased; and no expressions of opinion were heard that were not favourable. The colour of the light and its diffusion were good; and the light was perfectly steady. Taking a clear point of view from the farther side of the Strand, the life and power of these lamps stand out in striking contrast to the flame arcs on the neighbouring skating-rink.

These lamps, like electric lamps, have been designed and are made to be used

under certain conditions. There is the necessary pressure—that is to say, a certain pressure is required at the lamp head; and this pressure may not be, owing to friction and obstruction between the compressing-station and the lamps, the initial pressure at the compressors. There is also the question of the calorific power of the gas. The burners are adjusted for a certain consumption of a certain quality of gas; and if this quality is kept fairly uniform, and the pressure is the pressure desired, then the lamps will produce actually—at any rate, approximately—their nominal illuminating power. In the Gaslight and Coke Company's district, the calorific power is kept fairly uniform now—the Company being under a penalty test in regard thereto; and as to the pressure the Company are prepared to give the Keith lamps all the margin that is needed to compensate for any reduction of pressure between the compressors and the lamps in the Westminster area. Some gas engineers who have been brought up with a pious affection for tenths and up to 2 to 3 inches pressure, stand almost aghast when there is talk of pressures running up to 70 or 80 inches of water. Readily, the Gaslight and Coke Company have conceded the makers' desire to have the compressing plant for the Westminster lighting regulated so as to discharge gas at 80 inches pressure; and this will give an ample





Plan Showing the Positions of the Trial Lamps in Aldwych for the Gaslight and Coke Company.

- A. Column Pattern Lamp with Three Burners, each of 1000 candle power.
- B. Suspension Lamp in Harp with Two Burners, each of 1500 candle power.
- C. Column Pattern Lamp with Three Burners, each of 1500 candle power.
- D. Suspension Lamp on Swan-Neck Bracket with Two Burners, each of 1500 candle power.
- E. Two Suspension Lamps on Double Swan-Neck Bracket, each with Two Burners of 1000 candle power.

margin in pressure. Under the circumstance of conditions meeting requirements, so giving a proper flame and a high flame temperature, and with the improvements in the Keith lamps, there will be no doubt as to these showing efficiencies higher than anything the firm have previously produced.

It may be added that for the Westminster high-pressure lighting, the compressing plant will be situated at the Gas Company's Horseferry Road station, and will consist of four of Keith's rotary compressors. Provision is in this way made for all variations in requirement likely to be met with—at any rate, for a time. Each compressor will have a suitable gas-engine alongside it. The gas-engines will drive on to a common shaft, and from the shaft to the compressors. This will make a most interchangeable plant—capable of dealing with a 5000 cubic feet per hour day load and (if necessary) a 55,000 cubic feet night load. There is confidence that this Westminster lighting contract is going to confer an important benefit on street illumination by gas in connection with the more stressful competition of the lights at the present time.

IMPROVED LIGHTING AT STOKE-ON-TRENT.

SOME few weeks ago, mention was made in the columns of the "JOURNAL" that the Gas Committee of the Corporation of Stoke-on-Trent had placed an order with Messrs. D. Anderson and Co. for a considerable number of their "Dacolight" patent regenerative inverted burner lamps for re-lighting the principal streets of the borough. The work has now been completed under the direction and superintendence of the Engineer, Mr. W. Prince.

The installation consists of 98 two-light lamps, six four-light, and four three-light; the latter being used for lighting the open space around the Campbell Monument. The others are fixed throughout the district; and in all about $2\frac{1}{2}$ miles of streets have been covered. A total illuminating effect of 32,480 candles is provided. The lamps are lighted and extinguished automatically from the gas-works on the Alder and Mackay system, which method has been in use for some time at Stoke—the controllers being adapted to the new lamps.

In carrying out the installation, Mr. Prince has taken the opportunity to re-arrange the lamp standards in the respective streets, and to provide some additions, so that the average distance from lamp to lamp is 40 yards. The result is most gratifying; and the greatly improved illuminating effect is highly commended, affording much satisfaction to the members of the Committee.

The illustration accompanying this article is from a photograph taken at night, and shows how well the roadways are now lighted. It will be noticed that the effect around the Campbell Monument is particularly good—both as regards the ground illumination and the effect on the monument, and the fronts of houses opposite.

The following figures may be of interest as regards the annual cost of lighting the $2\frac{1}{2}$ miles of streets alluded to above. On the basis of the lighting hours being 3400 per annum, with half the burners out at 11.30 each night, it works out as follows, with gas at 2s. net per 1000 cubic feet—the present price in the borough:

| | | | |
|--|------|---|---|
| Gas, including flash lights, and the extra gas used when the pressure is put on for the operations of lighting and extinguishing | £227 | 0 | 0 |
| Labour, cleaning lamps and burners, remantling, supervision, and inspection, at 35s. per week | 91 | 0 | 0 |
| | £318 | 0 | 0 |



High-Power Gas Lighting at Stoke-on-Trent.

With regard to the cost of mantles, &c., it is too early to state definitely; but from the experience at present (two months), it will work out under five per burner per annum. The cost of these, together with glasses and other renewals incidental to the upkeep of the installation, is estimated at £25 per annum. This makes a total of £343 per annum.

Further examination of these figures is necessary in order to realize what this means. The majority of the lamps in use are two-light—each burner consuming $3\frac{1}{2}$ cubic feet per hour; the illuminating efficiency per lamp being 280 candles. On this basis, the installation is equal to 116 two-light lamps; and the cost works out at less than £2 19s. 2d. per lamp per annum. For this, an illuminating effect of 280 candles is given up to 11.30 at night, and afterwards it is reduced by half until extinguishing time.

Readers will agree that these figures bear comparison with any low-pressure lighting installation in the country; and the gas authorities at Stoke-on-Trent are to be congratulated upon the success of the installation, as, in view of the figures, any competition from electricity is out of the question.

In the article on the "Public Lighting of Bethnal Green," which appeared in the "JOURNAL" last week (p. 645), the name of the Borough Surveyor, who accompanied the Works Committee in their tour of inspection of the improved street lighting by gas in London, should have been Mr. A. E. Darby.

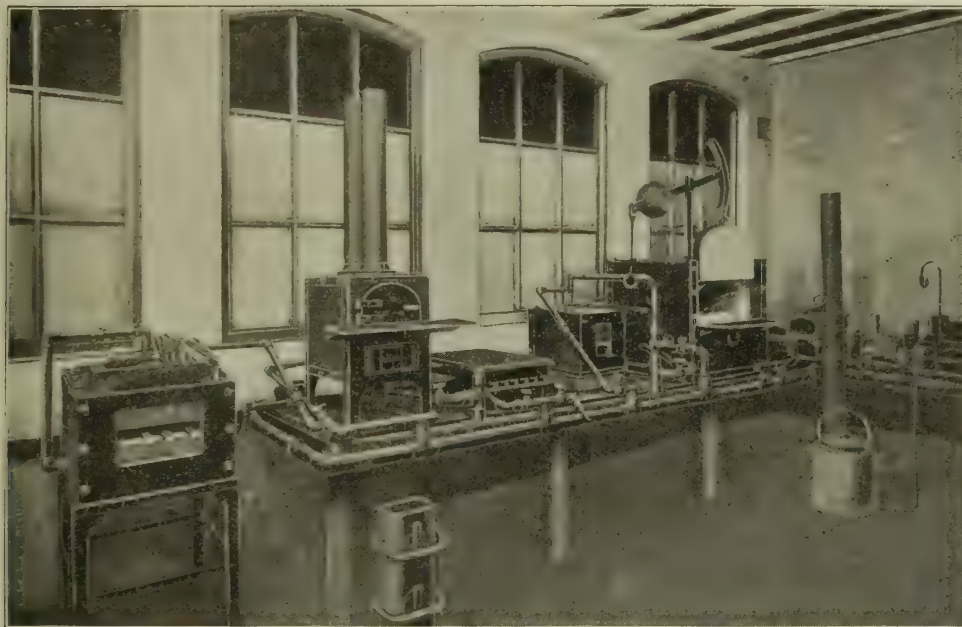
One of the latest of the useful pamphlets issued by the Anti-Socialist Union, of Victoria Street, S.W., is entitled "Co-Partnership." It furnishes a short account of the system, giving due prominence to the work of the late Sir George Livesey—who is justly styled "the pioneer of gas co-partnership," and cites recent examples of its adoption. The price of these pamphlets, in wrapper, is 1d. each.

GAS-HEATED FURNACES.

THE development of the industrial uses of gas is a direction in which, as previous articles in the "JOURNAL" have shown, we believe fruitful work can be done; and therefore we have pleasure in calling the attention of our readers to some interesting particulars relating to the subject received from the Richmond Gas Stove and Meter Company, Limited. The particulars have reference to the development of their gas-furnace department, with some general information concerning the construction and application of the furnaces they have supplied to some of the leading industrial concerns in the country. The Company will shortly issue a further comprehensive catalogue; their present one being confined to patented natural draught furnaces. From

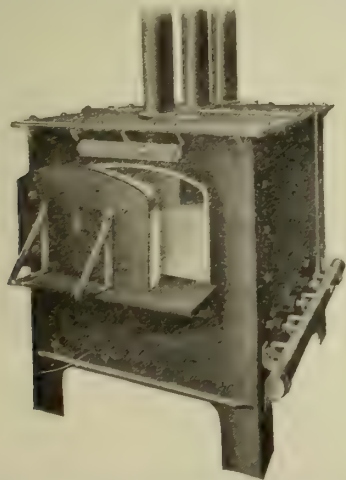
what we have before us as to the large number of furnaces of the later design already supplied for natural draught, gas with air blast, and high-pressure gas, there is sufficient evidence to convince one that the Company have a thorough grasp of the varied requirements in connection with modern manufacturing processes; and they may claim a conspicuous success in having supplied the largest plant in the country for gold and silver refining with town gas consumed in specially designed natural draught crucible furnaces, particulars of which will be given presently.

The Company are now, and have been for some time, giving close attention to experimental work in connection with the use of high-pressure gas for furnaces—a subject which has been referred to in previous articles. They draw a distinction between natural draught and blast, both of which may claim the most efficient and economical working results according to the duty required of them.



Special Room of the Sheffield Gas Company, Fitted with Richmond's Furnaces, for Showing them in Action to Manufacturers.

Gaseous fuels and their superiority over direct-firing have been much discussed, with advantage to the former; and it should be emphasized that the same reasons apply to town gas supplied at a reduced price for industrial purposes for small furnace work. In many of the intricate mechanical heating processes, town gas is not always the cheapest fuel; but no other kind of fuel can be used with such advantages—advantages that completely outweigh the importance of the fuel account. The Richmond Company illustrate a case in point. A leading manufacturer using a natural-draught twin-oven annealing furnace (as illustrated) saved the cost of the furnace in a few months by being able to heat stamped hollow-ware gradually with an absolute uniform heat. The pre-heating chamber (upper oven) is heated with the waste products of the lower one; and the amount of work put through the furnace without any waste through fractures (all too common with the old method of annealing) passed the expectations of the user.

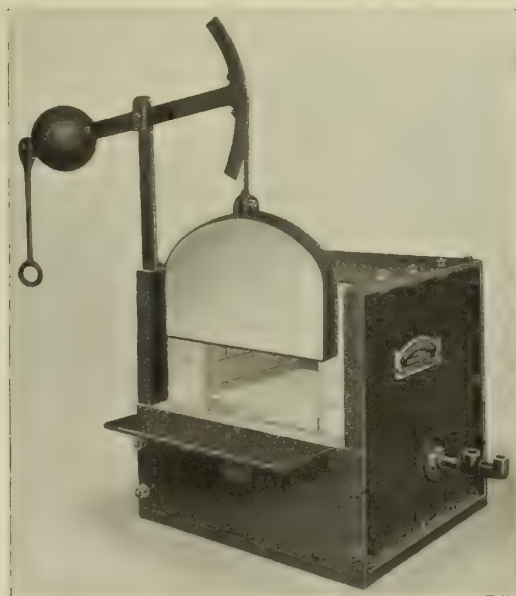


Type of Furnace Supplied to the Leading Manufacturing Silversmiths in Sheffield and Birmingham. The Twin-Oven above referred to has an Upper Oven of the Same Dimensions as the Lower.

This type of annealing furnace is worked most economically with natural draught. An oven furnace of the same type, having a single chamber measuring 36 in. deep and 24 in. wide by 12 in. high, may be maintained at a temperature of 800° C., with a consumption of 180 cubic feet of gas per hour (for the first hour-

and-a-half about 600 cubic feet are required to thoroughly heat the brickwork).

The series of natural draught crucible melting-furnaces are also of a very efficient character. The largest furnaces are worked with single giant burners, with an arrangement for pre-heating the air before it mingles with the flame. The combustion chamber and flues are so arranged as to obtain the highest efficiency possible, which is proved by the following results: Gold refining—Quantity in crucible, 400 oz.; gas consumption, 80 cubic feet; time taken, 24 minutes. Large installations of these crucible and annealing oven furnaces have been supplied to leading and well-known gold and silver refining firms in this country, and are giving the most satisfactory results.



Blast Oven Furnace.

There is a series of blast-oven furnaces particularly well adapted for hardening tools made of high-speed steel. In the furnaces of this class, gases (the products of combustion) surround the work

being treated; thus reducing oxidization to a minimum. The flame does not come into direct contact with the work as in forging furnaces. Twist drills, reamers, &c., which have a tendency to warp when heated, may be successfully treated in a vertical cylindrical furnace, worked with a cyclone flame. The articles are hung or placed vertically, and thus avoid flame contact.

All furnaces designed for gas with air blast may be also adapted to high-pressure gas, which in many cases is preferable.

Natural-draught furnaces are generally considered as being economical and preferable where heats not exceeding 800°C. are required for annealing purposes, provided the bulk and weight of the articles to be heated are not such as to cause sudden cooling down of the furnace in which they are heated.

The Richmond Gas Stove and Meter Company, Limited, have once more asserted, by the development of this gas-furnace department, their reputation for enterprise. They have supplied furnaces for the fitting up of permanent test-room installations at the Sheffield United Gaslight Company's furnace rooms, for the Newcastle and Gateshead Gas Company, and for the Glasgow Corporation Gas Department (Tradeston Works). These installations give a fair idea of their typical furnaces. There is scarcely an industrial town north of London and Bristol in which gas-furnaces may not be sold; and gas undertakings—company and corporation—will do well to give very serious consideration to this branch of business. The Sheffield Company have been very much alive to this new source of revenue; and there the furnace trade, as references at the meetings of the Company have shown, is being pushed with considerable success. Gas engineers and managers would, wherever situated, not be wasting time in looking into this interesting and important subject. The manufacturer is inclined to be reticent at times; but give him a reasonable chance of seeing a furnace in operation for test purposes at the gas-works or fitting shops, and it will certainly convince him far better than the most expert information.

Let it be remembered that many gas-furnace users are of more importance individually to the gas company (from a gas consumption point of view) than a street of 150 slot consumers, in support of which statement it may be added that there are now three firms alone, using Richmond gas-furnaces, who consume in the aggregate no less than 30 million cubic feet per annum.

PUBLIC LIGHTING—COMPETITION AND CHARGE.

A RETROSPECT AND A FORECAST.

[COMMUNICATED.]

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(Continued from p. 622.)

In this year (1862), in preparing the contracts for the public lighting, consideration was given as to the best means to be adopted for ensuring the full supply of gas to the public lamps. Dr. Letheby was of opinion that affixing meters was the best way of ensuring that the gas contracted for was supplied. It is worth remark that Dr. Letheby when he recommended meters, did not state that the proper quantity of gas was not given.

Experiments, however, were made with meters; and the evidence obtained showed that, when they were used, the Great

Central Consumers' Company were giving more gas than was required by contract, and that another Company supplying the same district was giving less than the contract quantity. The following table shows the results of the tests on this Company's district. For the first three nights after the meters were affixed,

| | |
|--|----------------------|
| Of the 31 meters to the 3-feet burners, | Cubic Feet Per Hour. |
| 20 showed a consumption of | 2' 59 |
| 11 | 3' 33 |
| The 6 meters affixed to the 5-feet burners showed a consumption of | 4' 68 |

It was not considered essential that meters should be affixed to each lamp; but the gas companies insisted upon this being done, if the charge was by meter. The lighting and maintenance were done by the local authority. The authority resolved to pay by meter, and to affix a meter to each lamp and assume the charge of lighting, cleaning, &c.

The results showed, with regard to the lamps fitted with carburetors, those with meters gave about 58 per cent. more light than those without them; while without carburetors the lamps with meters gave some 55 per cent. more light than those without them, consuming nominally 3 cubic feet of gas per hour, gave superior light to lamps without meters burning nominally 5 cubic feet per hour. This almost seems to imply that the worthy doctor had his doubts as to whether the burner nipples on the metered lamps had not been surreptitiously enlarged by the gas companies. At the same time, a series of pressure tests were taken. The four following are from a long list.

The results of the pressure tests showed the following readings, which are of interest by comparison with modern pressures.

| | The Pressure had | |
|--|------------------|------------|
| | A Maximum. | A Minimum. |
| In the district of the Great Central Gas Company | 19-10ths | 7-10ths |
| In the district of the Chartered Company | 14-10ths | 6-10ths |

The pressures were taken between sunset and sunrise only.

One method of testing the public lamps in 1862 for efficiency in illuminating power is interesting. It arose out of the question of the quantity of light given by public lamps varying considerably; the variation being not only between different lamps, but at the same lamp at different periods of the night, and would account partially for the extreme differences of opinion (then publicly stated) as to the efficiency or non-efficiency of the public lighting. It having been reported that there was a manifest difference between the light afforded by the lamps that had meters and those without, Dr. Letheby—the inventor of the photometer bearing his name—took circuits of inspection, and found it was very evident indeed. The means of a considerable number of rough observations were taken by Dr. Letheby to ascertain the distance at which a given object was visible, which showed that—

| | Strength of Light. | |
|---|------------------------|---------------------|
| | Without Meters. Yards. | With Meters. Yards. |
| At lamps with * carburetors (3 cubic feet per hour, contract supply) | 4' 378 | 5' 512 |
| At lamps without carburetors (5 cubic feet per hour, contract supply) | 4' 758 | 5' 925 |

* Naphtha carburetors fixed to public lamps by the United Kingdom Carbureting Gas Company.

Public Lamps.—Register of Pressures of Gas.

| Date. 1862. | Time. | SITUATION. | PRESSURE. | | | | | | Gas Company Supplying Lamps. |
|----------------|------------|---|----------------|-------------------|-------------------|----------|----------------------|---------|---------------------------------|
| | | | Lamps. | | With Carburetors. | | Without Carburetors. | | |
| | | | With Meter. | Without Meter. | Inlet. | Outlet. | Inlet. | Outlet. | |
| Oct. 8 | 11 P.M. | Opposite No. 31, St. Paul's Church- yard. | .. | Yes. | 11-10ths | 11-10ths | .. | .. | Great Central. |
| " 8 | 12 .. | | .. | " | 10-10ths | 10-10ths | .. | .. | |
| " 9 | 1 A.M. | | .. | " | 10-10ths | 10-10ths | .. | .. | |
| " 9 | 2 .. | | .. | " | 10-10ths | 10-10ths | .. | .. | |
| " 9 | 3 .. | | .. | " | 10-10ths | 10-10ths | .. | .. | |
| " 9 | 4 .. | | .. | " | 11-10ths | 11-10ths | .. | .. | |
| " 9 | 5 .. | | .. | " | 12-10ths | 12-10ths | .. | .. | |
| Oct. 8 | 11.15 A.M. | Opposite No 26, St. Martin's-le- Grand. | .. | Yes. | 10-10ths | 10-10ths | .. | .. | Great Central. |
| " 8 | 12.15 .. | | .. | " | 9-10ths | 9-10ths | .. | .. | |
| " 9 | 1.15 .. | | .. | " | 9-10ths | 9-10ths | .. | .. | |
| " 9 | 2.15 .. | | .. | " | 11-10ths | 11-10ths | .. | .. | |
| " 9 | 3.15 .. | | .. | " | 11-10ths | 11-10ths | .. | .. | |
| " 9 | 4.15 .. | | .. | " | 12-10ths | 12-10ths | .. | .. | |
| " 9 | 5.15 .. | | .. | " | 12-10ths | 12-10ths | .. | .. | |
| Oct. 8 | 11.30 P.M. | Opposite No. 10, Aldersgate Street. | .. | Yes. | .. | .. | 8-10ths | .. | Chartered. |
| " 9 | 12.30 A.M. | | .. | " | .. | .. | 8-10ths | .. | |
| " 9 | 1.30 .. | | .. | " | .. | .. | 8-10ths | .. | |
| " 9 | 2.30 .. | | .. | " | .. | .. | 8-10ths | .. | |
| " 9 | 3.30 .. | | .. | " | .. | .. | 8-10ths | .. | |
| " 9 | 4.30 .. | | .. | " | .. | .. | 8-10ths | .. | |
| " 9 | 5.30 .. | | .. | " | .. | .. | 8-10ths | .. | |
| Oct. 10 | 11.5 P.M. | Opposite No. 1, Princes Street. | .. | Yes. | .. | .. | 9-10ths | .. | Chartered. |
| " 12 | 12.5 A.M. | | .. | " | .. | .. | 8½-10ths | .. | |
| " 11 | 1.5 .. | | .. | " | .. | .. | 7-10ths | .. | |
| " 11 | 2.5 .. | | .. | " | .. | .. | 7-10ths | .. | |
| " 11 | 3.5 .. | | .. | " | .. | .. | 7-10ths | .. | |

In the lighting contract for 1862 the details of illuminating power were omitted; and in their place the flame of the 5-foot batwing burner was described—viz.: "It was agreed and declared that the gauge of each burner shall be such as will, on the cock being turned full on at a pressure of 5-10ths, allow the quantity of 5 feet during each and every hour, and the dimensions of the flame of each light shall be not less, on an average, than three-and-a-half inches in width and two-and-three-quarters of an inch in height, and such flame shall be regular and nearly level." In the event of a burner consuming less than the quantity specified, the company were to be fined a sum of £20 in each case; and the authority were to have the power to remove burners to test and to affix meters. For the first time the parliamentary candle power was incorporated in the contract—e.g.: "The gas supplied shall be of the quality prescribed by the Metropolis Gas Act, 1860; and if the gas supplied by the company shall at any time be inferior in illuminating power, the company shall forfeit and pay the sum of £100 for each offence, and, in addition, £10 per day for each offence after notice."

In the lighting contracts for 1867, 1868, 1869, and 1870, instead of the flames of the batwing burners being required to be 3½ in. by 2½ in. in size, it was specified that they be "regular and nearly level at the top"—a difficulty no doubt having been encountered in previous years in keeping the flame to the correct width and height. The clause enabling the authorities to come in and light with "oil or in any manner," in view of default, was still kept in the contract. Power to "assign or to part with the contract to any other company" was forbidden. The illuminating value of the light was to be of the "power prescribed by the 25th section of the Metropolis Gas Act, 1860. The benefits of clause 37 of this Act (giving special benefits to local boards) was also incorporated in contracts. But in the year 1870, section 54 of the Gas Act of 1868, with regard to price, was inserted in the contract. At this time, all "cockspur" burners were eliminated; and for the first time 6-foot burners were introduced, also power to fix carburators and meters. The unusual long list of penalties were kept in these contracts—viz., 20s. per burner for every burner not consuming the required amount of gas, 10s. per lantern that remained broken after twenty-four hours, 2s. 6d. per night for every lantern or burner not cleansed, 10s. for every lantern not painted, 10s. per burner per night for such burner as was not in lighting during the hours between sunset and sunrise.

In 1864, the question of public gas supply to lamps was dealt with exhaustively, and the prices which had now risen through the passing of the Metropolis Gas Act of 1860, had caused the "annihilation of competition" owing to the assignment of districts of supply to the thirteen Companies under the Act. For it was maintained that when, in 1822, Sir William Congreve (who was appointed to inquire on behalf of the Government into the lighting of the Metropolis) gave to the Metropolitan Gas Companies a well-defined district each, yet between this year and 1849 the prices for public lighting came steadily down in the 26 years from £5 5s. to £4 4s. for lamps consuming 5 feet of gas per hour. So much for the period of "districting."

From 1850 to 1860 there was ten years of unrestricted and cut-throat rivalry, known as the "competitive period," when the prices more rapidly fell from £4 4s. per 5-foot burner lamps in 1850 to £2 9s. 6d. in 1854. But on the introduction of the Metropolis Gas Act on Jan. 1, 1861, the price of gas was raised from 4s. to 4s. 6d. per 1000 cubic feet, although the Great Central Company had a bond with the local authority never to increase the cost beyond 4s. Gas was now 12½ per cent. higher than it was for twelve years previously, and the illuminating power was not so high as in the days of competition with gas at 4s.; while the annual price of the 5-foot lamps of the Chartered Company went up to £5 9s. 6d. each, or 4s. 6d. more per lamp than they were in 1823 with gas at 15s. per 1000 feet, and the Great Central Company charged £5 8s. 6d.

The difference in price charged for public lamps during the forty years ending 1862 is set out in the following table, showing it to be 84·03 per cent. dearer than in 1853—i.e.,

| 1853 | per cent. dearer than in | 1862 |
|-------|--------------------------|------|
| 15·87 | " " | 1827 |
| 21·66 | " " | 1832 |
| 30·36 | " " | 1844 |
| 41·29 | " " | 1851 |
| 52·08 | " " | 1852 |
| 41·29 | " " | 1853 |
| 84·03 | " " | 1859 |
| 73·81 | " " | 1862 |
| 33·54 | " " | 1856 |
| 30·36 | " " | 1856 |
| 24·43 | " " | 1859 |
| 21·66 | " " | 1859 |
| 15·87 | " " | 1862 |

Competition period.

It was stated that from the period when gas was first used in the public lamps the companies supplying them dealt liberally with the local authorities, "for the ample light which was given is well recollected by those officers under whose observation it mostly came—indeed, it is only within the last few years that the diminished light has become a matter of notoriety, and the subject of incessant complaint by the public." It was the opinion that the falling off in the intensity of the public light, dated as far back as the year 1853, when the charge for the lamps was at the lowest point. These continued and grave defects that were "becoming a matter for public anxiety" was the cause of the introduction of meters for public lamps, before mentioned. It is interesting to note that the first meter was fixed on Sept. 2, 1862.

To increase the illuminating value of the gas, carburating with naphtha at the public-lamp burner was resorted to, when the city authorities, in 1863, undertook the carburetting of the gas themselves, and saved in the southern district alone £1000 in that year.

For the 1864 lighting contracts, the three Companies before mentioned were approached, and tenders requested for lighting the streets. As before, specifications with the ordinary conditions were prepared; but the Companies took no notice whatever of them, and merely stated that they tendered under the conditions of the Metropolis Gas Act, 1861. The authority, having the "bond" with the Great Central Company, endeavoured to put it in force; but in the case of *Great Central Consumers Company v. Clarke*, taken in the Court of Common Pleas at Westminster for the purpose of testing it, the Judges of the Court decided, on Dec. 6, 1862, that the Metropolis Gas Act, 1860, did override the agreement entered into by the Great Central Company, and they were empowered to advance the price of gas. This judgment was confirmed by the Court of Exchequer Chamber.

(To be continued.)

ASSOCIATION OF GAS AND WATER ENGINEERS OF AUSTRIA-HUNGARY.

Annual General Meeting at Innsbruck.

The Twenty-Ninth Annual General Meeting of the Association was held at Innsbruck on the 26th to the 29th ult., and was attended by some 120 members and guests.

The customary reception was held on the evening of the 26th ult. by Herr Anzböck, of Vienna, who represented the President of the Association—Professor Friedrich, of Vienna, who was unavoidably detained elsewhere. Speeches of welcome to the Association were made by representatives of the Municipality, and an appropriate reply was made by the Chairman. Dr. Blum, of Berlin, one of the Honorary Members of the Association, also spoke. The technical proceedings commenced the following day, under the chairmanship of Herr Anzböck, of the Imperial Continental Gas Association's works at Vienna, who delivered an inaugural address of welcome. He was followed by Councillor Krapf, who spoke on behalf of the government of the district. Other complimentary addresses followed; and the Chairman then presented the annual report of the Association. From this it appeared that there were now 356 members, and that two important pieces of work had been carried out by the Association in the course of the past year. One was the establishment of an experimental works for the investigation of gas-lighting, fuels, and furnace plant, at the Technical College at Vienna. The works were opened November, 1909, and were now in full swing. The Association had contributed to the establishment of the works, and had promised to find for the first three years the remuneration of 800 kronen per annum for an assistant. The second departure was the establishment of a course of training for gas and water fitters, for which the Vienna Corporation had provided a suitable school. This course started on March 1 last. The "Zeitschrift" of the Association (from the last number of which this account of the proceedings at the general meeting is taken) was reported to be making excellent progress.

Herr O. Peischer, the Manager of the Innsbruck Gas-Works, next gave a description of the works, with particular reference to the installation of settings of horizontal carbonizing chambers, of which a description was given in the "JOURNAL" a short time ago (see Vol. CX., p. 231). Dr. R. Geipert, of Berlin, then gave an address, on "Retorts or Large Chambers," which was followed with great interest. It gave rise to a long and lively discussion, in which, among others, Herr Bössner, of Vienna, Herr Benninghoff, of Dortmund, Professor Strache, of Vienna, and Herr H. Koppers, of Essen, participated. A summary of Dr. Geipert's address will be given in the "JOURNAL" shortly, in so far as it contains matter not already dealt with in other papers by him recently published (see "JOURNAL," ante, pp. 167 and 169).

The proceedings on the 28th ult. opened with the election of Vice-Presidents and Members of the Council of the Association for the ensuing year; and it was decided that the next year's meeting should be held at Brünn. The following papers were then read: "Bauduins' Distance-Indicator of Gas-Pressure and Water-Level," by Herr F. Lux, of Ludwigshafen; "Novelties in Apparatus for the Utilization of Gas," by Herr Rösenbeck, of the firm of Friedrich Siemens, of Dresden and Vienna; "Gas-Meters," by Herr Wellard, of the Danubia Company, of Vienna; "Advances in High-Pressure Inverted Lighting," by Herr Max Scholz, of Berlin; "Gas Fires and Cookers as a Means of Increasing the Sale of Gas," by Herr G. Meurer, of Tetschen; and "Notable Advances in Gas Cooking and Heating, and a New Metal Coating in Place of Enamel for Cooking and Heating Apparatus," by Herr Schöne, of Harzgerode.

After these papers had been read, a resolution was passed deprecating the proposed imposition of a tax on light and gas in Austria; and instructions were given for copies of it to be forwarded to the Minister of Public Works and the Minister of Commerce. With a vote of thanks to the Chairman for his able conduct of the proceedings, the technical business of the meeting was brought to a conclusion.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to Malvern.

It was obvious, as one glanced at the programme, and saw the words "June 11—Visit to Malvern," that something which would be likely to combine pleasure with business had been arranged for the final fixture of the 1909-10 session of the Midland Junior Gas Engineering Association, and that the date had been chosen so as to offer the greatest prospect of securing the maximum of enjoyment. Unfortunately, on Saturday, owing to the mistiness of the atmosphere, the beauties of the district could not be fully realized; but whatever may have been the shortcomings of the meteorological conditions in this respect, there was certainly nothing wanting in the welcome which awaited the sixty or seventy members who joined in the outing. The Malvern Urban District Council not only gave permission for an inspection of the gas and electricity works, but they went further, and provided conveyances to take the visitors to the works, and subsequently for a drive. The Chairman (Mr. F. A. Moerschell) and members of the Gas and Electricity Committee, too, showed their interest in the Association by joining in the proceedings. Arriving at Malvern Link, a start was made with the first item on the programme—the inspection of the Malvern Link Gas-Works, over which (as well as afterwards over the electricity station) the members were conducted by the Engineer and Manager (Mr. J. W. Rendell Baker), who was assisted by Mr. Greenhalgh (the Assistant Electrical Engineer), Mr. A. Hancox (the Gas-Works Foreman), Mr. Houghton (the Gas Distribution Foreman), and other members of the staff.

Seeing the neat appearance of the gas-works and their attractive surroundings, one was tempted to envy Mr. Baker his lot. But even in Malvern there is something to contend against; and this "something" is a heavy capital account. To keep this down as far as may be, everything possible is done out of revenue; and, of course, in connection with all questions of extensions and improvements, "cost" is a most important consideration. It is gratifying to note, as showing that there is a determination to keep abreast of the times, that the whole of the streets are lighted by 1100 lamps, all of which are fitted with incandescent burners. There are some 63 miles of mains; and with a consumption last year of 133 million cubic feet, the unaccounted-for gas amounted to about 5 per cent. The improvement that has been secured in the latter respect by Mr. Baker (through the carrying out of extensive repairs), will be apparent when it is mentioned that five years ago the percentage of unaccounted-for gas was close upon 15.

To return to the inspection of the works, the visitors were first taken through the carpenters' shop, the smithy, and the engineering repair shop, and found them to be well fitted up, light and airy, and generally comfortable. The gas-works adjoin the Great Western Railway, and are equipped with sidings, which run into the coal-stores—there is, it may be remarked, storage room under cover for about 1800 tons. When the waggons arrive, they are, after passing over a weighbridge, end-tipped, by means of a belt-driven ram; and the coal is subsequently dealt with by breaking and elevating plant, which is in duplicate. The retort-house, which is 127 feet long and 52 feet wide, contains ten settings of eight retorts, each 20 feet long, set at an angle of 32°. The members were able to see one setting in course of renewal. There are four coal storage hoppers provided, each of an approximate capacity of 17 tons; and the charging arrangements are of the Shoubridge type. The coke from the retorts is discharged through an opening in the floor into tip-waggons, and quenched outside the house. The statutory power at Malvern is 16 candles; but Mr. Baker makes 17½-candle gas. Using North Wales, North Staffordshire, and South Yorkshire coal, he gets a production of 11,600 cubic feet per ton.

Of the usefulness of retort-house governors, Mr. Baker seems firmly convinced; and he has two of the Braddock type installed, through which the gas passes along the foul main to the annular condensers, and to a Livesey washer and a Clapham scrubber. The exhaustor-house contains four of Waller's exhausters, two of which are used (with Bryan-Donkin diaphragm governors) in connection with a high-pressure plant which aroused a considerable amount of interest among the members. The storage depôt for Great Malvern is situated at the electricity station, which is a considerable distance from the gas-works; but the only storage capacity for gas for the Malvern Link area is a 20,000 cubic feet single-lift holder at the gas-works. It being found impossible with this small holder to cope satisfactorily with the demands for gas, the plant referred to was installed last winter as a form of booster to give pressure on the Malvern Link district. These two exhausters were formerly employed solely for pumping gas through the trunk main to the storage station for Great Malvern; and connections are taken off to feed the holders at the electricity works as hitherto. Thus, instead of a pressure of perhaps 11-10ths when Sunday cooking operations are going on, it is possible to give the Malvern Link consumers from 28 to 30 10ths; and since this arrangement has been in operation, not a single complaint of ineffective cookers has been received. In fact, in many directions, Mr. Baker is able to show that he has done good work during his period of engineership at Malvern; and no doubt he will do more.

Among the other plant to which attention was drawn, there were two Lancashire boilers fitted with Wilton furnaces, feed-water heater, and boiler feed-pumps, and apparatus capable of

manufacturing a ton of sulphate of ammonia per day. Trouble was at one time experienced with regard to the effluent from the sulphate-making operations; but Mr. Baker recently installed a purification process which has thoroughly effectively solved this problem. There are eight purifiers—two 17 feet by 19 ft. 6 in., two 13 feet by 17 feet, and four 9 feet by 17 feet—but plans and specifications are in hand for increasing the size of these units to deal with the present make of gas. Mr. Baker was able to show his visitors a quantity of Lux purifying material, which he is now using mixed with coke-dust, and which he intends to try also with sawdust. The station meter is of the Parkinson and Cowan type, of a capacity of 60,000 cubic feet per hour.

The party having lingered at the gas-works as long as time would allow, and having been photographed at the entrance to the station-meter house, the drive was resumed to the electricity works. This branch of municipal enterprise has been in operation for some six years; and the installation is now self-supporting, while at the same time the sale of gas has not decreased. As already stated, the gas for the supply of Great Malvern is stored at the electricity works; there being for this purpose three gas-holders—one, of 500,000 cubic feet capacity, rope-guided, and two smaller ones, of 74,000 feet and 149,000 feet capacity respectively. Two water-loading governors are provided for this district—one a Parkinson and Cowan, and the other a Braddock. The Gas Department is still further represented at the electricity station by stores and a cooker cleaning and repairing shop.

As to the electrical plant, the boiler-house contains two Lancashire boilers, fitted with Wilton furnaces, which are used for the destruction of approximately 3500 tons of refuse per annum, and provide a portion of the steam for the generation of electricity. There are also a feed-water heater and boiler feed-pumps. The engine-room contains two 100 K.W. and one 50 K.W. alternators, generating electricity at 2000 volts, which is discharged through a high-tension Ferranti board to the various sub-stations in the Malverns, where it is transformed down to 100 volts. The equivalent of 16,500, 30-watt lamps are now connected.

The inspection completed, the conveyances were once more requisitioned, and the visitors were driven to the Imperial Hotel, where they were entertained at tea by Mr. Moerschell.

The PRESIDENT (Mr. A. O. Jones) proposed a hearty vote of thanks to the members of the Malvern Urban District Council, and particularly to the Chairman and members of the Gas and Electricity Committee, who had taken such a great deal of trouble to make the visit an interesting and enjoyable one to them all. Mr. Moerschell had presided over the Gas Committee for a series of years, with credit to himself and the Committee; and the Association heartily thanked him personally for the hospitality extended to them, and the Committee generally for the good time they had given them.

Mr. R. J. ROGERS (Birmingham) seconded the motion, and remarked that the members of the Association owed a great deal to such public-spirited gentlemen as Mr. Moerschell and the members of the Committee, for their hearty invitation to Malvern and the pains they had taken to make the visit so instructive and enjoyable. A great deal had been said recently as to the dual control of gas and electricity undertakings; and the matter was receiving the attention of some concerns having such joint control at the present time. But from what the members had seen that afternoon, he was sure they would all agree with him that the Malvern undertaking in its combined form was a very satisfactory one, and redounded to the credit of all concerned—to the Chairman of the Committee, and the Engineer and his staff.

The vote having been carried by acclamation.

Mr. MOERSCHELL responded. He said that when Mr. Baker, to whom they were indebted that afternoon more than to any member of the Council, brought the proposal before the Committee, it was agreed to with great pleasure, and had the unanimous support of the Council. In fact, they felt very pleased that Malvern was to be visited by an Association of members of what was to them so distinguished a profession, to whom they were indebted for the great privilege of having light when they most needed it. If the members carried away pleasant recollections of the afternoon's visit, the Council would feel amply repaid for any little trouble that had been necessary.

Mr. JAMES HEWETT (Saltley) proposed a vote of thanks to Mr. Baker, to whom the success of the visit was so largely due.

Mr. W. H. JOHNS (Saltley), in seconding, remarked upon the order and cleanliness of the works.

The vote was heartily accorded.

Mr. BAKER, in response, stated that he felt that any efforts of his would have been useless but for the spontaneous and whole-hearted willingness evinced by his Council when the proposed visit was brought before them. As regarded himself, it was always a pleasure to him to do anything for the Midland Junior Association, for he felt that he was doing something for those who were helping themselves. This was evidenced by the splendid papers which had been read at their meetings; and he was sure anything that any member of the Institution of Gas Engineers could do for such an Association of Juniors, would be done with great pleasure. He extended to them individually a very hearty invitation to visit the works again any time they were in the neighbourhood of Malvern.

The members then again mounted the coaches, and were conveyed by the lovely road round the Malvern Hills. Though a slight fall of rain was met with, it did not succeed in marring the enjoyment of the ride.

WAVERLEY ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Edinburgh.

The Ninety-Fourth Meeting of the Waverley Association of Gas Managers was held in the Cathedral Hotel, Edinburgh, last Friday—Mr. H. RUTHERFORD, of Aberlady, the President, in the chair.

The PRESIDENT extended a hearty welcome to the members, and returned thanks for the honour which had been conferred upon him by electing him President for the year. This was the second time he had held the office; the previous occasion being fifteen years ago, when Mr. Herring was present, and they gave him a very warm welcome. They were all very sorry he was about to leave them, because he had taken such an interest in their little Association. They hoped he might be spared for a long time to come, and have every success and prosperity in his new sphere of life. He (Mr. Rutherford) had been a member of the Association for thirty-two years, and he did not think that he had been absent on a single occasion. He hoped the members would find the meeting one of great usefulness. When he accepted the position of President a year ago, he intimated that he would not give an address, but they were to have a discussion which he hoped would prove beneficial to all.

OXIDE PURIFICATION.

The PRESIDENT then introduced Mr. R. W. COWIE, of Dalkeith, who, he said, was to open a discussion on oxide purification. He was sure they would all give Mr. Cowie a hearty welcome, especially as this was the first time he had been present at a meeting of the Association.

Mr. COWIE thought that the Committee of the Association had made a good choice when they selected oxide purification as the subject to be dealt with at the meeting, as it was one which every gas manager, no matter how small his works might be, could discuss with interest. He considered, however, the President had not been so fortunate in his choice when he selected him to open the discussion, as his experience of the particular method of purification referred to was very limited—he having adopted it only some nine or ten months ago. He was therefore unable to give any glowing accounts of boxes running for very long periods without being emptied and refilled; but no doubt some present would be able to furnish much really interesting information. His short experience, however, confirmed most of what he had heard in favour of oxide in preference to lime; and he would never think of returning to the use of the latter material. Should any member present be contemplating making the change, he could assure him that it would pay him to do so. The purifiers at Dalkeith were rather small; and in winter, when using lime, it was almost a constant job to empty and refill them. They were four in number, and were worked three on and one off, by means of a dry-faced centre-valve. When starting to use oxide, he did not wish to make the change too suddenly, in case he might experience what he had heard had troubled some managers—viz., the oxide failing to catch; in other words, passing foul gas while it was clean itself. As each lime box became fouled and out of action, he refilled it with lime and oxide—placing the lime in the bottom layer and the oxide on the top. Thus the boxes were filled with lime and oxide; and if the oxide failed the first time it was exposed to foul gas, the lime did the work. As each box again became fouled, he filled it with oxide only, using that which had been fouled and revived along with fresh oxide. This, again, was done with each box till all were filled with oxide only. The method described had effectually prevented the oxide passing foul gas. In his case, the gas entered the purifiers at the top, and passed down through the purifying material. He considered this to be a better way of working than passing the gas up through the mass. The moisture formed by the chemical action in the purifier was thus deposited on the top of the oxide and kept it moist; whereas if it were to form or be deposited on the oxide between the spars of the grids, there was greater liability to choke them, and to cause back-pressure. It was not until he had all his boxes filled with oxide that he started to introduce a small percentage of air. At first he used the high pressure of gas at the outlet of the exhauster as an injector for putting in the air at the inlet to the condensers; but this proved too erratic and uncertain. He discarded the method, and then used a steam jet to draw in the air through a wet meter, fitted with a copper drum, and with a dial showing the hourly rate of flow by one-minute observations. This meter was fitted with a back-pressure valve on the outlet, which prevented any chance of the crude gas from the condensers getting back to the meter should the steam be shut off and any back-pressure occur. This method of introducing the air was a very good one, and was reliable where steam was to be obtained. The only objection he had to it was that the condensed steam diluted the liquor too much, especially in summer, when the make of gas was low. He had just introduced a small rotary blower, driven from the exhauster pulley; and he considered this was really the best method of sending in the air. He introduced it to the gas at the condensers, and had to do so because of the steam. But with the blower it might be introduced to the purifiers direct. He should much like to hear what any of the members who had had larger

experience had to say on the point. He put in about 3 per cent. of air; and his boxes were doing splendidly. All the members present were doubtless aware that with oxide and no lime the carbonic acid was left in the gas, causing consequent reduction in illuminating power. This need scarcely trouble anyone nowadays, when the standard was becoming lower, and when most of the members used coals from the Lothians, which were more or less of a good gas-making quality. After working continuously for seven months, the air-meter did not operate quite satisfactorily; and on having it opened for examination he was very much surprised to see the state it was in. On the sides of it were sticking blocks of a soft, red substance, and on removing these he was surprised to see the metal quite pitted. This was probably caused by the fresh air being continually drawn through the water, and coming into contact with the wet surface of the inside of the meter, and thus rapidly corroding or oxydizing it. He had since had the meter filled with oil instead of water, and he had no doubt that its life would be very much longer, and that it would not require the frequent adjustment of the level, as the oil would not dry up. Shortly after changing from lime to oxide, he had a large number of complaints of dry and stiff joints and cocks in the consumers' fittings and cookers. Whether there was a more discontented spirit abroad, or whether the change in the method of purification had any connection with it, he did not know. There were a number of advantages which undoubtedly followed the use of oxide. In the first place, the cost of the material to purify a fixed quantity of gas was less than with lime. The labour was also much less, especially when a percentage of air was admitted to the purifiers. There was less wear and tear of the purifier grids, owing to much less frequent changing of material; and also a saving of gas, for the same reason. Moreover, purification could be effected without causing the bad smells inseparable from the use of lime; and there was less labour. The question of revivifying the foul oxide was one he had not touched upon; but it was one of great importance, and he trusted it would not be lost sight of in the discussion. Where the works were not well exposed to the winds, and in the open, he did not think it advisable to hasten revivification by the forceful admission of air and steam, because of the very objectionable smell caused thereby. There ought always to be a sufficient quantity of oxide in stock, ready to take the place of the foul material, and so give it plenty of time to recover by turning and watering. If the oxide were laid out in furrows, a greater surface would be exposed to the air.

Mr. A. ROSS (Burntisland) explained that he had used oxide of iron for the last four years, and his boxes were 10 feet square. Before changing, they passed $2\frac{1}{2}$ million cubic feet of gas through them. The cost for oxide was about £10 a year. They passed 22 million cubic feet of gas, and used no lime. At one time he sent in air through the purifiers; but he had taken off the air-meter altogether, and found it very satisfactory. In former years they paid more than £100 for lime.

Mr. P. BLAIR (Haddington) said when he originally started oxide purification he, like others, kept lime in reserve. First of all he had one sieve of lime and the other of oxide; but in a short time he gave this up. He had four purifiers, with a dry-faced centre-valve. He wanted to have a catch purifier, and he cut off one, and connected it up with a bye-pass for gas. He worked the three other purifiers in rotation—two on and one off; but he could work all of the purifiers. At the outset, he used the check purifier with lime. But after a time he found this material did very little good after the first fortnight; and as the oxide accumulated he filled up with oxide. As regarded the temperature of the purifiers, he took the exhaust steam from the exhauster, and put a 2-inch pipe three times round the bottom of the purifiers, so that the temperature was about 75° Fahr. He changed the purifiers twice a year—in the spring and in November. He was not troubled either with back-pressure or with moisture in the purifiers. All the moisture he used to get in the bottom of the purifiers was now carried off to a syphon between them and the holders. He used air, and had to reverse the valve—in winter every day, and in summer twice a week. The material was hard, and required a pick to get it out; and it had to be broken.

Mr. W. YOUNG (Penicuik) said he thought he was the pioneer of oxide purification in Midlothian, for he commenced about seven years ago. He was asked to try it. In their little gas-works it cost, when he went there, £43 a year for lime. There were four purifiers 10 ft. by 10 ft. by 4 ft., capable of dealing with three times as much gas as they made. This gave him a very great advantage. He filled three of them with oxide, and one with lime; and it was a wonderful revelation to him. In three years it cost them about £10 to purify their make of 9 or 10 millions. Till last year he was ree from any disturbance in purification; but in January he had occasion to empty two of the boxes and put in new oxide. All went well for a fortnight, and then it struck off. He could not understand this. He sought advice, and he was told to clear out the two new purifiers, and put in some dirty stuff. He did so, and it went all right. He put in about $2\frac{1}{2}$ per cent. of air, and found it acted excellently.

Mr. J. B. SCOTT (Cowdenbeath) said he had been purifying by

oxide for nine years. He had not experimented very much with it, having been quite content to get the best results in the usual way. The purifiers were small for the make of gas they now had. So long as the purifiers were of ample size for the make, they ran them sometimes eight or ten months, and never had a test-paper on the gas. The purifiers were getting too small, and he had to rush the gas through them, which meant that the oxide had not a chance of doing its work; and he had to be very careful, as otherwise they would find sulphuretted hydrogen. If they wanted oxide to be a great success, they must have ample purification accommodation; and then they must have a large stock of oxide. There must be ground enough for revivifying, and plenty of space in the boxes. There was no comparison between lime and oxide. Mr. Ross said he passed 2 million cubic feet of gas per box before changing, without air.

Mr. Ross explained that he used air for a year or two, but did away with it.

Mr. SCOTT said he introduced about 3 per cent. of air. The make of gas varied so much that they could scarcely expect men to regulate the injector to a nicety; but with about 3 per cent. he found no fault with it. He introduced it with an air injector. He did not think it mattered very much where the air was introduced; in fact, he had found it to be a good thing to have an air-pipe laid to each box, so that they could divert the air into any box they wished. His purifiers were 12 feet square. He had only three; and he had to work them two on and one off. They were 3 feet deep; so that his purifying space was limited for a 32 million make. Last year he was passing about $1\frac{1}{4}$ million feet of gas through each box. This year he was proposing to put down new purifiers; and he might mention that he was going to put them down large enough. The cost of purification with oxide, for the last eight or ten years, had been about 0.20d. to 0.35d. per 1000 cubic feet. They could only get the cost down to this figure by using oxide; and with this material they got rid of the dust and the heaps of rubbish lying about which they had with lime.

Mr. W. BLAIR (Helensburgh) said that about six years ago he started purification by oxide of iron, not altogether for economical reasons, but to reduce the nuisance caused when they were changing boxes, when using lime. He went in partly for lime and partly for oxide; but lately he had used oxide entirely. During the last five years, it had cost them, for purifying 289 million cubic feet of gas, £256. This worked out at 0.21d. per 1000 cubic feet. During the past year he had paid practically nothing for material. He had paid £8 for labour; but he had received £3 15s. for spent oxide, which brought down the cost of purifying 60 million cubic feet of gas to £5 13s. 4d., or 0.02d. per 1000 cubic feet. Purification used to cost them barely 1d. per 1000 cubic feet—material and labour. He introduced air. He first tried it at the hydraulic main, but afterwards brought it back to the inlet of the condenser, which was much handier, and avoided moisture settling in the pipe. There had been no difficulty with the meter during the six years he had had it. He was subject to a little back-pressure on the lower trays of the oxide. There were four boxes, 12 feet square, with centre-valve, working in direct rotation. He could work with one, two, or three on. The air introduced varied from $1\frac{1}{2}$ to $2\frac{1}{2}$ per cent.; but, it was practically *nil* at this time of the year. To give a greater run without having to change the boxes, he introduced to the lower tier what he called bye-pass valves. He had only changed his boxes once during the past year. He did not require to do it, but he was anxious to see the inside of them. There was no doubt that those who had had experience with oxide purification would never think of going back to lime. Apart from economy, they got rid of the nuisance they always had when changing a purifier box, which was one of the most disagreeable jobs a gas manager had. He would advise those who had not given oxide a trial to do so. It was true that the illuminating power of the gas was slightly reduced; but he enriched his gas $2\frac{1}{2}$ or 3 candles by benzol, and he did not take this into account.

Mr. W. BROWN (Cardenden) said he had only just begun purification by means of oxide, and he had three purifiers filled entirely with this material. There was no air-blower as yet; but he had purchased one. Up till now he had passed about 3 million feet of gas through his purifiers. From his experience with lime, he would never think of going back to it.

Mr. H. O'CONNOR, F.R.S.E. (Edinburgh), said perhaps he had had a longer experience with purification by oxide than anyone present, as it was more than thirty years since he first used this material. They always had two or more boxes with oxide, as well as lime purification. That was in London, where the gas had to be purified from bisulphide of carbon, and other sulphur compounds, as well as from sulphuretted hydrogen. The principal difficulty in the use of oxide had always been that it would not remove carbonic acid; and so long as the candle power of the gas was what it was required to be, this was a very important matter, especially in Scotland, because the Scotch coal contained a larger percentage of carbonic acid than the Newcastle and Durham coal used in the South. The difficulty had, however, now largely passed away, because they no longer wanted so much illuminating power in gas. Lowering by 5 per cent. meant a reduction of 1 per cent. of carbonic acid; and the calorific value of the gas would probably only be reduced to this extent. It was calorific value they wanted nowadays; so he thought the use of oxide would extend considerably in future, and, in his opinion, very wisely, especially where the oxide was treated with an addition of air, because then they would not only get rid of all the smells they had with the lime,

but also what little odour there was with the oxide itself. If they did not use air with oxide, they would have a certain amount of smell from the foul oxide when it was laid out; but if they used air, this smell would be done away with. There were two ways of getting oxide to start rapidly; one being to mix a little old material with the new. Another plan was to water the oxide, when it was first mixed, with weak ammoniacal liquor. This would make it start to work immediately. Another point which was of great advantage was the thorough washing of the gas before it went to the purifier. In some works the washing of the gas had been increased considerably. In one case which he had in his mind, he thought the quantity of ammoniacal liquor and tar amounted to 70 gallons per ton of coal. This was pretty high; and there was no question about it that this 70 gallons of tar and liquor contained a large percentage of sulphuretted hydrogen and carbon dioxide, which would otherwise be passing on to the purifiers, and have to be dealt with by them. There was no doubt that, for oxide purification, it was much better to have the purifiers of large size. If they had to use purifiers which were too small for the make, it was well to adopt some of the patent systems of grids, so as to enable them practically to fill the purifier with oxide, and yet obviate any great increase in their back-pressure. This would sometimes allow for double the quantity of gas passing through a purifier of a certain size. The trouble with the air-meter which contained a large amount of rust or deposit upon it might have been completely overcome if the air had been drawn primarily through a small water-seal, and then the seal-pot from time to time cleaned out, and care taken that no dirt, or probably oxide of iron, which might be flying about in the air, especially during warm weather, should get into the meter. The question of the temperature of the purifier was a most important one. He had in his mind a case in which he was called in to advise as to the purifiers, which had suddenly stopped. When he arrived at the works, he found that the purifiers, though they had a roof over them, were open on all sides to the weather, and that snow had blown in on to the top of the purifiers, and was lying some 6 or 8 inches thick. He immediately said: "There is the reason at once. The material has become so cold that purification is not taking place at all." He advised that steam-pipes should be used to get the purifier warmed, and that a partition should be put up a certain height, so as to prevent the blowing-in of the snow. He believed this completely removed the trouble. When lime and oxide were used together, they should certainly never be put in the same box, because the foul lime gradually got mixed with the oxide, which made less oxide for purifying purposes, and rendered it useless for selling. They should therefore keep oxide and lime quite separate. If they ever wanted to use the two, let the gas pass through the oxide first, and then through the lime. The reason for this was that the valuable part of the foul oxide, to the people who purchased it, was its content of cyanogen. If the gas first passed through lime, a very large proportion of the cyanogen would be deposited in the purifiers, and would be thrown away with the foul lime. If they passed the gas through the oxide first, the oxide would retain the cyanides, and they could then be recovered.

Mr. D. VASS (Airdrie) gave a brief description of what he did from the beginning. He said they were hampered very much in getting rid of their lime; and this was what put them on to oxide of iron. He had had experience with oxide in Greenock years before. He began by putting in a tray of oxide and then a tray of lime; but it was not long before he decided to work with oxide alone. He then fitted up a blower to every box. There was in his mind the danger of firing in connection with the blowing-in of air, drawing the plugs, and letting it go through. He was puzzling as to how to get rid of this danger when he observed a remark, made in connection with another works, that in the presence of foul gas and a mixture of air there was little or no revivification, but that in the presence of a pure gas and air a certain chemical action took place; and that in the works in question they had been working in that way—putting the gas into one box, then through the second box, and then sending it away. Then they reversed the action, and put the gas into the second box first, and back through the one which had been fouled. In this way they found that the second box, which was comparatively clean, took up all the impurity, and that the box which had been already fouled got purified. He began to consider how he might apply this, and he discovered that the best way of doing it was to put the second purifier on first instead of last. This was the principle of what they called the backward way of working. It was not a reversing of the blow, as was done in the other works; it was a reversing of the way of turning the valves. He wished to make this point clear, because many had an erroneous notion of it. The gas travelled in the same direction; but they reversed the turning of the centre valve. The theory of the method of purifying was that air which was not able to do its work in the first box because of the presence of an impurity, did it in the second box, when the impurity had been removed; and so they were given a clean box without the labour of having to open it. It would work with four three, or even with two boxes. His own idea would be to have three oxide purifiers of fairly good size, then two lime boxes, about the same size, by which he would catch carbonic acid gas, and then other two, of smaller size, with oxide, because when they passed gas through oxide and then into lime there were certain sulphur compounds which were broken up in the lime, and were not always captured before they left the lime box, but which would be caught in the oxide box. His idea would be seven boxes, two

of which would be catch boxes of lime and two of oxide. He had occasionally had difficulty in getting the material to catch, owing partly, no doubt, to its becoming cold; and for this reason he recently introduced a system of steam-pipes. He blew steam into the boxes; but great condensation took place, and now his arrangement was to put a steam-coil through the boxes, so as to bring up the temperature to from 55° Fahr. to 70° Fahr. He seldom had any difficulty with the material not catching. Perhaps at the beginning of winter, when the steam was not on, they might have trouble. He had found it was a good plan to bye-pass a portion of the scrubbing plant for a short time. In this way they got the ammonia into the purifiers; and this would catch all the sulphuretted hydrogen until the material began to act. He had found that by doing this he could bring back the boxes into action within 24 hours. Perhaps a little ammonia getting forward had been the trouble with the stopped cocks at Dalkeith; though he did not say it was. It might interest some of the members to know that in a few works they got very good results from using air with lime, pretty much in the same way as they were doing with oxide of iron; but the lime purifiers must be ample. A reaction took place, but only when the boxes were greatly in excess of the requirements of the works. His costs for labour were simply the expense of renewing four boxes twice a year. He could run longer, and he did so on one occasion; but he would not advise anybody to go more than half-a-year. When a box was opened, the material was found to be as hard as a briquette; but there was no difficulty with back-pressure. It was said that there was a danger of adding to the bulk of the material in the boxes by converting it into free sulphur, which would not rise freely enough, as it increased in bulk, and that an expansion took place, which, in large works, affected the side sheets of the purifiers. This might account for some things; and he would therefore advise everyone to open his purifier boxes at least twice a year. His working costs had been something like $\frac{1}{2}$ d. per 1000 cubic feet over a number of years; and he thought they would find that in most of the works where oxide was used the cost was from $\frac{3}{4}$ d. downwards, while in those where lime was employed his experience was that the cost was about 2d. per 1000 cubic feet. Mr. O'Connor said that the value of spent oxide was very much based on its content of cyanides; but in Scotland they had not a market for oxide on this account—they were dependent very much on the sulphur. He approved of what Mr. O'Connor had said as to using oxide first and lime afterwards. He also employed oxide alone.

The President proposed a vote of thanks to Mr. Cowie, and to the gentlemen who had taken part in the discussion.

Mr. Cowie said he was very pleased indeed that there had been so excellent a discussion. He must acknowledge that he had benefited by the experience of others. He had been thinking of what Mr. O'Connor had said about lime getting mixed with oxide; but if the oxide were put on the top, there would be no danger of mixing.

PROPOSED BENEVOLENT FUND.

The Hon. Secretary (Mr. W. Young, of Penicuik) submitted a proposal by a member of the Council for the formation of a Benevolent Fund in connection with the Association; the suggestion being that 6d. of the members' subscriptions should be applied to the fund, and that any surpluses which might arise in connection with the general fund, as well as donations, should be added to it.

Mr. Vass moved that the subject be referred to the Committee to prepare a scheme; and this was agreed to.

ELECTION OF OFFICE-BEARERS.

The following were elected office-bearers for the year:—

President.—Mr. R. W. Cowie, of Dalkeith.

Committee.—Messrs. James Gemmell, of Melrose, J. M'Laren, of Duns, and J. Hamilton, of Tranent.

Hon. Secretary.—Mr. W. Young, of Penicuik.

Auditor.—Mr. J. O'Halloran, of Edinburgh.

PRESENTATION TO THE PRESIDENT.

Mr. J. M'Laren presented to the President a gold-mounted silk umbrella, bearing an inscription; it being explained that the presentation was in lieu of the President's Medal, which Mr. Rutherford already had.

THE DINNER.

After the meeting, the members and friends dined together—Mr. Cowie in the chair. The toast of "The Waverley Association" was proposed by Mr. A. H. Hamilton, of Glasgow, and acknowledged by the President.

Subsequently a pleasant afternoon was spent by the company in the Marine Gardens at Portobello.

Mr. Balfour Browne on "State and Municipal Trading."—In the "JOURNAL" for the 26th of April last, we gave an abstract of a lecture delivered by Mr. J. H. Balfour Browne, K.C., before the British Constitution Association, on "State and Municipal Trading and Where it Leads." The lecture has now been published, with notes and in a wrapper, by the Anti-Socialist Union, of Nos. 58 and 60, Victoria Street, Westminster, S.W., at the price of 1d.

FUEL CALORIMETRY.

At the Meeting of the London Section of the Society of Chemical Industry, held at Burlington House on Monday last week, under the chairmanship of Dr. J. Lewkowitsch, Mr. G. NEVILL HUNTLY, B.Sc., F.I.C., read a paper on the "Accuracy Obtainable in Fuel Calorimetry." Mr. Huntly is one of the staff of Gas Examiners of the London County Council, and as such has had experience with the Boys calorimeter for determining the calorific value of gas. But his paper on this occasion dealt almost entirely with the determination of the calorific power of coal and other solid fuels in the bomb calorimeter of the Berthelot-Mahler type.

The author stated that the limit of accuracy of work with the bomb calorimeter using a mercury thermometer was about 2 parts in 1000; but rather a greater degree of accuracy was attainable if an electrical resistance thermometer was used. The Beckmann type of mercury thermometer, which has a scale divided into one-hundredth of a degree, and the range of which is limited to 5° or 6° C., cannot, according to Mr. Huntly, be read more accurately than to one-tenth of a division, or one-thousandth of a degree Centigrade. But so far as fuel calorimetry is concerned, he considers this degree of accuracy fictitious, because the terminal points of the limited scale are set according to a thermometer which is graduated in tenths of a degree; and the readings of the Beckmann thermometer consequently are dependent on the accurate calibration of the thermometer with the less open scale against which it has been set. Hence there is no real advantage in bomb calorimetry in using the Beckmann type of thermometer in place of a good thermometer graduated in tenths of a degree.

The merits of the French, German, and English makes of thermometer were discussed by the author, who pointed out the difficulty of reading thermometers with an enamelled background when the top of the column of mercury happened to coincide with one of the lines of the scale. The finest lines are used on French thermometers; and these have a width of 0.2 mm. Since 1 mm. represents approximately one-tenth degree, it will be seen that when the top of the mercury column coincides with one of the lines on the scale, it is impossible to read exactly, unless the thermometer has a clear-glass background, and can be turned round so that the reading may be made with the scale at the back.

The author proceeded to discuss the corrections which were required in a thermometer to ensure absolute accuracy; and he enumerated the following seven corrections which were necessary in precise thermometry: (1) Calibration; (2) for external pressure; (3) for internal pressure; (4) for change of zero; (5) for the value of a degree; (6) the stem correction; (7) for reduction to the hydrogen scale. Of these, calibration was the most important. The certificates given for thermometers by the Reichsanstalt gave the calibration corrections; but those issued by the National Physical Laboratory did not give the calibration corrections but merely the general correction deduced from the results of comparison with a standard thermometer. The limit of accuracy in a mercury thermometer, in practice, was about 1 in 1000.

The most important point in bomb calorimetry was the determination of the water equivalent of the instrument. This was usually done by the makers; and engineers and others adopted the figure so given without any idea of the limits of accuracy of the methods employed for determining the figure. There were three methods, of which that of burning a given quantity of a substance of known calorific power—such as naphthalene, benzoic acid, or sugar—was the most common. But the determinations of the calorific power of (e.g.) naphthalene made by Berthelot and other observers with extreme care differed by 1 to 3 parts in 1000; and consequently that represented the extreme limit of accuracy of the determination by this method of the water equivalent of the calorimeter. The more accurate method was that of putting a known quantity of heat into the calorimeter by an electric current, which was accurately measured. Other sources of error in bomb calorimetry were due to the assumption that the specific heat of water was constant, which is, of course, not the case, and to radiation and evaporation. Regnault's formula for the radiation correction was the basis of those generally used.

In conclusion, however, Mr. Huntly pointed out that the real difficulty in obtaining useful results in fuel calorimetry was the difficulty of sampling fairly a material such as coal. With the methods of hand sampling generally followed, however carefully they were carried out, two samples would not agree more closely than ± 0.5 per cent. in respect of the determinations of either ash, moisture, or calorific power. With the sampling machines which were in use in the United States (and in which a very large quantity of coal was crushed), the results on two samples would agree more closely. The error due to sampling was in any case as great as, or greater than, the possible errors of calorimetry if the calorimetric determinations were made with proper care. It was, however, in any case futile to return the results of determinations of the calorific power of fuel to the fourth figure, as the differences in consecutive determinations made with care frequently affected the third figure.

Dr. Brame, at the invitation of the Chairman, spoke a few words, in which he expressed his appreciation of the value of Mr. Huntly's paper, and emphasized the importance of the accurate sampling of coal and other fuel.

ASSOCIATION OF WATER ENGINEERS.

Abridgments of Papers and Discussions.

Continuing our report of the Meeting of the Association, we to-day extract the following from the papers and discussions.

RESERVOIR OUTLETS TO EARTHEN EMBANKMENTS.

By GEORGE N. YOURDI, M.Inst.C.E.

Embankment-making in Great Britain is, practically speaking, a matter of yesterday; and perhaps it would not be wide of the mark to say that the failure of the Dale Dyke Embankment in 1864 earmarks the date when the attention of water engineers was turned to the study of reservoir construction, and a revolution was made in the mode of providing proper, safe, and durable outlet arrangements to regulate and control stored waters. Practically up to the time of the failure of the Dale Dyke Embankment, the general practice was either to lay a line of naked pipes surrounded with puddle, or to construct a masonry culvert through or under the embankment. The outlet arrangements of the Dale Dyke reservoir consisted of two lines of 18-inch diameter spigot and socket cast-iron pipes, laid in a trench, and surrounded with puddle; each pipe line being controlled by a valve at the outer end. The trench to which the pipes were laid was under and through the embankment. The cause of the failure at Dale Dyke has never been satisfactorily explained, on account of the divergence of opinion expressed by the experts who were called in; and, like a good many other similar problems, it has been left unsolved.

Nothing can very well be worse than naked pipes laid through or under the made embankment, resting on, and surrounded by, a mass of plastic clay puddle, subjected, as this would be, to the unequal pressure due to the weight of the embankment. The pipes can never remain as originally laid; but sooner or later some of the joints must get drawn or a pipe or pipes become fractured, with the result that the water will have full play, and must very quickly effect the destruction of the works.

The obvious danger of the practice of laying naked pipes prepared the way for constructing a masonry culvert built in a trench under the made embankment; and at the point where the culvert crosses the puddle trench, a masonry or concrete pillar is brought up from the bottom of the puddle trench, with a view of giving it support, and preventing it yielding to the pressure brought to bear on it. The effect of this was, unfortunately, the breaking of the back of the culvert, owing to the unequal pressure and weight of the embankment on either side of the pillar acting on the ground supporting the culvert. To get over the difficulty, the slip-joint method was introduced. This consists of building the culvert in a series of lengths; each length being independent of the one against which it abuts as regards vertical bonding. In this way the rigid culvert was made articulated, and capable of responding to any tendency to settlement. On paper, this mode of allowing the culvert to accommodate itself to any tendency it may have to settlement, should work satisfactorily; indeed, it has been successfully carried out in a number of cases. There are, however, instances where it has proved a dire failure. The weakness of the "slip-joint" method lies in the fact that the settlement must be uniform, and the range of vertical movement small; otherwise jamming will take place with a crushing of the abutting faces, which will probably be accompanied by fracture. It is not, therefore, an arrangement to be recommended.

The doubtful practice of providing an outlet for the stored waters by means of a culvert of any kind through or under the embankment, and the numerous failures that have occurred with these methods, have induced many engineers to adopt an outlet arrangement consisting of a tunnel driven through and in the solid rock, passing round one end, and entirely disconnected from the embankment. The tunnel can either be made of a size to deal with flood water during construction and after, in which case there would be no need for a waste watercourse, or of a size just sufficient to permit of accessibility to the permanent draw-off pipes as well as for periodical examination of the work. The tunnel can be lined with cast-iron plates backed either with concrete or with a thin backing of cement grout injected pneumatically in the ordinary way, or it may be constructed of brick or ashlar, in all cases having projecting dividing walls provided at suitable points along its length to prevent the water from creeping on the outside.

It is extremely difficult to lay down any rules in regard to outlets, as they are the most difficult part of the work with which an engineer has to deal. It might, however, be laid down as an axiom that for high embankments a tunnel outlet is the only safe and reliable means of providing for the stored waters. For medium high embankments (say, not exceeding 40 feet), and provided solid rock that will not yield when subjected to the unequal pressure due to the weight of the embankment can be found at a reasonable depth, a culvert under it might safely be adopted. The trench must not, however, be at a great depth; and the rock must be not only homogeneous but massive, and not interbedded with shale or other soft strata, and, above all, must be continuous from one end to the other. For low embankments, when the depth does not exceed (say) 25 or 30 feet, a syphon carried over the top of the embankment or round one of the flanks may be adopted with advantage.

The outlet, whether tunnel or culvert, should be commanded

by a tower, in which the valves or other arrangements for regulating the discharge of the stored waters should be fixed. The best position for this is at the mouth of the outlet; the valves being so arranged that they are accessible for repairs, and the tower be capable of coping with any and every eventuality. A watertight bulkhead or stopping is fixed at the base, which acts as a water-lock, and effectually safeguards against the flooding of the culvert should any accident occur to either the tower or the valves, and the supply, even if the tower were carried away, could be maintained without interruption. The tower permits of proper inspection, and the carrying out of repairs to the valves and fittings at all times, as by its means all are accessible. Should a pipe at any time become fractured in the tunnel, the supply can be cut off, and the necessary repairs carried out.

Regulating the discharge of stored waters by means of a valve-pit, built in the middle of the inner slope or close to the puddle wall, is a method that has been followed in the past; but, in the author's opinion, it should be avoided.

Another and a still more reprehensible method of controlling the discharge in culverts through embankments, is the introduction of a masonry, concrete, steel, or iron bulkhead in or about the centre of the culvert. The discharge-pipes lead off from this central stopping, and are governed by a valve or valves in the downstream side of the culvert. Here, again, the upstream end of the culvert is inaccessible, and in case of a burst pipe it would mean sending divers down to attempt to plug the inlet-end of the pipe. Should they fail in this, there would be no other course left but to empty the reservoir. Nothing can be worse than this mode of controlling the discharge; and the folly of such a design is too self-evident for further critical analysis.

Discussion.

Mr. R. H. WYRILL (Swansea) remarked that the paper was of extreme importance to water engineers. The embankments of reservoirs generally were more studied now than they were formerly; and such progress had been made that now a reasonable amount of security might be assured. There had in the past thirty years been considerable changes in method; but through all that time, wherever there had been a report of weakness in an embankment, it was usually found to be caused by the outlets. Regarding some of the points mentioned in the paper, the first was as to the advisability of carrying culverts through the embankment at all. Geology would have a great deal to do with this question. Supposing one had an embankment founded on solid rock, where a trench could be cut through the rock, there would be a chance of constructing a culvert there, because the strata would be weight-bearing. One would not be subjected to subsidences in the culvert; and there would be nothing to fear from the superincumbent weight. As to slip-joints, generally speaking they were not effective. The greatest security was to be obtained by passing round the end of the embankment, and making a tunnel. This presented no difficulties, and, as a rule, little more expense. The security had justified the expense in nearly all cases within his experience.

Mr. E. SANDEMAN (Derwent Valley Water-Works) thought the most interesting part of the paper was that referring to the Dale Dyke reservoir. There was no doubt that the failure of this reservoir had been the means of preventing the failure of many others. It taught engineers a lesson; and they had been more careful since. There was a curious point about the laying of the pipes in puddle. He quite agreed that in theory Mr. Yourdi was right—that it seemed a dangerous thing to do, and particularly in the way they were laid in the Dale Dyke reservoir. It was a most extraordinary way. But he remembered being told by Mr. Eaton, who was at one time Water Engineer to the Sheffield Corporation, that, when they took out the pipes from the Dale Dyke reservoir many years after the accident, they found the 18-inch pipes absolutely true and straight. It seemed to him contrary to theory; but it was a fact.

Mr. J. H. TAYLOR (Barnsley) said he was told that, at the request of Mr. Thomas Hawksley, a trolley was constructed, and a man went on it right through the line of pipes. Mr. Hawksley's opinion was that the failure was due to a land slip.

Mr. C. H. PRIESTLEY (Cardiff) remarked that the author stated that embankment making was practically "a thing of yesterday." Still, during the past seventy or eighty years some hundreds of embankments (the majority earthen ones) had been constructed, and very considerable experience had been gained. There had been comparatively few failures. He knew of only two instances where failure had been absolute—the Dale Dyke, and the Bilberry at Holmfirth in 1852. Both were due to settlement. In the former case, the cause of settlement was never satisfactorily explained; and in the case of the latter, it was due to an escape of water in the embankment. The late Mr. Bateman said the pipes through the Dale Dyke reservoir were as true after the failure as they were in the beginning, though, of course, no engineer would now recommend the laying of pipes in the same manner. The author pointed out the danger of making a culvert through or under an embankment with a central pillar. Although possibly this was not good practice, they had near Cardiff a large reservoir constructed in 1887, having a culvert under the embankment with a central pillar, which had never shown the slightest sign of yielding to unequal pressure. Regarding the tunnel outlet, the method suggested as being of doubtful practice was one that had been carried out successfully by many of the leading engineers in the kingdom, and, in a large number of cases, had proved entirely

satisfactory. Although it might be desirable under certain conditions to take the tunnel through the solid rock and round one end of the embankment as suggested by the author, it did not follow that this should be the universal practice. In the case of a large reservoir he was now designing, such a method would, in addition to very considerable extra expense, introduce a further element of danger, owing to the size of the tunnel (16 feet diameter), and the difficulty of preventing the creep of water between the concrete backing and the excavation, which in this case had a periphery of about 87 feet. If the valve shaft and the tunnel on either side of the valve-shaft were built in the solid and unyielding measures, there could be little or no danger of the breaking of the back of the culvert, owing to unequal pressure. Concerning the point as to the valve-pit, the author stated that a considerable length of culvert on the upstream side was inaccessible when the water was in the reservoir. He could not see any reason why this should be accessible after the reservoir was in operation. The water pressure would be in equilibrium in this part of the culvert; and there would be no likelihood of any failing. On the point of central stopping, it was very unlikely that any burst would occur in the stop-piece, or the short length between that and the valves—in fact, the method recommended by the author was just as liable to failure as the practice he condemned. The author's statement that nothing could be worse than the method of controlling the discharge as described at the end of the paper, was of such a sweeping character that it condemned the general practice of a number of leading engineers in this country, and also threw doubt on the stability of many works that had been constructed during the last twenty years, none of which showed the slightest sign of failure.

Mr. ROBERT ASKWITH (Weardale and Consett Water Company) referred to an experience of his own. In the case of one of his reservoirs with a tunnel through the embankment, a shaft on the centre of the tunnel (in which a valve was now fixed) went out of the perpendicular. The shaft cracked inside; and it had to be made solid. The movement ceased at a certain time. The valve was put in; plugging was carried out to a good height; and there had been no further trouble. It was feared at one time when the reservoir was brought into use that the embankment would have to be taken down, and the shaft rebuilt. The embankment was designed in the days of the late Mr. Thomas Hawksley. He (Mr. Askwith) did not see any objection to water being on the inner side of the tunnel—that was, between the valve and the inlet to the tunnel—when the inlet was protected by a grating, because it would be an awkward thing if logs of wood were to get into the inlet and approach the valves, as this might prevent them being closed. The tunnel in the case of the reservoir referred to was constructed in the line of the stream in the centre of the embankment. Upon the tunnel was built a shaft. When the embankment was constructed, they could not get it to set absolutely evenly; and a greater weight went on to one side than on to the other, to the extent of 1 to 10 in about 70 feet height. Open cracks resulted, in which one could put his little finger. This was built in 1867-70, before Portland cement was much used. The tower was built in *lias* lime and brickwork; and that was very weak compared with Portland cement. As to the failure of the Dale Dyke reservoir, Mr. Hawksley told him it happened on a stormy night, and had nothing to do with the outlet-pipes. It was due to a slip of the hillside.

[Mr. Yourdi will communicate his reply to the discussion to the Association's "Transactions."]

EFFECT OF A SINKING HEAD ON LARGE CASTINGS.

By THOMAS KENNEDY.

Cast iron is not a pure metal; for in addition to pure iron it always contains considerable and variable quantities of silicon, sulphur, phosphorus, manganese and carbon chemically combined with iron, and carbon uncombined, existing as little shining plates of graphite in the mass of the iron, so that, on taking a wide average, there is only from about 90½ to 91½ per cent. of metallic iron in practically any cast iron. As cast iron comes molten from the cupola, it contains, in addition to the preceding list of impurities, more or less slag—the less the better.

Large pipes are as a rule specified to be cast on end, with the upper end prolonged to form a sinking head, which is afterwards cut off. The object of this paper is to show the advantages of this, and the desirability of it, in nearly all large castings—taking, as illustration, the results obtained in casting some large columns about 32 feet long, weighing about 12 tons, where a sinking head 2 ft. 10½ in. long, and weighing about 2 tons, was added. When this head was cut off, and broken under the ball, the fracture was very interesting. It showed that the head, which was much larger in area than the column proper, had been most efficiently feeding the column, as the molten metal in it was contracting in setting. It showed a good deal more than that. In the large pockets left by the receding, cooling metal, there were groups of crystals of pure iron. The crystals group together so that they all interlace one with another; the other ingredients combining with some of the iron, and forming a matrix which fills the interstices. The real strength of the casting is in these interlaced groups of crystals. In the body of such a casting, the crystals exist in identically the same form but much smaller, due to the quicker cooling, perfectly interlaced and homogeneous, owing to the great pressure above them of the slower-cooling sinking head.

The most deleterious impurities contained in cast iron, as it leaves the cupola, are slag globules, gases mechanically contained in the metal, and gases technically called "occluded" or absorbed physically in the metal, all or most of which will separate out as the metal passes from the liquid to the solid state. The excess of carbon in the metal separates into little plates of graphite as the metal solidifies; and there are also crystals of a very brittle substance known as phosphide of iron, and little areas of sulphide of manganese. All these substances are potentially in the metal as it leaves the cupola and goes into the ladle. As the metal is being poured into the mould, still more gases are formed by the action of the hot metal on the sand of the mould. The bulk of these escape through the cores and joints of the boxes in which the mould is formed, and when ignited burn with a non-luminous flame. Now the remainder of all the impurities mentioned—slag, gases, excessive graphite, &c.—are of a much less gravity than the proper metal; and if they have a free passage in the mould, they escape upwards to the top, but if not, they remain, and the result is a porous, weak casting.

When a long column, such as has been described, is cast on a sloping bank instead of vertically, crystals always begin forming at right angles to the cooling surface, with the result that millions of crystals form round the mould, and the passage of impurities is seriously impeded. If the column is cast horizontally, their escape is rendered impossible; and they remain in the top side of the casting.

In small, thin castings, the cooling is so rapid, and the gate is so near the body of the casting, that sinking heads are not necessary, as the air and gases escape readily, and the impurities have no time to segregate; but being spread more or less uniformly over the whole casting, their effect is so diminished as to be practically negligible.

Discussion.

The PRESIDENT (Mr. W. H. Humphreys) thanked Mr. Kennedy for his paper, which, he said, contained the results of a great many years' experience.

Mr. ALFRED TOWLER (Ilkley) remarked that the paper was valuable from the scientific point of view. The author did not mention one of the practical reasons why pipes and columns of considerable length were cast vertically in preference to being cast at an angle or horizontally. If cast at an angle or horizontally, there was some difficulty in preventing the core getting out of the straight line. It bent with the heat; and there was the tendency of the metal to lift it. Such things as water-pipes with spigot and socket joints that did not require machining, could be dealt with in the ordinary way; but when they were dealing with columns, things like rams, and so forth, which required machining, it was quite another problem. The author had not dealt much with mixtures, and probably for a very good reason. People who got out specifications for pumping machinery sometimes told the makers what mixtures to employ; and at times this made matters exceedingly difficult for the manufacturers. Different sorts of castings wanted to be treated differently with regard to the mixtures; and in this country, he thought, they were not so far advanced in this particular line as in some other countries. The Germans studied the subject more scientifically. Quite recently they brought out means for compressing iron borings and turnings, and making them into briquettes; and so used up waste products. These borings and turnings did not realize anything like their real value, because it had been found very difficult indeed to melt them up again in the loose state, seeing that a good deal of it was oxidized, and thrown away by the blast. Still it had been realized for years that such fine particles of metal had an exceedingly good effect in getting a close-grain mixture; and with steel added a stronger metal was secured. The Germans had been compressing these finely-divided pieces of metal not only in cast iron, steel, and wrought iron, but in bronzes and aluminium, with excellent results. A number of tons of the briquettes had been sent to different people in this country to try; and it had been established that an inferior mixture of iron could be used by the aid of the briquette, and better results could be obtained.

Mr. R. A. BLAKEBOROUGH (Brighouse) said there was only one thing he should like to know, and that was as to the shape from top to bottom of the pillars mentioned by the author. Sometimes where there was a large flange on the outside of a column or the casting was of an irregular shape, it was advisable to have more than one header to take away the impurities.

Mr. H. PRESTON (Grantham) said the author had referred to the decomposition of iron owing to electrical action between the iron and the graphite. They had at times mains which seemed to decompose when placed in the ground. When in clay all the nature of the iron would go out of it. A pick striking it would go straight through without cracking it; and such pipes could be cut with a knife. If the pipes were laid where there was furnace slag, the same action would come about. Was that the action to which Mr. Kennedy had referred? And what was really the chemical action that took place under these two conditions—in clay and in furnace slag?

Mr. KENNEDY, in reply, remarked, regarding the question as to briquettes, that his firm had never used them. In the briquettes, steel was sometimes used; but he did not know it was a very desirable thing to do, because it was apt to segregate, and to get into different parts of the metal, making it irregular. It was, however, quite a common thing to use the steels from rolling hot plates. This was not so dangerous as putting in lumps of steel.

Briquettes were not greatly known to metal users in this country. In reference to the large columns, there were flanges at both ends; but there was nothing in the centre, except a test-bar—a piece put in for a test-bar. As to electrical action, where there was graphite in large patches in close contact with large masses of iron, and there was acid in the ground or water, galvanic action was set up, which carried off the iron, either as ferro-carbonate, or some other oxide of iron. The effect was the same whether from inside or outside.

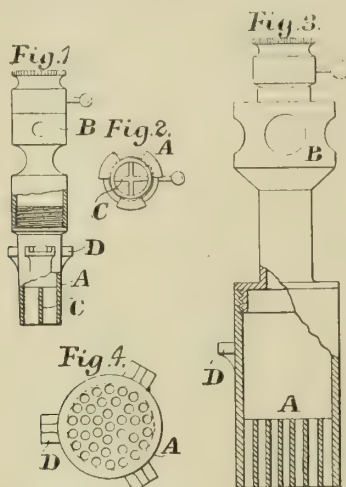
REGISTER OF PATENTS.

Inverted Incandescent Gas-Burners.

ZECHNALL, L., of Bunhill Row, E.C.

No. 12,049; May 21, 1909.

This invention has for its object to provide an inverted incandescent gas-burner with a tube shorter than those generally made, with the consequent advantage that lower gas pressures may be employed, and "lighting-back" is also prevented.



Zechnall's Inverted Burners.

Figs. 1 and 2 are a part section and an inverted plan of one form of this burner; figs. 3 and 4 are similar views of a construction more particularly adapted for large burners.

In figs. 1 and 2, the member A, forming the mouth or end of the burner-tube, is made of clay or other suitable refractory material secured to the lower end of an extension of the mixing-chamber B. It is provided at its lower end with internal partitions C arranged crosswise and extending from the mouth upwards for (say) from $\frac{1}{2}$ inch to $\frac{3}{4}$ inch, so as to provide separate tubular passages opening at the mouth of the burner. In this way, while the mixture of gas and air from the mixing-chamber will issue as separate jets from the tubular passages, they will constitute one flame which has no separate air supply admitted in the midst of it or between the tubular passages.

Figs. 3 and 4 show the form of the invention intended for larger mantles. Here there is a cluster of closely assembled tubular passages evenly distributed over the whole sectional area, so as to give, in the aggregate, a combined flame adequate for the size of mantle employed, and without any separate air admission in the midst of the flame.

Ordinary inverted burners with straight tubes without baffle-plates, but with wire gauze, for (say) a consumption of 4 feet of gas per hour, are, the patentee remarks, generally made with a length from $4\frac{1}{2}$ inches to 5 inches all over from the point of injection of the gas to the mouth of the burner, if good efficiency is to be obtained; while his burners for this consumption need only measure about 3 inches. Gas burners with a consumption of about 12 to 16 feet of gas per hour, with ordinary straight tube and open mouth with wire gauze, to be efficient, have to be made about 8 inches to 9 inches long, while with the burner mouth shown they can be made about $5\frac{1}{2}$ inches long, or even less. The above-mentioned dimensions for the improved burner give satisfactory results when made as herein described. As regards the length of the tubular passages, it is found that, with a gas consumption of about 4 cubic feet per hour, a good length of passage to prevent firing-back is about $\frac{1}{2}$ inch to $\frac{3}{4}$ inch; while in burners with a consumption of (say) 12 to 16 feet of gas per hour, a suitable length is about $\frac{3}{4}$ inch to 1 $\frac{1}{2}$ inches.

Gas-Lamps.

BREEDEN AND CO., J., and BREEDEN, F., of Birmingham.

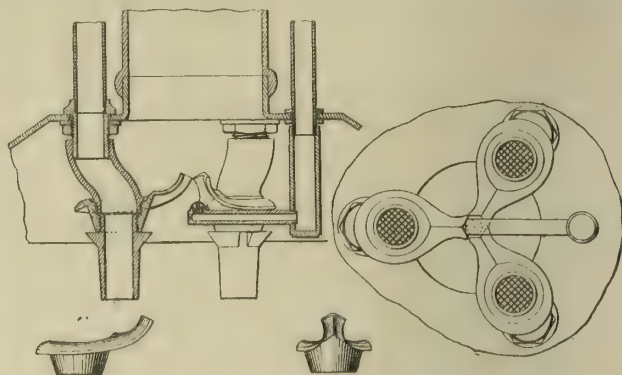
No. 21,236; Sept. 17, 1909.

This invention relates to gas-lamps having inverted incandescent burners, arranged around, and lighted (on turning on the gas supply) by one centrally arranged pilot or light; the invention having for its object "to provide simple and efficient means for ensuring the lighting of the series of burners by the common pilot or bye-pass light."

On each inverted incandescent burner-tube, at a short distance above the mantle-carriers of the burners, is a collar or flange, having a channel or inverted U or V figure in cross section, each collar or flange having at one side a projecting, and preferably upwardly curved, tongue or arm, also of channel or inverted U or V cross section, and forming a continuation of, or outlet from, the channel in the collar or

flange. The collars or flanges are so arranged on the burner-tubes that their projecting tongues are directed radially to the common centre under which the pilot light is situated; and the tongues have such a length that they meet above the pilot light—their ends being preferably so shaped or cut away as to provide an opening immediately above the flame of the pilot light.

When the gas is turned on, a portion of it rising from each burner is trapped by the channelled collars or flanges on the burner-tubes, and is directed by the channelled tongues of the collars or flanges to the pilot light, and, becoming ignited, the light is simultaneously flashed outwardly to the several inverted burners.



Breedon's Gas-Lamp Pilot Lighter.

The illustration shows the burner in vertical section, with a plan of the underside of so much of a three-light gas-lamp as is necessary for illustrating the carrying of the invention into effect. There is also shown, detached, an inside and an end view of the collars or flanges constituting the essential feature of the invention.

The flanges or collars may be permanently fixed to the burner-tubes, or they may be adjustably secured thereon; and they may be of metal or steatite.

Conveying, Cooling, and Discharging Incandescent Coke.

BERLIN-ANHALTISCHE MASCHINENBAU-ACTIEN-GESELLSCHAFT.

No. 18,908; Aug. 17, 1909. Date claimed under International

Convention, June 30, 1909.

This invention relates to installations for conveying coke from retorts of the type wherein the receptacle for the coke is driven from the retort, where it receives its charge, to the point where it discharges its contents and back again by means of an endless cable. The object of the invention is so to arrange the installation that one attendant at the mouth of the retorts can control single-handed the whole installation without having to leave his post. A single controlling mechanism is employed to stop the conveyor on its arrival in front of the retort, and for re-starting it after it has received its charge; while the quenching of the incandescent coke and also the discharging of the conveyor or truck are effected automatically.

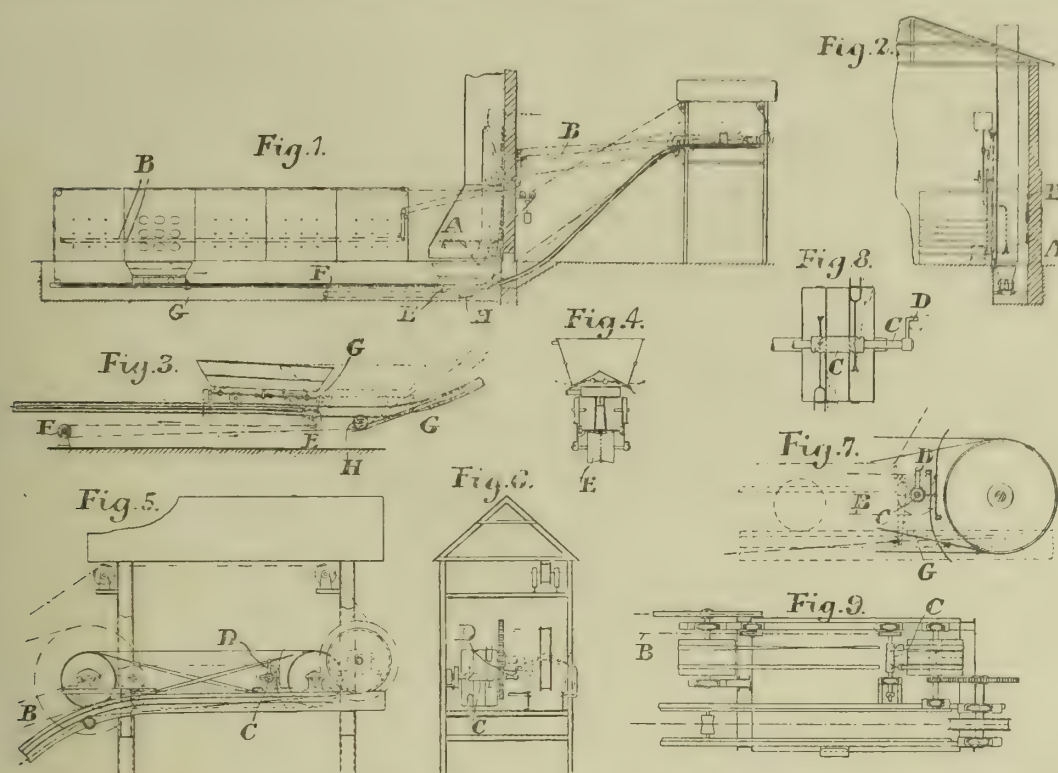
Fig. 1 (p. 703) shows diagrammatically one form of plant in side elevation. Fig. 2 is a section of fig. 1. Fig. 3 shows, on an enlarged scale, the portion of the track where quenching takes place. Fig. 4 is a section of fig. 3. Fig. 5 shows the portion of the track where the truck is discharged. Fig. 6 is a vertical section of fig. 5. Fig. 7 is a detail view showing a portion of fig. 5 on an enlarged scale. Fig. 8 is an end elevation of fig. 7. Fig. 9 is a horizontal section of fig. 5.

The retort-furnace has a conduit or trench formed in front of it below the ground level, and disposed within the conduit is a track, the length of which in front of the retorts is horizontal, while at the place where the coke is quenched—i.e., between the retorts and the point of discharge—it is given a gradual downward gradient, and on leaving the retort-house rises obliquely upwards to the discharging point, beyond which it is carried with a slight upward gradient on a raised platform. On the track a truck travels driven by an endless cable or the like, guided by rollers between the two rails of the track and driven through a drum by means of an engine.

Below the sprayers A, guide-rollers are arranged between the rails of the track at a certain distance behind each other; while outside the track—for instance, below it and towards the retorts—a third guide-roller is mounted at a distance from the rollers dependent upon the time to be occupied in the quenching of the coke. The endless cable is guided over these three rollers in the form of an open loop; so that its continuity is broken along the track between the rollers. To the cable is secured a driver in the form of a transverse bar, preferably guided on the portions of the track which extend from the rollers to the ends of the track by means of a guide secured to the inside of the track rails. Two arms project from either end of the track in the path of the driver; the arms are adapted to co-operate with one or other of these arms, and to guide the truck along with it. During the travel of the truck, the arms are between the two arms; so that the truck is driven whichever way the cable is moved.

To the upper portion of the truck is secured an adjustable projection co-operating with an arm which guides its path below the sprayers in such a manner that the truck is stopped for the quenching water is automatically opened when the truck arrives below the sprayers, and on the truck continuing its path it again automatically closed by an auxiliary device, provided with a lever or cock, to the plug of which is secured a counter-weight. A chain, passing over a pulley, has one end secured to the truck and its other end is connected to a lever provided with a weight which constitute a bell-crank lever.

The stopping of the truck in front of the retort to be discharged, and its restarting when the direction of the cable is reversed, is effected by the attendant at the retorts by an endless controlling cord or band B



A "Bamag" Coke-Conveying, Cooling, &c., Plant.

carried in front of the furnaces. In order to reverse the movement of the truck when it is at the end of the track, without necessitating the presence of an attendant on the platform, the cable is automatically reversed by the truck itself. To this end a pin-like stop projects from the frame of the truck (fig. 4) into the path of an arm formed on the shifting spindle (fig. 8); this arm constituting a crank C, secured to the spindle in such a manner that when the cable is stationary it remains in the central position shown in full lines in fig. 7.

The working of the apparatus is as follows: When the truck is in front of the retorts to be discharged, the driver is between the arms of the truck, and the belts are running on their loose pulleys; so that the cable is stationary. After the truck has been filled, the attendant at the retorts pulls the controlling cord B (say) from right to left. Owing to the rotation of the spindle C thus effected, the belt forks are shifted to the left, whereby the open belt is transferred from the loose pulley to the fast pulley, and the cable is accordingly driven in such a manner that the driver will travel towards the platform. The crank D is then brought into the position shown by dotted lines in fig. 7.

The driver, after the cable has been started, strikes the arm of the truck and drives the latter until it leaves it at the guide-roller E, and continues its travel round to the guide-roller F. The truck, owing to its momentum or by reason of the downward gradient of the track near the guide-roller E, continues to travel until it reaches the position shown by dotted lines in figs. 1 and 3, when the arm G is situated between the guide-roller H and the platform. The truck is prevented from passing beyond this point by the upward gradient of the track.

On the truck arriving below the sprayers arranged at this stopping place of the truck, a movable arm is turned by a projection on the truck in such a manner that water is discharged from the raised tank on to the incandescent coke. The water-valve is not closed again until, during further travel of the truck, the movable arm is released by the projection. The time during which quenching takes place corresponds to the stoppage of the truck under the sprayers, and depends on the time which the driver takes to travel the distance between the guide-roller E, the roller F, and the arm G of the truck when the latter is stationary. For regulating the time occupied by quenching, the guide-roller F can, therefore, preferably be made adjustable in the longitudinal direction of the track (fig. 3).

Towards the end of the quenching period, the driver has passed into the guide-track, and, by striking the arm of the truck, drives the latter up to the platform. On arriving at the centre, its contents are automatically discharged by an extension of the pawl striking a fixed stop. Moreover, a stop or projection then strikes the crank D; so that the latter is brought from the position shown dotted in fig. 7, beyond its central position, into the position shown by chain dotted lines.

The rotation of the spindle C is thus effected, and the open belt is therefore brought back to the loose pulley by the shifting of the belt forks to the right, whereupon the crossed belt is transferred to the fast pulley. This results in the reversing of the direction of movement of the cable; so that the driver moves towards the retort-bench. Owing to the gradient of the track on the platform, the empty truck, under the action of gravity, rests against the driver, till the latter, just in advance of the guide-roller H, is brought out of the path of the arm G.

The truck is again left stationary under the sprayers, while the driver travels the section of the cable between the guide-rollers H, F, E., preferably in such a manner that the arm is slightly behind the guide-roller E, looking towards the retorts. The arm is connected to the water-valve, actuating mechanism in such a manner that the valve is not opened when the projection on the returning truck strikes it.

The truck is driven up to the retorts again by the striking of the driver against the arm, and is there stopped by the attendant in front of the retorts again operating the cord and, for instance, by his pulling the upper portion of the cord B from right to left. Owing to the rotation of the spindle C thus produced, the crossed belt is brought back again to the loose pulley; so that both the belts travel on their loose

pulleys and the crank D is again in its central position. By a second pull on the cord in the same direction, the attendant can again start the cable after the truck has been charged, and so simultaneously re-start and reverse the movement of the cable.

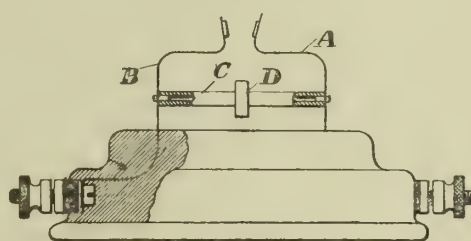
"The whole installation in which the incandescent coke is discharged from the retorts, and after being quenched is unloaded at some distance off, can, therefore, be attended to by a single workman, who need not leave his place in front of the retorts, to which he can therefore readily attend."

Safety Device for Indicating an Escape of Gas.

KREBS, L., of Berlin.

No. 1095; Jan. 15, 1910.

This safety device for indicating an escape of gas is characterized by the provision of two contact springs carrying pins, which, in turn, support a casing containing platinum black.



Krebs' Gas Escape Indicator.

The springs A B are secured to a base of some non-conducting material—wood, compressed fibre, china, or the like. The springs are bent in such a way that when the tube C is broken or removed they come into contact and close an electric bell circuit. Each spring carries a pin adapted to project into the bore of the hollow tube C, of paraffin wax, thereby supporting it in position. The tube carries a receptacle D, adapted to contain platinum black. Thus, in case of a gas escape, the presence of the gas will heat the platinum black in the casing D, and this heat will be transmitted to the wax, which will melt and allow the springs to come into contact and close the alarm bell circuit.

Unprofitable Electricity Supply at Acton.—After a controversy extending over three years, the Acton District Council have decided, by 12 votes to 10, to hand over their electricity undertaking to the Metropolitan Electric Supply Company. The proposal is to lease the undertaking for 37 years; the Company paying all the Council's loan charges, and handing back the undertaking to the Council at the end of the term, if so required. The following remarks on the subject appeared under the heading of "The Best of a Bad Job" in the "Occasional Notes" in the "Pall Mall Gazette" yesterday: "The sacred duty of wasting public money overrides all other principles with the advocates of Municipal Socialism, and the Acton District Council is naturally meeting with severe condemnation from these sources for its courage in admitting that its electrical administration has been a failure. The Council has decided to negotiate for terms upon which to hand over its electric supply business to a private company; and, looking to the history of the concern, it must be recognized that the proceeding is wisely inspired. The business has been a prolific creator of deficits and a serious burden upon the rates; and the ædiles of Acton have shown hard-headed sense in facing their losses, and deciding not to go 'double or quits.'"

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The House re-assembled last Wednesday after the recess consequent on the national mourning; and since then the following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: South Hants Water Bill.

Bills read the third time and passed: Great Grimsby Gas Bill, Havant Gas Bill.

Petitions against the Glasgow Gas Consolidation Bill have been presented by the County Council of Lanark, the Baillieston Gas Company, the Glasgow Houseowners' Association and others, and manufacturers, engineers, and others within the gas-supply area of the Corporation of Glasgow; also against the Water Orders Confirmation Bill, in respect of the Chelsham and Woldingham Water Order, by owners and occupiers of property in the places named.

HOUSE OF COMMONS.

Since the House re-assembled last Wednesday, the following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Havant Gas Bill.

Bills read a second time and committed: Cambridge University and Town Water Bill [Lords], Garnant Gas Bill [Lords], Matlock Bath and Scarthin Nick Urban District Council Bill [Lords], Thorne and District Water Bill [Lords], Water Provisional Order Bill.

Bills reported, with amendments: Fylde Water Board Bill, Middlesbrough Corporation Bill, Shirebrook and District Gas Bill, Southend Water Bill [Lords].

Bills read the third time and passed: Farnham Gas and Electricity Bill [Lords], South Hants Water Bill.

The Gas Companies (Standard Burner) Bills [Lords] stood for second reading on Thursday; but Mr. Holt (Hexham) gave notice of his intention to move their rejection, and the second reading was accordingly postponed till Tuesday (to-day). Mr. G. H. Roberts, the Labour Member for Norwich, has also put similar notices upon the paper. The following authorities have petitioned against the Bills:—

No. 1 Bill—The Bootle, Hastings, Liverpool, and Torquay Corporations; the Allerton, Great Crosby, Ilford, Litherland, and Waterloo with Seaforth Urban District Councils; and the Mersey Docks and Harbour Board.

No. 2 Bill—the Bournemouth, Cambridge, Faversham, Hemel Hempstead, Reading, and Shrewsbury Corporations; and the Harrow-on-the-Hill and Wealdstone Urban District Councils.

No. 3 Bill—the Bath, Exeter, Guildford, Southampton, and Wolverhampton Corporations; and the Romford Urban District Council.

Petitions against the Cambridge University and Town Water Bill [Lords] have been presented by the Cambridge Corporation and the Cambridgeshire County Council; against the Warrington Corporation Bill, by the Runcorn Rural District Council; and against the Water Provisional Order Bill, by the Kingswood Water Company.

SHIREBROOK AND DISTRICT GAS BILL.

House of Commons Committee.—Thursday, June 9.

(Before Sir LUKE WHITE, Chairman, Mr. WORTHINGTON EVANS, Mr. WHEELER, and Mr. BARTON.)

This Bill came up for consideration to-day; its object being to extend the limits of supply of the Shirebrook and District Gas Company, and to repeal certain powers at present vested respectively in the Mansfield Corporation and the Bolsover Gaslight and Coke Company.

Mr. HONORATUS LLOYD, K.C., and Mr. R. S. CLEAVE appeared for the promoters; the Warsop District Council and the Mansfield Corporation were represented by Mr. C. C. HUTCHINSON.

Mr. HONORATUS LLOYD, in opening the case for the Bill, said the Shirebrook Gas Company were incorporated by Act of Parliament in 1899. Part of the area proposed was within the limits of the Bolsover Company; but they had not given a supply. There were two parishes proposed to be included within the limits, which were at present in no authorized area of supply. The parish of Bolsover, which belonged to the Duke of Portland, was anxious for a supply; and arrangements had been made that a supply should be given. The portion of the proposed area on which the opposition arose was a part of the parish of Warsop which was not included in the Shirebrook Company's limits in their Act of 1899. When the Act was obtained, there was included in their limits a portion of the parish of Warsop; and they were now asking for the remainder. In 1878, the predecessors of the Mansfield Corporation obtained powers enabling them to supply gas in the parish of Warsop, with the consent of the Sanitary Authority; but no supply had been given. In 1899, an arrangement was made as to the supply. The Mansfield Corporation did not oppose their taking part of the parish; and the Corporation were still left with the right and obligation to supply another portion of the parish of Warsop. This portion had never been supplied by the Corporation; and now there was a

very substantial demand for better lighting in the remainder of the parish. Upon the Shirebrook Company setting to work to give this supply, the Corporation asked whether the Company intended to make them any offer. The Company refused to do so, upon the ground that the Corporation and their predecessors had had vested in them, since 1878, the power to supply by the consent of the Sanitary Authority. In 1901, they obtained the repeal of the proviso which required the consent of the Sanitary Authority; but the Sanitary Authority of Warsop had the right to purchase that part of the undertaking which was within their own area. The Mansfield Corporation had, however, been advised that the capital expenditure they would have to make was such that, having regard to the distance and the difference of levels between their works and Warsop, it would not be remunerative to do so; and they had not done it. It was not usual for local authorities to offer for sale concessions which Parliament had granted them. When the Shirebrook Company were before Parliament in 1899, they got rid of the opposition of the Mansfield Corporation for £500. But Parliament would not allow such a provision in the Bill; and it was therefore struck out. However, the Corporation had the £500. Warsop had certain rights with respect to gas supply; and under the Mansfield Act of 1878 they had the right to purchase part of the Mansfield undertaking. The remainder of the parish of Warsop, however, would not in itself be sufficient to enable them to set up works on a sufficiently large scale and to supply gas at anything like the price at which the Shirebrook Company could supply. Although the maximum price was 5s. per 1000 cubic feet, they had never charged more than 3s. 6d.; and they were now supplying at 3s. 4d., which was the highest price according to a scale by which large consumers paid less, and it came down from 3s. 6d. to 2s. 9d. for lighting. The output had grown to 25 millions. The Shirebrook Company thought it was in the interests of the consumers that they should supply the area. The Warsop Local Authority, however, were advised that they could give the supply equally economically; and they applied to the Local Government Board for an Order under the Gas and Water Facilities Act to enable them to set up gas-works for themselves. In March of the present year, a local inquiry was held; and the Local Government Board refused the Order. Accordingly, the present position was that there was a district in which it was admitted that lighting facilities were required. The Shirebrook Company were prepared to give the facilities by the extension of their limits of supply, and the consumers would then get gas at a price at which they could not get it in any other way. Having dealt with the joint petition of the Warsop Council and the Mansfield Corporation, Counsel was proceeding to call evidence in support of the Bill when

Mr. HUTCHINSON remarked that his clients wished to retain the rights possessed by them under their Act of 1878. Warsop was not prepared to supply gas at the present moment; but they wanted gas, and the promoters ought to have some little time to recoup themselves for the special expenditure incurred. They would incur no capital expenditure on works or mains, because they had them. There were the distributing mains; and they would only have to put in small distributing pipes. He asked for the preservation of their rights subject to a period during which he would bind himself not to exercise these rights. This might give the Shirebrook Company an opportunity of recouping themselves for their expenditure, and would continue the right that had been given to his clients by Parliament. The Mansfield Corporation would also be bound to accept this.

Mr. HONORATUS LLOYD then conferred with the Shirebrook Company's representatives, and announced that he thought they would be able to come to an arrangement.

When the matter came again before the Committee later in the day, the clauses were formally adjusted; and the Bill was ordered to be reported.

LEGAL INTELLIGENCE.

MAIN DAMAGED BY A TRACTION-ENGINE.

At the Epsom County Court last Wednesday, before his Honour Judge Harington, Messrs. Richardson and Co., haulage contractors, of Epsom, were sued by the Leatherhead and District Water Company to recover £1 17s. 9d. for damage done to one of their mains by a traction-engine. A witness deposed to seeing the engine, with two trucks of bricks attached to it, pass along the road in which the main was laid at a depth of 1 ft. 9 in., and afterwards there was a sudden spurting of water. The Company's outdoor superintendent (Mr. J. Cowan) said he had examined the broken pipe, and, except for the fracture, it was in very good condition. In answer to Mr. T. Bell, who appeared for defendants, he said the Company's new pipes were laid at a depth of 3 feet, really as a protection against frost. Mr. G. T. Derry, the Manager and Resident Engineer of the Sutton Water Company, said he found that the pipes were of the thickness and depth usual when they were put in. Mr. Bell contended that the statutes governing traction-engines placed no restriction upon their use on the highway; and he submitted that the plaintiffs' pipes were not laid at a sufficient depth.

His Honour, in giving judgment for the amount claimed, with costs on the higher scale, said he thought the plaintiffs were entitled to recover. The actual damage was caused owing to the traction-engine and trucks passing over the pipe; and there was no evidence to show that the main was not in a perfectly sound condition prior to the actual breakage. The main was properly laid, having regard to the period when it was laid and to the requirements then in vogue. The Company were bound to lay these mains to supply water; and it would be perfectly unreasonable to say that, because when these pipes were laid they were only put 1 ft. 9 in. deep, now the Company should be compelled to lower the mains to 2 ft. 6 in. on account of the alteration in the character of the traffic which used the road. It appeared that the Locomotive Act was a permissive Act, to allow owners of traction-

engines to make use of the roads; and he was quite satisfied that no exemption was given under that Act from liability for damage which might be done by locomotives so using the road. He thought it was clear that engines must be so employed as not to be a nuisance or cause damage to persons having the use of the roads. This being so, it seemed to him the owner of the traction-engine must be held liable.

AFFAIRS OF THE MID OXFORDSHIRE GAS COMPANY.

In re a Petition of a Debenture Holder.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, June 7.

(Before Mr. Justice SWINFEN EADY.)

The petition of a debenture holder for the winding-up of the Company, which was considered by his Lordship on the 25th ult. (*ante*, p. 570), came up again to-day.

The Hon. FRANK RUSSELL, K.C., who appeared with Mr. NOAD for the petitioner, who had obtained judgment for £736, said he asked for a compulsory order, notwithstanding that a resolution had been passed for voluntary winding up. The petition was presented on April 19, the date for which it was to be answered being May 3. When it was served, the Company's Solicitors approached the petitioner's Solicitors, and, by the payment of £100 down and a promise to provide for the satisfaction of the whole claim, induced them to defer the hearing until May 24. They did nothing further, however, with regard to the settlement of the claim, but called an extraordinary general meeting at Bicester—the registered office being in London, and the central office at Oxford—and on May 29 a resolution was passed for winding-up voluntarily. The Company was incorporated on Oct. 10, 1905, with a share capital of £50,000, in 2500 preference shares of £10 each, and 2500 ordinary shares of like amount. There had been issued 1282 preference and 198 ordinary shares, which were fully paid, except £180 *ros.* unpaid calls. According to the last accounts, there was a balance to the debit of the revenue account of £1422 odd, and to the debit of capital account of £18,402. The capital expenditure during the year was £22,914; and there was a debenture debt of £58,530 (about four times the issued capital), and the unsecured creditors were £62,916. The Company was formed under the following circumstances: In the year 1905, there were various small gas undertakings in different villages and small towns in Oxfordshire, such as Bicester, Chipping Norton, Woodstock, Shipton, &c.; and the Company was formed to take them over—the promoters being the Finance and Construction Company, Limited, and Mr. E. O. Preston, who held all the founders' shares in the Company named. There was a denial by the present Secretary of the Company that Mr. Preston was a promoter; but he had not denied it himself. On March 27, 1906, a prospectus was issued, offering for subscription £15,000, of 5 per cent. debenture stock, 2000 5½ per cent. preference shares, and 2000 ordinary shares, for the purpose of completing the purchase of the several gas undertakings enumerated, making improvements in the plant, &c., and defraying the expense of an application to Parliament. It appeared that the Company's application to Parliament was rejected by the Committee, on the ground that the finances of the Company were unsatisfactory. The prospectus set out the price of other gas companies' shares, and referred to an agreement of March 23 with the Finance and Construction Company. In addition to the debenture stock offered for subscription, it stated that certain special debentures and special debenture stock had been issued, or agreed to be issued, to the various vendors, which were a first charge on the properties purchased, and, subject to this, ranked *pari passu* with the other debentures; these special debentures, giving a first charge, amounted to £53,051.

His LORDSHIP, interposing, asked what was the result of the statutory meeting of creditors, under the voluntary liquidation.

Mr. RUSSELL said he did not know; but the Liquidator gave the petitioner no notice of the meeting.

Mr. CHRISTOPHER JAMES said the Liquidator appeared to have been under the impression that debenture holders were not creditors.

Justice SWINFEN EADY: Then the statutory meeting has never been properly convened.

Mr. JAMES said he must admit there had been an irregularity.

His LORDSHIP asked if the Liquidator was connected with the Company?

Mr. RUSSELL said the Liquidator (Mr. A. H. Stephens) had filed an affidavit in which he said he did not know anything about Mr. Preston or the Directors, and was absolutely independent. He also said it was not his practice, when acting as Liquidator, to summon debenture holders to a meeting of creditors. He summoned the unsecured creditors, according to a list furnished to him by the Secretary. The amount due to debenture holders was upwards of £50,000, and to other creditors £16,000, which included a claim for more than £6000 by Mr. Preston, which required investigation.

His LORDSHIP asked if there was any affidavit stating the result of the meeting.

Mr. JAMES said there was not; but he was informed that a resolution confirming the appointment of the Liquidator was passed unanimously.

After some further discussion,

His LORDSHIP said the petition must stand over until a proper meeting had been held.

Mr. RUSSELL said he was informed that at Chipping Norton the gas supply had ceased.

Mr. JAMES said this was one of the undertakings of which the Receiver and Manager was in possession at the instance of the debenture holders.

His LORDSHIP said he might not have any assets with which to buy coal or make gas. It must be assumed that he was doing all he could until there was some evidence to the contrary.

It was ultimately arranged that the Liquidator should summon a meeting of all the creditors, to be held in London on the 21st inst.; the petition to stand over till the Tuesday following.

ACTION IN RESPECT OF GAS-GOVERNORS.

A case of importance to gas consumers came before his Honour Judge Willis in the Southwark County Court last Tuesday, when "The Hornsey Journal, Limited," were sued by Messrs. W. Tice and Co. (New Company), Limited, of Union Street, S.E., in respect of £11 *ros.* alleged to be due to them for supplying and fixing gas-saving appliances at the defendants' printing works.

Mr. BLACKWELL, who appeared for the plaintiffs, said they were manufacturers of a governor for regulating and lessening the quantity of gas consumed. They sent out a circular-letter advertising the appliance, and on Sept. 22 last they received a post-card from defendants asking for particulars. This led to negotiations; and there was a letter from the plaintiffs to the defendants on Sept. 29 which contained the terms of the contract in dispute. This letter was as follows: "We beg to thank you for permission given our representative to supply the automatic gas-saving apparatus free of all cost for three months upon the understanding that unless the lighting meter effects a saving of 15 to 25 per cent., and the engine meter a saving of 10 to 20 per cent., as compared with the corresponding quarter, we will, at your request, remove them without charging anything. But if they effect a saving, you are to purchase the lighting meter for the sum of £6 *ros.*, and the engine meter for the sum of £5 *ros.*, on a seven years' guarantee that we keep them in working order. In the event of faulty registration of the meters, or any variation of the conditions as compared with the corresponding quarter, we stipulate for a short test, with or without the apparatus working." The governors were installed on Oct. 2; but at Christmas the defendants wrote to say that their gas bills were heavier than in the corresponding quarter. A short test was then made, which, according to the plaintiffs, showed a saving of 23 per cent. on the lighting and 15 per cent. on the engine power. It was this test that was really in dispute. The plaintiffs' representative called upon Mr. Wiltshire, the Chairman of the defendant Company, and it was arranged that he (the representative) should make the test on the following Wednesday.

His HONOUR asked if Mr. Wiltshire agreed to the test being made, because if he did not, it seemed that the plaintiffs had no case.

Mr. DEANS, who appeared for the defendants, said this would be his submission. He added that subsequently the defendants themselves had a test made by Mr. Browning, of the Gaslight and Coke Company, whose figures did not agree with those of Tice's representative.

Evidence for the plaintiffs was then called.

Reginald Conway, a traveller in their employ, said he called on Mr. Wiltshire just after Christmas last, and was told there was no reduction in the gas bill from the use of the governors. He said he wanted to make a short test to see if there had been fluctuations; and Mr. Wiltshire called the foreman and told him to make arrangements for the machines to be worked for half-an-hour the following Wednesday, so that witness could make the test. Witness, accompanied by a fitter, made the test. Defendants' foreman said he was too busy to see to it, and sent the "engineer" to look after the test. Witness first tested the light meter without the governor for half-an-hour, in which time it registered 65 cubic feet of gas. Tested for the same period with the governor at work, it passed 50 cubic feet, which was a saving of 23 per cent. The engine meter, similarly tested, showed a saving of 10 feet in the half hour when the governor was in action, or 15 per cent. The "engineer" checked the figures with him. Witness was present when Mr. Browning made the test for the defendants, and, so far as he was aware, it was a fair one. It showed a saving of 2 per cent. on the engine gas and 14 per cent. on the lighting. He could not account for the difference in the figures, except that there must have been less pressure of gas during Mr. Browning's test.

In cross-examination by Mr. DEANS, witness said Mr. Browning used a stop-watch, and only made five-minute tests, which, as pressure fluctuated every minute, would not show an average like half-hour tests. He told Mr. Browning that, so far as his knowledge of such matters went, he was satisfied with the test. He now thought there must have been more pressure of gas from the main when he made his own test, which would result in more saving. He admitted that when he made his test he was checking on a dial registering 100 feet in fractions, and that when the indicator hand was between the figures he had to guess the exact quantity of gas measured; whereas Mr. Browning used an indicator which measured 10 cubic feet of gas in fractions, so that he could tell when one-fifth of a foot had been consumed. All the same, he did not think his test was far wrong.

Alfred Weymark, an employee of the plaintiffs, said gas pressure would make a difference in the tests, and it varied considerably. If the pressure was low when a test was made, it would have no effect on the plaintiffs' apparatus; but it would affect the test as to the gas saved with and without the apparatus working. It would be usual at a test for both sides to agree as to the reading of the indicator hand.

This concluded the evidence for the plaintiffs.

Mr. W. H. Wiltshire then gave evidence on the point of his alleged agreement to the test. He said when Mr. Conway called upon him about the matter he had quite forgotten the clause in the letter of Sept. 29 as to a short test being required by the plaintiffs as a condition binding the contract. Witness saw his foreman, and told him to make arrangements for Mr. Conway to test the governors. His idea was that the plaintiffs merely wanted to ascertain if they were working properly. The "engineer" who actually assisted Mr. Conway was only a machine minder.

In cross-examination by Mr. BLACKWELL, witness said it was only in consequence of something Mr. Conway said the day after he had made his test that he (witness) looked up the letter.

Judge WILLIS said he did not think the clause in the letter indicated that the parties were to agree that the conditions should be fulfilled by such a test as the one made. They ought to say what kind of test it should be.

Mr. BLACKWELL then addressed the Court on this point; arguing that as the defendants had had the governors for the stipulated three months, they must have been aware that the test made was to determine whether or not they were satisfactory, with a view to binding the contract.

Judge WILLIS said they must have an honest test; and he did not think this was one. The whole thing depended upon whether Mr. Wiltshire deputed his foreman to properly check the test; and he (his Honour) did not believe he did. From Mr. Conway's evidence, he could scarcely come to the conclusion that it was distinctly pointed out that the test he was going to make was to be binding on the defendants as to whether or not the conditions under which they were to purchase the apparatus had been fulfilled. There was no one to see that the test was properly carried out, and he (his Honour) was therefore satisfied that defendants never consented to it as being binding upon them. There must consequently be judgment for the defendants, with costs.

Mr. DEANS applied for costs on the higher scale, as, he said, the case was a technical one, and had involved heavy expenses. His Honour refused the application.

LIABILITY FOR A DEFECTIVE STOPCOCK BOX.

In the King's Bench Division of the High Court of Justice last Thursday week, Mr. Justice Channell (sitting without a Jury) had before him a claim by Miss Leah Rosenbaum against the Metropolitan Water Board for damages for personal injuries alleged to have been caused to her through the negligence of the Board's servants. The only question his Lordship had to try was that of liability, as the amount of damages had been settled. On Jan. 18, 1909, the plaintiff was crossing Oxford Street close to Regent Circus. In the middle of the road at this point there is a refuge, and on the north side of it a stopcock box. In the ordinary way, the tube containing the stopcock is filled up with a wad of straw, to make it level with the road. In the present case, however, the wad had either not been properly inserted or had been allowed to fritter away until there was a depression. No metal cover was used over the tube. The heel of plaintiff's shoe apparently caught in the depression, with the result that she was thrown to the ground and her leg strained and bruised. These facts were stated to his Lordship by Mr. Norman Craig, K.C., who, with Mr. McCardie, appeared for the plaintiff. Mr. J. Eldon Banks, K.C., who, with Mr. A. B. Shaw, represented the defendants, said his case was that this particular stopcock was the property of the Borough Council, and it was their duty to repair it. Evidence was given for the defence by officials of the Board, to the effect that the hole had been properly wadded before the accident; that there were thousands of these holes all over London, and that the number of accidents which had happened on account of them for many years past could be counted on one's fingers; and, further, that in regard to the risk of accident it made little or no difference whether or not the holes were wadded. Mr. Shaw submitted that there was no evidence of negligence making anyone liable; but that if there was negligence it was the Borough Council who were responsible. Mr. Norman Craig contended that the defendants were under statutory obligation to keep these holes in such a condition that they were not dangerous to the public. His Lordship, in giving judgment, said the difficulty he had was in seeing that this plug hole, even if it had no wad of straw, exceeded the limit of things which had a certain amount of danger in them, but which nevertheless were lawful, and did not give rise to a cause of action from their mere existence when an accident happened through them. He considered, however, he was justified in holding that the public had a right to complain of these holes being without the usual wads of straw; and he could not help thinking that they were not inspected frequently enough, especially in a place like Oxford Street. He thought a Jury would come to the conclusion that an efficient wad of straw had not been put in when the stopcock was last examined, and that the hole was in fact dangerous at the time of the accident, though not having the usual protection to which people had become accustomed for many years. He was also of opinion that the liability to keep these things in order rested upon the Water Board. He therefore gave judgment for the plaintiff for the amount agreed (£150), with costs. Execution was stayed in view of an appeal.

Liquidation of the Automatic Gas Lighter, Limited.

The statutory meetings of the creditors and shareholders interested under this liquidation were held at the Board of Trade Offices, Carey Street, W.C., last Wednesday, under the presidency of Mr. H. M. Winearls, the Assistant Official Receiver. The Chairman, after dealing with the proofs of debt lodged, stated that the Company carried on business at 3, East India Avenue, E.C.; and he had not been able to obtain much information in regard to its affairs. The winding-up order was made on the 18th of May, on the petition of Mr. Ernest E. Jessel, the former Secretary and a judgment creditor. No statement of affairs had been lodged. Most of the Directors were resident in France. Only one of them had replied to the Official Receiver's communication; and he said he was not in a position to furnish any information. The Company was registered in England in March last year with a nominal capital of £60,000, divided into 58,000 ordinary shares of £1 each and 20,000 deferred shares of 2s. each; and 30,000 of the former, and 19,500 of the latter had been issued as fully paid. The calls unpaid were returned at £7438; but this figure seemed to the Official Receiver to be obviously incorrect. The Company was formed to acquire certain patents relating to a system of lighting gas-burners from a distance, by means of a switch attachment, known as the "Zenith," and also a patent for the automatic lighting of advertisements by means of gas. The patent rights were owned by three persons who transferred them to the Company for 19,000 fully-paid ordinary and 10,000 fully-paid deferred shares. The Official Receiver had been unable to obtain any books of account showing the results of the trading. Proceedings had been instituted in France against the Company, and it had there been declared to be in a state of bankruptcy. The whole of the assets were in the possession of the Trustee, and their value was unknown to the Official Receiver. It had been suggested that Mr. Jessel should be appointed as Liquidator in this country; but it was quite clear that nothing could be done for the English creditors. At both meetings a unanimous resolution was passed for Mr. Jessel's appointment as Liquidator; and a Committee of Inspection was also nominated.

MISCELLANEOUS NEWS.

LISBURN GAS ARBITRATION.

At the Surveyors' Institution, Great George Street, Westminster, on Saturday, the arbitration proceedings were resumed in respect to the purchase of the undertaking of the Lisburn Gas Company by the Urban District Council (*ante p. 570*). Mr. RAM, K.C., was Umpire; the Arbitrators were Mr. CORBET WOODALL and Mr. H. E. JONES.

The Gas Company were represented by Mr. JOHN GORDON, K.C., M.P., and Mr. R. S. CLEASE; Mr. HONORATUS LLOYD, K.C., Mr. VESEY KNOX, K.C., and Mr. C. C. HUTCHINSON appeared for the Urban District Council.

Mr. C. H. Spencer gave further evidence on behalf of the Urban District Council. He said the total subscribed capital of the Company was £12,000, which included £4700 cash introduced into the concern. There was £5900 transferred from time to time from reserve, and £200 from the profit and loss account. In 1878, the assets were written-up to the extent of £1200; and the share capital was written-up by a similar amount. A sum of £250 premium was paid on 100 shares issued in 1872. This was not carried to capital, but to the reserve fund. The total amount of capital expenditure was £22,822, which did not include £1200 by which the assets were written-up on revaluation. This was made up of original outlay £2486, extension of works and mains £16,642, property purchased £1971, and there were sundry sales of £67. The expenditure upon meters and stoves was £1788. Of the total capital expenditure, the shareholders had subscribed £4950; the rest had been found by the consumers in one form or another. Many renewals had been charged to capital. The sum written-off for depreciation was £9762 gross. Witness was proceeding to give figures to show what had been the position of the Company from its commencement when

Mr. GORDON objected. He said the figures which had already been placed before the tribunal were agreed between Mr. Cash for the Company and Mr. Spencer for the Council.

Witness said he agreed with Mr. Cash to put in certain figures in regard to capital; but there was nothing said as to how far they should go back in the accounts.

Mr. HONORATUS LLOYD said the point he was going to lay before the tribunal was that the Company, under existing circumstances, must be regarded as a future statutory concern, and they had to consider what was the capital upon which it should be based. He wished to show what was the fair capital; and he wanted to see that they got every penny which they were entitled to as represented by works. And whether the works had gone out of sight and into oblivion, he would give the Company every penny which they themselves, from their earliest start, had called capital expenditure.

Mr. GORDON eventually agreed to the figure of £22,822 for actual capital expenditure; but this did not include any sum in respect of working capital, or the registration of the two Companies. The two last items were estimated at £2500 and £300 respectively.

In reply to Mr. HONORATUS LLOYD, witness said that at the present time they could not raise loans upon as favourable terms as was the case a few years ago. In 1896, money was freely offered at 2½ per cent.; to-day the rate was 3½ to 4 per cent.

Mr. H. E. JONES asked what the price of gas was prior to the years which the tribunal had before them. It looked as though this was a low-priced Company; but it might be that they were doing their improvements out of the extra price of gas. He wanted to find where the money came from.

Mr. HONORATUS LLOYD said they were unable to find out, because they could not see the books.

Mr. Leonard, a plumber residing in Lisburn, said that for a period of years there had been general complaints as to the gas supply, and particularly by the users of incandescent lighting, because of inadequate pressure. When the general lighting began, the pressure dropped. He had seen the officials of the Company pumping water out of the mains day after day for several days in particularly wet weather.

Mr. M. Murray, a member of the Urban District Council, said that in his laundry he had been very dissatisfied with the gas supply, and had installed electric light in part of his works.

Mr. HONORATUS LLOYD then addressed the tribunal on behalf of the Urban District Council. He said there was going to be an important point in this case, because it seemed to him that the history of non-statutory gas companies had now reached a pitch when very careful consideration would have to be given to their value. He was going to take the responsibility in this case of saying that, having regard to all the circumstances, and having regard to the evidence given by both sides, and the admissions made by Mr. Stevenson on behalf of the claimants, the only way of valuing the Company was to take its future as that of a statutory concern. He was going to put before the tribunal, as a point of law, that, although at the date of the notice to treat the undertaking was a non-statutory one, and not subjects to any legal restriction as to the amount of profit which should be divided, the Umpire and Arbitrators were bound to take into account the likelihood that the Company, if it had continued to exist, would have become a statutory concern, and to use their judgment as to when that time would have arisen and what restriction, according to the practice of Parliament, would have been imposed. And in fixing the purchase price, the maintainable profit as from that time should be taken at a sum not exceeding that which, under statutory restrictions, the shareholders would have been allowed to divide. He asked the Umpire, if there was any disagreement about it, and he did not see his way to accept the principle, to make his award in the form of a special case. It appeared to him to be a most interesting point, and one worth discussing. The importance, to his mind, arose because non-statutory companies had for many years enjoyed a sort of existence which it was a little difficult to account for. Any man had a right to go and set up a business; and if somebody obtained compulsory powers to take his

premises, and it involved the destruction of his business, he had a claim. He was not going to say that a non-statutory gas company was in exactly the same position. Such security as non-statutory companies had in the past enjoyed had been due to the fact that local authorities had supposed that they had power to grant rights. In recent years, local authorities had awakened to their position, and they knew they had no right to allow non-statutory companies to break up the streets; and it was becoming more and more difficult for a non-statutory company to exist. Nowadays, their position was a precarious one. The time had come when non-statutory companies, if they were going to exist, must obtain parliamentary powers; and this Company recognized that, the moment attention was being called to their affairs, their only chance of a future existence was as a statutory concern. Mr. Stevenson, the expert witness for the Company, agreed that, in all probability, this would have been the case. If the Company obtained a sum of money which they could invest in an undertaking as well secured and give them a similar income, they would get an absolute equivalent of what they had got.

Mr. GORDON, in replying, remarked that the process of arriving at the figure of compensation indicated by Mr. Lloyd should have been inserted in their Bill. But this was not done because Parliament would never have allowed it; and it was hopeless to put it before the present tribunal. If a case were stated, it would never be maintained. The undertaking must be valued as a non-statutory concern. The maintainable profit was £2200; and there was a prospective profit of £3100. The award, after consideration, will be given.

HIGH-PRESSURE GAS IN BIRMINGHAM.

Important Developments.

The "Birmingham Daily Post" for last Wednesday contained an article dealing with the preparations now being made for the supply of high-pressure gas in the city. It was, of course, written for ordinary readers; but the following extracts are of technical interest.

Within the last few days, the activities of the Birmingham Gas Department have been brought prominently before the eyes of the people in the centre of the city by the laying of a gas-main in New Street. This marks the completion of the first part of a scheme that promises ultimately to be of far-reaching importance in relation to developments of the gas undertaking, especially in reference to industrial and public lighting requirements. The main is being laid for the supply of high-pressure gas, which represents the latest of the many advances that have been made in recent years in the production and application of gas for lighting and heating purposes. The new pipe already extends from the Windsor Street Gas-Works to New Street—a distance of about a mile. It is a 24-inch main, and from it will branch smaller pipes, according to the requirements of supply. In laying down plant for a high-pressure scheme, the department primarily had in view the reinforcement of the existing low-pressure distributing system in order to provide for the needs of the outlying districts in the area supplied by the Corporation. For this purpose the high-pressure gas will be governed down to ordinary pressures; but it is also proposed to provide for high-pressure gas lighting and for the supply of high-pressure gas for furnace heating of all kinds. In a city like Birmingham, it is expected that it will be found especially useful in the jewellery and metal trades for annealing, melting, case-hardening, brazing, and so on; and the Gas Department look to a development in this direction as a means of creating a new and increased industrial demand for gas. It is probable that in the high-pressure system will be found the means of supplying these increasing demands on the most economical lines. At any rate, it promises to obviate the necessity for the construction of new gasholders and the laying or relaying of the large and costly mains required for the distribution of gas on the low-pressure system.

In regard to public lighting and the application of high-pressure gas to industrial uses, there is no question of its value and great advantages. For some time Victoria Square has been lighted by gas raised to 30 inches water pressure by means of a small compressor situated in the basement of the Council House. The result has been very satisfactory; but the lamp at the Town Hall corner, opposite the Post Office, shows a light produced from gas at 55 inches water pressure, and the increased illumination as compared with the other high pressure has been very noticeable. It is now proposed to light the whole of Victoria Square with high-pressure gas at 55 inches, and to use inverted instead of upright mantles. The lighting of the space in front of the Council House is, and has always been, done freely by the Gas Department, who use the square as a demonstration-ground for the latest developments in gas illumination. The responsibility for the lighting of the city as a whole rests with the Public Works Department; and it is expected that they will seize the opportunity of the laying of the high-pressure main to have the principal streets along its track illuminated by means of the improved light. There is abundant evidence that, for the special purposes of the manufacturing metal trades that form so large a feature of Birmingham's industries, high-pressure gas has great advantages over gas at ordinary pressures, and even over many kinds of coke-furnaces. For this reason, it is expected that ultimately there will be a considerable demand for the new supply in the jewellery district. It is pointed out that with high-pressure gas the temperature required for the processes of annealing, melting, case-hardening, brazing, and the like, can be quickly obtained, the heat can be regulated to a nicety, and it can be maintained uniformly at the degree desired. This latter advantage is one of considerable value; but, in addition, the use of high-pressure gas yields substantial gains in the economies effected. The consumption of gas required to produce desired results is about 50 per cent. of the quantity necessary at ordinary pressures; and the effects are obtained in about one-third of the time needed under the old system.

Dr. Davidson, Chief Chemist to the Gas Department, estimates that the use of high-pressure gas industrially leads to a saving of 60 per cent. in cost as compared with heating at low pressures. As the result

of experiments, he has stated that 10 lbs. of copper can be melted for less than 1d. with gas at 1s. 6d. per 1000 cubic feet. Some slight modification of the ordinary furnace is required when high-pressure gas is employed; and for some time the Gas Department have been conducting experiments in order to devise forms of furnaces most suitable and economical for use in the Birmingham metal trades. Manufacturers are being canvassed with a view to the adoption of the high-pressure gas, which is already being used by the department for the lighting of their works and for furnace purposes in the testing of fire-bricks. They have hardly yet considered the question of the price to be paid for the gas by the consumer in comparison with the rates for the existing supply. It may be necessary to make a slight charge to cover the cost of compressing the gas, though it is not yet certain that it will be. But even if the consumer who uses it for manufacturing purposes be required to pay a small charge additional to that now levied for low-pressure gas, he will be many times recouped by the great economies and the better results achieved by the adoption of the high-pressure gas.

NOTTINGHAM CORPORATION GAS UNDERTAKING.

The Report before the Council.

At the Meeting of the Nottingham City Council on Monday of last week, the report on the working of the gas undertaking for the past financial year (*ante*, p. 642) came up for approval.

The MAYOR (Mr. Albert Ball, J.P.), who is also Chairman of the Gas Committee, in submitting the report, remarked that it was first of all necessary to clear up some erroneous ideas that seemed to exist in the minds of some people as to the treatment of the prepayment collectors. These collectors, he explained, received a salary of £100 a year, with uniform; and up to three years ago they were taken from all sorts and descriptions of work, and taught their new duties by the Gas Committee's own employees, who did understand the job, in from four to five weeks. He was sure the Council would agree with him that a business with which a man could become adequately acquainted in four or five weeks was not a difficult one to learn. They worked from 8.30 to 1 o'clock, had an hour-and-a-half for dinner, started again at 2.30, and collected until 4.30. Then they went into the office, and were engaged in counting up their money until 6 o'clock. They had nineteen days' holiday in the year, for which they were paid; and he thought the conditions of service which he had mentioned would compare favourably with any other class that could be mentioned. In addition, the collectors were paid for all time off during sickness. During the year they put in 2170 hours, which worked out at 11d. per hour. The collectors were thus fairly paid and treated; and there was no cause for complaint. Turning to the general position of the gas undertaking, he went on to trace the cause of the increased profit made last year. In 1906, he said, when coal cost them 8s. 6d. per ton, they only made a profit of £47,364; but last year, when coal was 9s. 6d. per ton, the profit was upwards of £65,000. The price of coal therefore did not account for the extra profit made last year. It was attributable to the fact that they were now making more gas per ton of coal carbonized, and to the fact that the general condition of the undertaking was much better than it was some years ago. In 1901, they made 9675 cubic feet of gas per ton of coal carbonized; whereas to-day they were making 11,196 cubic feet—an increase of 1519 feet. In addition to this improvement, there was a great saving of gas unaccounted for. In 1901, it was 7.5 per cent. of the total make; while to-day it was 4.5 per cent. There was a saving between last year and this year of 11,500,000 cubic feet of gas unaccounted for. Substantial improvements had been made in the works; and if they were to retain the services of the Engineer, who might have obtained a better position very recently, it would be necessary to consider some increase in his salary. The reserve fund to-day stood very much higher than it had ever been in the history of the concern—namely, £128,706. Then, £21,792 had been placed to renewal account, which they were putting on one side to improve and remodel and bring up to date the Radford works; and there also was a small depreciation fund of £3500—making a total cash reserve of £153,988. He thought it would be agreed that the gas undertaking was now being managed in the best and most economical manner possible; and if those who were so ready to criticize the actions of the Gas Committee would take a little greater interest in the works, and see what was being done, they would be well satisfied. He was confident that the Committee were carrying out their duties to the best advantage.

Alderman Sir EDWARD FRASER recalled the unqualified abuse to which the management of the gas undertaking was subjected not so very long ago, when the whole city resounded with criticism; and he asked how it came about that, under the same Engineer, they had now entered into Paradise, as it were. Was it not, as the figures in the report showed, that since 1902 down to the present time there had been a steady improvement in the returns of the undertaking? The gross profit had risen from £75,000 to £110,000 over this long series of years, which was absolutely creditable to the Gas Engineer and those under his control. The improvement, he felt bound to point out, had not been sudden or spasmodic; and the return showed most conclusively to his mind that the agitation which was got up some years ago was not in the interests of the undertaking, but for extraneous purposes. He realized this at the time; and what had happened since had confirmed the view. The perusal of the figures during the period he had mentioned showed that the undertaking had become increasingly profitable—as, of course, it ought to be, with the price of gas what it was. He could not allow it to be said that all these things had come about within the last one or two years; for the figures in the report conclusively proved that, prior to the agitation and down to the present time, there had been a steady and continuous improvement in the working of the undertaking.

Dr. MILNER disagreed with some of the conclusions of the previous speaker, and declared that the gas inquiry was the best thing that had happened to the department and for the city. The improvement, it was true, had been gradual since Mr. Brown's appointment.

The MAYOR explained that the increased profits of the gas under-

taking had not been continuous since 1902, as they dropped from £97,037 in 1904 to £91,941 in 1905. As to the price of gas in Nottingham, it was below that of several other large cities. The Committee were, however, gradually bringing the charges down, beginning at the right end—the small consumers.

When the report of the Gas Committee recommending an increase of salary from £1000 to £1200 to the Gas Engineer (Mr. J. H. Brown), and that the Gas Accountant (Mr. W. Garton) should be granted £50 in recognition of his fifty years' services to the department, was to have come before the Council.

The Mayor announced that it would be deferred until after the presentation of the report in reference to the one day's rest in seven and the minimum wage of 6d. per hour. At the same time, he said, it was not the intention of the Committee not to bring forward the report. If it was desired to have the gas undertaking managed efficiently, they would have to act as other large concerns of a similar character did, and give fair remuneration.

STAFFORD GAS AND ELECTRICITY SUPPLY.

Large Profits from Gas—Reduction in Price.

At the last Meeting of the Stafford Town Council, the report of the Gas and Electricity Committee for the past financial year was presented. They recommended that, in pursuance of the arrangement as to profit-sharing by the employees of the Gas Department, a bonus of 9.25 per cent. on the wages, compared with 6.3 and 9 per cent. in the two preceding years, be paid to the clerks and workmen in respect of the year's working; and that, in pursuance of a similar arrangement in regard to the officials and workmen of the Electricity Department, a bonus of 7.9 per cent. be paid on the wages, compared with 7 and 7.25 per cent. in the two preceding years. They further recommended that from the 30th inst. the following reductions should be made in the price of gas for lighting: (a) To ordinary consumers in the district from Weeping Cross to Milford from 4s. to 3s. 6d. per 1000 cubic feet, and to slot-meter consumers from 4s. 5d. to 4s. per 1000 feet; (b) to all other consumers, 2d. per 1000 feet.

Alderman WRIGHT said he had never appreciated bringing an annual report before the Council so much as he did on this occasion; and he thought they would approve of what the Committee had decided to do. The sales of gas had not amounted to quite so much as they did twelve months ago. They had yielded £25,587—a decrease of £24; and the residuals had produced £7092, or £275 less. The fittings department showed a profit of £356; and the hire of stoves and repairs department a profit of £47, against a deficiency of £175 before. The manufacture of gas had cost £13,950, compared with £13,947. There had not been quite so much gas made in the year just ended, and the increase was due to the cost of coal having gone up from 10s. 3d. to 10s. 7½d. per ton. The revenue was £33,595, and the expenditure totalled £18,316. The gross profit for the year was consequently £15,280—an increase of £526 upon the previous year. This he thought the Council would consider highly satisfactory. With the balance brought forward, they were left with £15,522 in hand. The charges against the net revenue account, such as repayment of loan, amounted to £7072; and this left an available balance of £8450, compared with £5660 before. Out of this balance they proposed to make a contribution of £3500 in relief of the district rate. They intended to pay £50 to the Free Library Committee as usual, for lighting expenses at the institution; £1000 would be transferred to the credit of the suspense account in respect of the carburetted water gas installation; £2507 would be added to the reserve fund; and £500 would be set aside for payment of the cost of new coal waggons. There remained a balance of £893, from which they proposed to pay a bonus to the workmen; and the working costs enabled them to make it 9.25 per cent., against 6.3 per cent. last year. This meant that the men would receive nearly 2s. in the pound in the shape of a bonus on their wages. He thought this would encourage them to take the greatest interest in their work, and to work together for the improvement of the undertaking. Another satisfactory feature was the very slight leakage. He would not be surprised to hear that their leakage during the year established a minimum for the whole country. It was only 1.07 per cent., and was the lowest on record so far as their own works were concerned. The capital had not been increased; they had not borrowed any money for years, and the total loan on the undertaking was £40,406. Thanks to its excellent management, the concern now stood at the ratio of 4s. 1d. per 1000 cubic feet of gas, whereas ten years ago it stood at 9s. 6d. To sum up the condition of things, they had to-day an undertaking which, upon the very moderate estimate of 25 years' purchase of their profits of £15,000, would work out at £375,000, while the total loans stood at £40,446. The works were valued at £34,553; and they had contributed to the rates £55,225 from the profits of the undertaking. They had paid off loans amounting to £73,437; and he considered that the record was one upon which the town had a right to feel proud. In the electricity department the sales of current, including the public lighting, amounted to £4341, against £4361 the previous year. The electric fittings showed a loss of a few pounds, against a profit of £102; and the general receipts had decreased by £128. But economies had been practised; and the result was that they had a gross profit of £2478, compared with £2465 the preceding year. They had paid their way, and had set aside the instalment of the loan; and they did not ask the ratepayers to contribute anything to the department. They proposed to pay the employees a bonus of 7.9 per cent., against 7 per cent. the previous year.

Alderman MOTTRAM, in seconding the motion, said the rates of Stafford would have been 10d. more in the pound if the gas-works had been privately owned, instead of belonging to the Corporation.

The recommendations were adopted.

The Midhurst Rural District Council have accepted a tender for gas-driven air-lift plant in connection with the water supply, at a cost of £403.

SALFORD AND ITS GAS CHARGES.

A Special Meeting of the Salford Town Council has been called for to-morrow (Wednesday) to re-consider the proposals of the Gas Committee as to a re-imposition of meter-rents, a reduction in the quantity of gas supplied for 1d. by prepayment meters, and a lessened charge for gas to consumers of over 2,000,000 cubic feet. As reported in last week's issue of the "JOURNAL," the Council rejected these recommendations—a decision which placed the Gas Committee in an awkward position, having regard to the fact that coal is costing £7200 more this year than last, and that in response to pressure by the Finance Committee an increased contribution has been promised in aid of the rates from the profits made by the Gas Department.

Last Thursday a meeting of the General Purposes Committee, presided over by the Mayor, passed the following resolution: "That, after full consideration, the General Purposes Committee approve of the proposals of the Gas Committee, and respectfully request the Council to reconsider their decision of last week." The General Purposes Committee, which embraces all the members of the Council, met in private.

The same evening Councillor Royle, addressing a meeting of ratepayers in St. Paul's Ward on the subject, said he opposed the proposed reduction of the quantity of gas supplied to penny-in-the-slot consumers from 30 to 27 cubic feet. One argument urged in favour of it, he added, was that the cost to collect from the slot-meter users was greater than the cost of collecting from quarterly consumers. His answer to this was that if it was so, then the department must be overstuffed. What was wanted was that something should be done as regarded the internal management of the department. While the Gas Committee were anxious to increase the price of gas to small consumers—because the proposal meant an increase in price—they were ready to reduce it to large consumers. A large quantity of gas was bought by people in the outside districts; and, in his opinion, the better plan would be to raise the price of the gas supplied to them. Then the Gas Committee desired to re-impose meter-rents. The only argument so far brought forward in favour of this was that a number of people used electric light and had gas-meters as a stand-by. This was no argument for making all pay.

BOLTON CORPORATION GAS DEPARTMENT.

The Annual Accounts.

The report of the Gas and Lighting Committee of the Corporation of Bolton for the year ended the 31st of March has been issued. The accounts accompanying it show that the net revenue from the sale of 933,106,000 cubic feet of gas was £114,745; residuals produced £38,103; and the total receipts were £155,201, compared with £152,877 in the preceding year. The manufacture of gas cost £83,298 (coal and cannel figuring for £55,695); distribution came to £10,183; management to £2238; the total expenditure to £105,413—leaving £49,788 to be carried to the profit and loss account. For the preceding year, the expenditure was £102,479; and the balance was £50,398. After meeting annuities and interest on loans, paying the dividend on the Corporation stock, &c., there is a net balance of £24,243, out of which the Committee have voted £20,000 in aid of the district rates, and carried the balance of £4243 to the credit of the reserve fund account, the balance of which on March 31 was £56,194. The following comparative statistics of working are given by the Committee.

| | 1910. | 1909. |
|--|----------------|-------------|
| Tons of coal and cannel carbonized. | 98,872 .. | 94,802 |
| Average cost per ton | 11s. 3d. .. | 11s. 7d. |
| Percentage of cannel used. | 1'16 .. | 1'02 |
| Gas made, cubic feet | 986,131,000 .. | 970,577,000 |
| Do. do. per ton carbonized | 9.974 .. | 10.238 |
| Gas accounted for, cubic feet per ton carbonized | 9.510 .. | 9.700 |
| Gas unaccounted for, per cent. | 4'65 .. | 5'25 |
| Maximum quantity of gas supplied in 24 hours during year, cubic feet | 5,471,000 .. | 6,047,000 |
| Minimum quantity, do. | 889,000 .. | 797,000 |

The total net capital expenditure was £687,918; being at the rate of £697 per million cubic feet of gas made, £6 19s. 2d. per ton of coal carbonized, and 14s. 9d. per 1000 cubic feet of gas sold.

LINCOLN CORPORATION GAS UNDERTAKING.

The Past Year's Working.

At the Meeting of the Lincoln City Council last Tuesday, Alderman Wallis, the Chairman of the Gas Committee, gave some particulars from the accounts of the gas undertaking for the year ended the 31st of March. He said the gross profit was £14,235, compared with £12,996 for the preceding year. After allowing for interest and sinking fund charges of £7929, the net profit was £6306—an increase of £1137. The figures relating to the gas supplied showed that the total quantity was 8½ million cubic feet more than in the previous year, following an increase of 13½ millions reported twelve months ago. He thought this was very satisfactory, considering the competition of the Electricity Committee. The total assets exceeded the liabilities by upwards of £104,000. During the year they had spent in repairing, renewing, and refixing meters £1634, of which £800 was for new meters. They had laid out another £1000 on new cookers, which had been provided out of profit, as had the meters. The Council intended to hand over to the rates £3000 out of the profits; and he was glad to say they were carrying forward a greater sum than they anticipated—£1134. They had spent £3134 on new purifiers, which were working very satisfactorily, and would not require renewing for probably 25 years. Their

liabilities amounted to £148,464; and, with the balance of assets, the total was £253,268. The concern was thoroughly up-to-date; and if the Corporation were called upon to purchase such an undertaking, they would have to give at least £300,000 for it. In conclusion, the speaker paid a high tribute to the Engineer (Mr. John Carter).

MARKET HARBOROUGH GAS UNDERTAKING.

Satisfactory Year's Working.

At the Meeting of the Market Harborough Urban District Council last Tuesday, the report of the Gas Engineer and Manager (Mr. A. T. Harris) on the working of the undertaking for the twelve months ended March 31 was presented. It furnished the following particulars.

The total receipts on revenue account were £9093, and the total expenditure was £6389; leaving a gross profit of £2704. This was £39 less than in the year 1908-9; but Mr. Harris explained that the reduction made in the price of gas a year ago had adversely affected the revenue to the extent of £330. After meeting the interest on loans and the repayment of the principal, there was left a net surplus of £612. During the year a sum of £200 was expended on new mains, meters, and stoves. Deducting this, there was a net gain of £412 in the financial position of the department. The total balance to the credit of the profit and loss account at the close of the year was £3020. Coal cost £3278; being £139 less than before, though the make of gas had increased by nearly 2 million cubic feet. This reduction was due to lower prices prevailing, and to improved working results; the make of gas being 11,800 cubic feet per ton, against 11,567 cubic feet in 1908-9. The total make of gas last year was 53,100,000 cubic feet, or an increase of 1,926,000 cubic feet; and the sale to private consumers and for public lighting was 49,208,000 cubic feet, being an increase of 2,006,000 cubic feet. The net receipts from ordinary consumers showed a decrease of £104, though the increased sales of gas through these meters amounted to 1,256,000 cubic feet—the decreased income being due to the reduction in price already referred to. Prepayment meters showed an increase of £115; leaving a net increase of £11 on the total sales. The receipts from ordinary and prepayment meters were £4792 and £1661 respectively; making a total net income from sales by consumers' meters of £6453. There was a net decrease of £39 in the receipts for residuals. Mr. Harris concluded by stating that no special outlay would be required for extensions during the current year; the plant being generally in an efficient condition. But attention would shortly have to be given to the purifiers, to which repairs had been executed several times during the past year.

Accompanying the report of Mr. Harris was that of the Gas Committee, who recommended—"That, subject to confirmation by audit, the annual report and statement of accounts be approved; that the payment of the sum of £200 expended in additions to plant during the year out of profits be approved; and that the balance of £412 be carried forward to the credit of the profit and loss account." They also instructed the Manager to prepare the necessary plans and specifications, and obtain prices for renewing and enlarging part of the purifying apparatus.

Mr. J. L. DOUGLASS, the Chairman of the Gas Committee, in moving the adoption of their report, said the year had been a very successful one, both from a financial and a general point of view. The net profits showed a diminution of £39 compared with the previous year; but the Council must take into account that the price of gas was reduced during the whole of the past year—for six months the reduction was 3d., and for the other six months 2d., per 1000 cubic feet. This had affected the profits to the extent of over £300 during the year; so that if the price had not been reduced the profits would have been £260 more than in the previous year. After allowing for repayment of principal and interest, and additions to plant, and also taking into account the £160 transferred in relief of the rates during the year, there remained a surplus of £252, which it was proposed to carry forward. For the first time since the Council had been in possession of the undertaking, surpluses of revenue had been used for providing new plant, instead of raising additional capital. The Manager told him that the whole of the plant had been maintained in a thoroughly efficient condition; and there was no doubt the undertaking was in a sounder financial position now than it had ever been. On March 31, their assets showed a surplus of £12,100 over all liabilities. They had been able to maintain their profits in spite of the reduction in the price of gas, owing largely to the facts that coal had been cheaper and that the new retorts had produced better results. He thought he ought to voice the opinion of the Committee that the Manager was much to be congratulated on the results achieved during the year.

Mr. S. GOWARD seconded the motion.

Mr. R. C. DUNKLEY said it had been his pleasure in the past to support everything that had been said with regard to the management of the gas-works; and he did so again, as he was convinced that it could not be excelled. As one outside the Gas Committee, he offered the Manager his compliments and thanks; and he also included the other officers of the Council, and particularly the Gas Committee, who, during the past year, had given their best to this work in the interests of the town. No Committee could have supported a Manager better than they had done. Their thanks were due also to the men, who gave of their bone and sinew in their service.

The report was adopted.

Public Lighting of Oswestry.—At the meeting of the Oswestry Town Council on Monday last week, the report presented by the Watch Committee contained a recommendation that the tender of the Oswestry Gas Company for the public lighting of the borough for a period of seven years from Oct. 1, 1910, should be accepted. The matter gave rise to a long discussion, as the recommendation was arrived at only on the casting vote of the Mayor. The Electric Light Company had submitted a tender which it was stated was lower than that of the Gas Company; but it did not comply with the specification. Eventually the recommendation of the Committee was adopted.

MANAGEMENT OF THE BURTON-ON-TRENT GAS-WORKS.

Assistant-Manager's Salary Increased.

At the Meeting of the Burton-on-Trent Town Council last Wednesday, a discussion took place on a recommendation contained in the report of the Gas and Electricity Committee to increase the salary of the Assistant Gas Manager (Mr. R. S. Ramsden) by £30 per annum.

Alderman Lowe, in moving the adoption of the report, said Mr. Ramsden was appointed 3½ years ago at a salary of £180 a year, with a house, coal, gas, rates, and other items. At the time the salary was agreed upon, it was a fair remuneration. But the position of the works had steadily improved, and as Mr. Ramsden had done his duty and rendered good service to the Council, he (Alderman Lowe) maintained that he was entitled to some consideration. Consequently, the Committee recommended an increase of £30. Several members felt that this amount was inadequate; but, after considerable discussion, it was fixed upon as a fair advance. Mr. Bell, their Consulting Engineer, had had an opportunity of forming an opinion of Mr. Ramsden's work; and he spoke of him in the highest terms. He described him as most attentive to his duties—never being away from the works except on business; while the works were thoroughly well looked after. Mr. Bell, in fact, thought they were not paying Mr. Ramsden the salary he was entitled to. The Council should also bear in mind that the gas-works were doing very well, and they ought to be more generous in their prosperity than in their adversity. He hoped the Council would pass the recommendation, as it was a very fair one. Alderman Roberts seconded the motion.

Mr. J. Rowland moved, as an amendment, that the paragraph in the report referring to the proposed increase in salary be deleted, and that the matter be considered twelve months hence. He thought the proposal should be referred back to the Committee until the Council found themselves with a fully-equipped gas undertaking. Alderman Lathbury seconded the amendment. Alderman Rowland thought that Mr. Ramsden was entitled to some advance; but he considered an increase of £20 per annum would meet the case, so long as Mr. Bell was retained as Consulting Engineer. He gave notice of an amendment to this effect. Mr. King suggested the adjournment of the question until the reconstruction of the gas-works had been completed, and possibly alterations made in the staff. The Mayor (Mr. T. Jenkins) said he should vote for the recommendation of the Committee, because Mr. Ramsden was worth more than his present salary and the extras; and the proposed increase would not affect the rates. Alderman Lowe, in reply, pointed out that Mr. Ramsden was really more than Assistant-Manager, and that he was all the week at the gas-works.

The Council then voted upon Mr. Rowland's amendment, which was lost by 14 votes to 12. Alderman Rowland then submitted his amendment for an increase of £20 per annum; and Alderman Lowe said he was prepared to accept it, as it appeared to meet the view of the Council. After some further remarks, the amendment was put and carried unanimously.

DEVONPORT CORPORATION GAS UNDERTAKING.

The Disposal of Municipal Profits.

From the statement of accounts submitted to the Devonport Town Council, it appears that the year ending March last was one of the most profitable in the history of the municipal gas undertaking. The sales of gas reached a total of 358,751,500 cubic feet—an increase of 15,651,200 cubic feet, or 4.5 per cent., compared with the previous year. The income from the sale of gas for private consumption and public lighting was £45,513; being £2069, or 4.76 per cent., more than before; and the gross profit amounted to £21,599, which is equivalent to 6.79 per cent. on the capital employed. From a detailed statement, it appears that the make of gas has increased from 295,929,000 cubic feet in 1903, the first year in which the Corporation had control of the undertaking, to 369,803,000 cubic feet last year; while the unaccounted-for gas has decreased in the same period from 23,031,000 cubic feet, or 7.1 per cent., to 7,760,500 cubic feet, or 2.1 per cent. The number of consumers has risen from 7923 to 16,935, of whom 10,367 are supplied through prepayment meters. There are 1055 stoves on hire. The coal and its equivalent carbonized last year amounted to 37,543 tons; the average cost, including delivery, working out at 12s. 4.47d., against 13s. 4.68d. the previous year. The make of gas per ton of coal carbonized was 9850 cubic feet, compared with 10,248 cubic feet in the year 1908-9. Of coke, there was produced 18,562 tons, which sold at an average price of 14s. 8.9d.; while tar, of which the produce was 270,627 gallons, realized 13s. 3.37d. per ton, and sulphate of ammonia (238 tons) made only £6 6s. 1.94d. per ton. From the gross profit, £18,115 had to be deducted for interest and repayment of loans; leaving £3475 to be carried to the reserve fund.

Alderman TOZER, the Chairman of the Gas Committee, said it was satisfactory to find that they had such a sum as £3475 to add to the reserve fund. The Committee were not able to reduce the price of gas or to make any contribution to the rates, as the whole of the profit had been swallowed up in meeting expenditure outside the ordinary payments. In the past year, the manufacture of gas had cost 1.3d. per 1000 cubic feet less than in the year 1908-9. The sales had increased by 50 million cubic feet between 1903 and 1910, notwithstanding the fact that between these years the supply to Government establishments had fallen off to the extent of 30 millions. This was accounted for by the augmentation of the automatic installations, and by the use of 35 million cubic feet of gas for public lighting. The increase in the sale of gas last year was a record, except for 1904, the first year the Corporation had control of the works.

Mr. DAYMOND moved that the report be referred back to the Committee with a view to the appropriation of a portion of the profits for the relief of the rates.

A similar motion had previously been made with reference to the accounts of the Electricity Committee. In the course of the discussion on this question, the Town Clerk had remarked that the subject of

allocating net profits to the relief of the rates or to a reduction in the price of the commodity was one which demanded careful consideration; but there were certain features which made it expedient not to deal with the matter in the open Council. He suggested that the Council should meet in Committee for the discussion of the subject, when he thought they would receive a large amount of enlightenment.

Mr. MOON supported the proposal to refer the Gas Committee's report back, and expressed the opinion that it was quite time the ratepayers received some benefit from the undertaking.

Mr. COUSINS explained that a large expenditure was being incurred in renewing mains which had become defective through age, and contended that the time was not opportune to talk of appropriating the reserve fund for the reduction of the rates.

Alderman TOZER said they had overspent their capital, and now had to pay for work out of current revenue. In the past year they had incurred expenditure to meet deficiencies, some of which had existed for eight years. Although they had a net profit of £3474 to add to the reserve fund, the fact was that the balance in hand on the fund was now £200 less than last year. When the time arrived, no one would be more pleased than he to see contributions made to the relief of the rates.

The report was adopted.

TEIGNMOUTH GAS SUPPLY.

Improved Results.

At the Meeting of the Teignmouth Urban District Council last Tuesday, a statement for the year ended March 31, prepared by the Gas Engineer and Manager (Mr. J. A. Gray), was presented. It showed a gross profit of £2127, of which £1100 had been required for repayment of loans, while a further £558 was absorbed by interest. A balance of £469 remained to be added to the net revenue account, increasing it to £2780. At March 31, 1903, there was a deficit of £1283 on revenue account; so that financial improvement to the extent of £4063 had been effected in seven years, while the output of gas had increased by 75 per cent. At March, 1902, the debt on the gas-works amounted to £16,319; and at March last to £16,136. As the sales increased, the more hopeful became the prospect for cheaper gas. The quantity sold to private consumers was 29,335,900 cubic feet—an increase of 5·7 per cent. Slot-meter consumers accounted for 4,287,600 cubic feet—being an increase of 15·2 per cent. over the year 1908-9; 5,725,000 cubic feet were estimated to have been consumed by the public lamps, and about 800,000 cubic feet were used at the works. In January last, the erection was completed of new purifiers of ample area, displacing plant which had done duty for 41 years. An all-round reduction of 3d. per 1000 cubic feet in the price of gas was made at the commencement of the second half of the financial year; also a reduction at the rate of £160 per annum—the equivalent of a rate of 1d. in the pound—on the charges for public lighting. Successive reductions to a total amount of 1s. 4d. per 1000 cubic feet had been made in nine years; and the public lighting charges had also been repeatedly reduced, to the advantage of the district rates. Mr. Turpin, alluding to a recommendation of the Gas Committee to apply for sanction to a loan of £1000 for the

provision of slot-meters and stoves, urged the necessity of not adding to the indebtedness of the town. He said that they were now getting into a healthy financial condition in regard to the gas-works, and they should not go in for borrowing. He proposed that the matter be referred to the Gas Committee to consider the question of paying for these things out of current revenue. It was pointed out that the Council need not take up all the £1000. The proposition, however, was carried; and the matter was referred back to the Committee.

COVENTRY CORPORATION TRADING DEPARTMENTS.

Lecture by Mr. F. W. Stevenson.

Some interesting information concerning the trading departments of the Coventry Corporation was imparted by Mr. Fletcher W. Stevenson, the Engineer and General Manager of the gas undertaking, in one of a series of "Citizenship" addresses lately delivered by him to a gathering of Coventry citizens, under the presidency of Mr. W. H. Batchelor, the Chairman of the Gas Committee. Mr. Stevenson's remarks were based upon "The Citizen as Trader." He observed that there were three trading departments of the Corporation that regularly made contributions in aid of rates—the gas, water, and electricity undertakings. During the last ten years, the amount contributed by the Water Department had been £34,500, and by the Gas Department £17,000; while the Electric Light Department had contributed £3850 in the last four years. The contributions in aid of the rates from the gas and electricity concerns were always justified on account, it was said, of the risk incurred. With regard to the electric light, it had been necessary to draw upon the rates to make up deficiencies to the amount of something like £12,000 in past years; but now that this was a flourishing concern, it must pay back this debt with interest, just as any private trader would have to do. There, however, its obligation ceased. But the gas had never needed a penny from the rates. The gas consumers had made all the profits, and were entitled to them, subject only to proper provisions for renewals, depreciation, and reserves. Very many were probably consumers of gas through prepayment meters, and therefore paid at a higher rate for the gas; and it was much more important to them to have the price reduced than to have a penny or two in the pound less on the rates. The gas undertaking was purchased from the Gas Company in 1884. It was comparatively a small concern, supplying about 184 million cubic feet of gas a year, and charging an average price of 3s. per 1000 cubic feet. Now it supplied nearly 800 million cubic feet a year, and the price had fallen to an average of 2s. 3d. per 1000 cubic feet. It was growing more rapidly than ever; and with the increased growth there was no doubt the price would go steadily down. It was astonishing to note the ever-widening field for the uses of both gas and electricity in providing light, heat, and power. It was only about thirty years ago that electricity first entered the field for lighting and power; and it was then prophesied that coal gas was doomed, and that the new illuminant would hold unrivalled sway. But Baron von Welsbach invented the incandescent mantle, and the so-called doomed illuminant sprang into fresh life, and was to-day more generally used than ever. At the same

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 680

| Issue. | Share. | When ex- Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest- ment. | Issue. | Share. | When ex- Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest- ment. |
|------------|--------|-----------------------|-----------------------|---------------------------|--------------------|---------------------------------|-----------------------------------|-----------|--------|-----------------------|-----------------------|---------------------------|--------------------|---------------------------------|-----------------------------------|
| £ | Stk. | Apl | p.c. | Alliance & Dublin Ord. | 82-84 | .. | £ s. d. | £ | Stk. | May 12 | p.c. | Imperial Continental | 177-179 | .. | £ s. d. |
| 1,474,000 | Stk. | Jan. 13 | 5 | Do. 4 p.c. Deb. | 100-02 | .. | 3 18 5 | 4,940,000 | Stk. | Feb 10 | 3 | Do. 3½ p.c. Deb. Red. | 04-96 | .. | 4 9 5 |
| 310,000 | Stk. | May 12 | 7 | Bombay, Ltd. | 6½-6½ | .. | 5 9 10 | 1,235,000 | Stk. | Mar. 16 | 6 | Lea Bridge Ord. 5 p.c. | 122-124 | .. | 4 16 9 |
| 200,000 | 5 | | 7 | Do. New, £4 paid. | 48-54 | .. | 5 9 3 | 195,242 | Stk. | Feb. 25 | 10 | Liverpool United A. | 219-221 | -3 | 4 10 6 |
| 40,000 | 5 | | 7 | Bourne- o p.c. | 29-30 | .. | 5 0 0 | 561,000 | Stk. | | 7 | Do. B. | 163½-165½ | .. | 4 4 7 |
| 50,000 | 10 | Feb. 25 | 15 | mouth Gas B 7 p.c. | 16½-16½ | .. | 4 3 7 | 718,100 | " | Dec. 29 | 4 | Do. Deb. Stk. | 104-106 | +1 | 3 15 0 |
| 311,810 | 10 | | 7 | and Water Pref. 6 p.c. | 15-15½ | .. | 3 17 5 | 306,083 | " | Nov. 26 | 5 | Malta & Mediterranean. | 42-5 | .. | 0 0 0 |
| 75,000 | 10 | | 6 | Brentford Consolidated | 251-254 | .. | 4 18 5 | 75,000 | 100 | Apl. 1 | 5 | Met. of 15 p.c. Deb. | 100-102 | .. | 4 18 0 |
| 380,000 | Stk. | | 12½ | Do. New | 183-191 | .. | 5 0 0 | 541,920 | 20 | May 27 | 3½ | Melbourne 4½ p.c. Deb. | 100-102 | .. | 4 8 3 |
| 300,000 | " | Aug. 12 | 5 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 0 | 250,000 | 100 | " | 4½ | Monte Video, Ltd. | 12½-13 | .. | 5 7 8 |
| 50,000 | " | June 10 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 | 1,775,892 | Stk. | Feb. 2 | 3½ | Newcastle & G'tesh'd Con | 102½-103½ | -2 | 4 9 4 |
| 206,250 | Stk. | Mar. 16 | 1 | Brighton & Hove Orig. | 213-216 | .. | 5 1 0 | 529,435 | Stk. | Dec. 29 | 3½ | Do. 3½ p.c. Deb. | 91-93 | .. | 3 15 3 |
| 220,000 | Stk. | | 4 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 55,940 | 10 | Feb. 25 | 7 | North Middlesex 7 p.c. | 13½-13½ | .. | 5 1 10 |
| 246,320 | " | Apl. 1 | 18 | British | 44-45 | .. | 4 14 8 | 300,000 | Stk. | Apl. 29 | 8 | Oriental, Ltd. | 138-140 | .. | 5 14 4 |
| 469,000 | 20 | Feb. 25 | 6 | Bromley, A 5 p.c. | 118-120 | .. | 5 0 0 | 60,000 | 5 | Apl. 1 | 8 | Ottoman, Ltd. | 6-6½ | .. | 6 8 0 |
| 109,000 | Stk. | | 4½ | Do. B 3½ p.c. | 88-90 | .. | 5 0 0 | 31,800 | 53 | Feb. 25 | 13 | Portsea Island A. | 134-136 | .. | 5 1 0 |
| 165,700 | " | | 5½ | Do. C 5 p.c. | 105-107 | .. | 5 2 10 | 60,000 | 50 | " | 13 | Do. B. | 126-128 | .. | 5 1 7 |
| 82,278 | " | Dec. 29 | 3½ | Do. 3½ p.c. Deb. | 87-89 | .. | 3 18 8 | 100,000 | 50 | " | 12 | Do. C. | 119-121 | .. | 4 19 2 |
| 51,000 | " | Oct. 14 | 7 | Buenos Ayres (New) Ltd. | — | .. | — | 114,800 | 50 | " | 10 | Do. D and E. | 100-102 | .. | 4 18 0 |
| 500,000 | 10 | Dec. 29 | 4 | Do. 4 p.c. Deb. | 98-100 | .. | 4 0 0 | 398,490 | 5 | Apl. 29 | 7 | Primitiva Ord. | 71-7½ | .. | 4 13 4 |
| 250,000 | Stk. | | — | Cape Town & Dis., Ltd. | 4-5 | .. | — | 796,980 | 5 | Jan. 27 | 5 | Do. 5 p.c. Pref. | 52-5½ | .. | 4 10 11 |
| 100,000 | 10 | | — | Do. 4½ p.c. Pref. | 5½-6½ | .. | — | 488,900 | 100 | June 1 | 4 | Do. 4 p.c. Deb. | 97-99 | .. | 4 0 10 |
| 50,000 | 50 | May 3 | 6 | Do. 6 p.c. 1st Mort. | 49-50 | .. | 6 0 0 | 1,000,000 | 10 | Oct. 14 | 8 | River Plate Ord. | — | .. | — |
| 100,000 | Stk. | Dec. 29 | 4½ | Do. 4½ p.c. Deb. Stk. | 89-91 | .. | 4 18 11 | 312,650 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 157,150 | Stk. | Feb. 25 | 5 | Chester 5 p.c. Ord. | 109-111 | .. | 4 10 1 | 250,000 | 10 | Apl. 1 | 9 | San Paulo, Ltd. | 15½-15½ | .. | 5 14 3 |
| 1,511,280 | Stk. | Feb. 25 | 5½ | Commercial 4 p.c. Stk. | 107-109 | +1 | 4 15 5 | 62,500 | 10 | " | 0 | Do. 6 p.c. Pref. | 112-122 | .. | 4 18 0 |
| 560,000 | " | | 5 | Do. 3½ p.c. do. | 103-105 | .. | 4 15 3 | 125,000 | 50 | Jan. 3 | 5 | Do. 5 p.c. Deb. | 50½-51½ | .. | 4 17 1 |
| 475,000 | " | Dec. 29 | 3 | Do. 3 p.c. Deb. Stk. | 81-83 | .. | 3 12 3 | 135,000 | Stk. | Mch. 16 | 10 | Sheffield A. | 232-234 | .. | 4 5 5 |
| 800,000 | Stk. | June 10 | 5 | Continental Union, Ltd. | 96-98½ | .. | 5 2 0 | 209,984 | " | " | 10 | Do. B. | 232-234 | .. | 4 5 5 |
| 200,000 | " | | 7 | Do. 7 p.c. Pref. | 135-137½ | +½ | 5 2 2 | 523,500 | " | " | 10 | Do. C. | 232-234 | .. | 4 5 5 |
| 492,270 | Stk. | | 5½ | Derby Con. Stk. | 121-123 | .. | 4 9 5 | 70,000 | 10 | May 27 | 7 | South African | 11½-11½ | .. | 5 19 2 |
| 55,000 | " | | 4 | Do. Deb. Stk. | 104-105 | .. | 3 16 2 | 6,429,895 | Stk. | Feb. 10 | 5/9/4 | South Met., 4 p.c. Ord. | 120-122 | .. | 4 9 7 |
| 142,995 | " | Apl. 1 | 5 | East Hull 5 p.c. Ord. | 96-98 | .. | 5 2 0 | 1,895,445 | " | Jan. 13 | 3 | Do. 3 p.c. Deb. | 80-82 | .. | 3 13 2 |
| 486,99 | 10 | Jan. 27 | 12 | European, Ltd. | 24½-24½ | .. | 4 17 0 | 209,822 | Stk. | Mar. 16 | 8 | South Shields Con. Stk. | 157-158 | .. | 5 1 3 |
| 354,060 | 10 | | 12 | Do. £7 tos. paid. | 18½-18½ | .. | 4 16 0 | 605,000 | Stk. | Feb. 25 | 5½ | S'th Suburb'n Ord. 5 p.c. | 121-123 | .. | 4 12 0 |
| 16,198,672 | Stk. | Feb. 10 | 4½ | Gas 4 p.c. Ord. | 103½-104½ | .. | 4 9 3 | 60,000 | " | " | 5 | Do. 5 p.c. Pref. | 121-123 | .. | 4 1 4 |
| 2,600,000 | " | | 3½ | light 3½ p.c. max. | 88-90 | .. | 3 17 9 | 117,058 | " | Jan. 13 | 5 | Do. 5 p.c. Deb. Stk. | 122-124 | .. | 4 0 8 |
| 4,002,235 | " | | 3 | and 4 p.c. Con. Pref. | 104-106 | .. | 3 15 6 | 502,310 | Stk. | May 12 | 5 | Southampton Ord. | 110-112 | .. | 4 9 3 |
| 4,531,706 | " | Dec. 29 | 3 | Coke 3 p.c. Con. Deb. | 81-83 | .. | 3 12 3 | 120,000 | Stk. | Feb. 10 | 6½ | Tottenham A 5 p.c. | 133-135 | .. | 5 1 9 |
| 258,740 | Stk. | Mar. 16 | 5 | Hastings & St. L. 3½ p.c. | 93-95 | .. | 5 5 3 | 453,940 | " | " | 5½ | and B 3½ p.c. | 113-115 | .. | 4 13 6 |
| 62,500 | " | | 6½ | Do. do. 5 p.c. | 117-119 | .. | 5 9 3 | 149,470 | " | Dec. 29 | 4 | Edmonton 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 70,000 | 10 | Apl. 29 | 11 | Hongkong & China, Ltd. | 17-17½ | .. | 6 5 9 | 182,380 | 10 | June 10 | 8 | Tuscan, Ltd. | 9-9½ | .. | 8 8 6 |
| 131,070 | Stk. | Mar. 16 | 7 | Ilford A and C | 145-147 | .. | 4 15 3 | 149,900 | 10 | Jan. 3 | 5 | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 19 0 |
| 75,780 | " | | 5½ | Do. B | 105-110 | .. | 5 0 0 | 236,476 | Stk. | Feb. 25 | 5 | Tynemouth, 5 p.c. max. | 113-115 | .. | 4 0 11 |
| 65,500 | " | Dec. 29 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 255,636 | Stk. | Feb. 25 | 6½ | Wands-1 B 3½ p.c. | 139-141 | .. | 4 14 0 |
| | | | | | | | | 79,416 | " | Dec. 29 | 3 | worth 3 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |

Prices marked * are "Ex div."

time electricity had developed, and its usefulness had increased side by side with the growth of the gas industry. They had a striking instance of this in Coventry. For the financial year just closed, the sale of electric current increased by upwards of 30 per cent, and the sale of gas by about 10 per cent; and record surplus profits had been made by both departments.

GAS SUPPLY IN THE WOLSTANTON DISTRICT.

The accounts of the Gas Department of the Wolstanton United Urban District Council for the year ended the 31st of March have been issued by the Gas Committee. They show that the revenue was £11,304, and the expenditure £6557; leaving £4747 to go to the profit and loss account, the total of which at the end of the financial year, with the amount carried forward, was £4897. After repayment of loans and interest, there was a net profit on the year's working of £303; being at the rate of 1s. 10²/₃d. per ton of coal carbonized and 1¹/₁₆d. per 1000 cubic feet of gas accounted for. Under the supervision of the Engineer and Manager (Mr. A. A. T. Botteley), 5584 tons of coal were carbonized and 68,440,000 cubic feet of gas made; being at the rate of 12,255 cubic feet per ton. The total quantity of gas sold to ordinary consumers was 30,654,000 cubic feet, to prepayment consumers 21,433,100 cubic feet, and for public lighting 9,867,700 cubic feet. The coke made per ton of coal was 13.6 cwt.; and 12.8 gallons of tar and 25.1 lbs. of sulphate of ammonia were produced. The average receipts per ton from coke were 9s.; from tar, 19s. 5d.; and from sulphate of ammonia, £11 1s. 11d.

EXPERIMENTAL LIGHTING IN THE CITY OF LONDON.

By the time these lines appear in print, the first portion of the experimental high-pressure gas lighting in the City of London, in connection with the recommendation of the Court of Common Council, will be in operation. The work of installing the lighting has been in hand by the Gaslight and Coke Company during this past fortnight. The thoroughfare dealt with is New Bridge Street, from Ludgate Circus to Blackfriars Bridge. The lamps, six in number (in addition to a small "traffic lamp" on a refuge), are erected on columns on the footpath, without lowering gear, suspended from "swan-necks." The illuminating power of the lamps, which are of the Keith (new pattern) Fleet Street type, is 1500 candles each. They will work at 54 inches (minimum) water pressure; and as they are connected to the two compressing-houses of the Company in Tudor Street and Essex Street, all risk of failure is avoided. This lighting taking place concurrently with the trial lamps of 3000-candle power in Aldwych for the City of Westminster, some particulars in regard to which are given elsewhere,

will afford the members of the Institution of Gas Engineers who are in London this week from all parts of the country an opportunity of witnessing a display of the latest types of high-pressure gas lighting in the public thoroughfares.

LYTTELTON (N.Z.) GAS AND WATER SUPPLY.

We have received the report made by Mr. G. A. Lewin, the Town Clerk of Lyttelton (N.Z.), to the Mayor and Corporation, on the municipal year of the year ended the 31st of March. In the course of it, he furnishes the following particulars as to the gas and water supply.

Mr. Lewin says a good, solid year's progress may safely be credited to the Gas Department. The sales by meter increased from 9,263,000 cubic feet at March, 1909, to 10,543,800 cubic feet at March, 1910—an advance of 1,280,800 cubic feet, or 13.8 per cent. The demand for new services kept up, and necessitated the expenditure of slightly over £400 in the plant account, which is regarded as profit spent on extensions, and is practically equivalent to writing down the capital account by that amount for depreciation. The year just closed was the first complete one of the substantial reduction made in the price of gas for lighting purposes; and this fact is reflected in the gross revenue from gas sales on the basis of 1000 cubic feet sold. Last year the average was 77.28d., while this year the figure is down to 76d. On the other hand, both coke and tar sales show a slight increase in the returns per 1000 cubic feet. The make per ton of coal shows a slight decline, compared with last year's figures, due to the somewhat inferior quality of the coal available, owing to threatened trouble in the coal trade generally as a reflex of the Newcastle strike. The net cost of coal per 1000 cubic feet sold again shows a slight decline, which, in view of the foregoing disabilities, Mr. Lewin thinks must be counted as satisfactory. The figures this year work out at 2.64d., against 2.95d. last year.

The following are some of the statistics submitted by Mr. Lewin: Receipts, £4423; expenditure, £4142; net profit, £1163; coal carbonized, 984 tons; gas made, 11,278,800 cubic feet, or 11,462 cubic feet per ton of coal; coke sold, 374.5 tons, or 7.61 cwt. per ton; tar made, 12,025 gallons, or 12.22 gallons per ton; net cost of coal per 1000 cubic feet of gas sold, 2.64d. Of the total make of gas, 39.5 per cent. was sold by meter for lighting, 44.77 per cent. by meter for special purposes, 9.22 per cent. for public lighting, 3.68 per cent. was used on the works, and 2.83 per cent. was unaccounted for. From Dec. 1, 1902 (the date of the transfer of the undertaking to the Corporation), to March 31, 1910, the total sum earned was £25,741; and the total payments were £19,149—showing a net profit of £6592, of which £2974 has been expended on new works and extensions, £500 has been transferred to the general account in relief of the rates, and there is a cash credit of £1013.

Reporting upon the water supply, Mr. Lewin gives figures showing

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that the total quantity of water pumped in the period reported upon was 66,462,000 gallons, compared with 59,737,000 gallons in the preceding year; the town consumption being 57,133,750 gallons, against 50,575,300 gallons. The daily consumption per head varied from 33.18 gallons in June to 46.2 gallons in December—the average being 39.15 gallons, compared with 34.65 gallons in 1908-9. Mr. Lewin says the first complete year with the new plant—producer-gas engines and high-lift turbine pumps—at the Heathcote Valley pumping-station, the installation of which was referred to in the last report, has demonstrated its advantages. The cost of pumping has been reduced, if not as much as the first two or three months' work seemed to suggest, still to an extent which more than pays the interest on the whole of the expenditure. In 1908, the last complete year with the old steam outfit, there were pumped 56 million gallons of water to the main reservoir, at a fuel cost of £381, or £6 16s. per million gallons. On this basis, the cost of fuel to raise last year's 66½ million gallons would have been £449, whereas by means of the new plant the work was done at a fuel cost of £175, or a saving of £274. Some little difficulty was at times experienced in starting the engines; and with the view of overcoming this trouble a compressed air-starting outfit has been installed. It consists of a little oil-engine driving a compressor, by means of which compressed air is stored in a steel reservoir. Mr. Lewin says the plant works admirably, and is now doing all that was foretold of it.

POOLE CORPORATION WATER SUPPLY.

The New Works.

In the last number of the "JOURNAL" (p. 649), reference was made to the opening of the new water-works which have been constructed for the supply of Poole, in accordance with the plans of Mr. W. Matthews, M.Inst.C.E., the Consulting Water Engineer to the Corporation. The following are some additional particulars respecting the scheme.

Following the amalgamation in 1906 of Branksome with Poole, the feeling grew that the water supply for the borough should be in the hands of the Corporation. It had, for half-a-century, been vested in a Company, who had under consideration the promotion of an extension scheme costing about £40,000. The matter was referred to arbitration; and the purchase price of the undertaking was fixed at £134,000. The Corporation then had to take into consideration the other part of the Act, under which they had obtained powers for extension; and the services of Mr. Matthews were secured.

The new scheme consists of a well and pumping-station at Corfe Mullen, in the valley of the Stour, about midway between Wimborne and Bailey Gate, and a line of pipes through which the water is pumped to a new service reservoir at Forest Hill. From this high-level reservoir the water flows by gravitation through lines of pipes to the new service reservoirs at Lytchett and Constitution Hill, and also to

the existing service reservoir at Broadstone and the water-tower at Parkstone. The existing tower at Broadstone, being at a higher level than the Forest Hill reservoir, cannot be supplied direct, and it has been necessary to provide a small pumping plant in the base of the tower, which, working for perhaps a few hours twice a week, lifts the required quantity of water from the Broadstone reservoir into the tower above it.

The well was commenced on June 27, 1907, and it and the headings were completed on July 11, 1908. Galleries or headings of a total length of 435 feet have been driven into the chalk at a depth of 160 feet from the surface. The well proper yielded 30,000 gallons of water per hour, and the driving of the galleries added another 10,000 gallons per hour, until, with little warning, a fissure was struck, which yielded so much water that the Contractors' pumps were overpowered, and the men had to be withdrawn hastily from the workings, which have since remained flooded. The yield of this well cannot be less than 2 million gallons a day; and while the quantity to be pumped remains under a million gallons a day, the water will be maintained at such a high level as considerably to diminish the power required to lift it, and so reduce the fuel consumption.

The pumping-station, built over and around the well, is of brick-work, with white brick facings and red terra-cotta and Portland stone ornamentations. It comprises an engine-room, in which are assembled the whole of the main pumping machinery and gas-engines, and a producer house, in which are the gas generators, scrubbers, and circulating tanks, with coal-store adjoining. Subsidiary to these are a small engine-room for the compressed air starting gear and the petrol gas producer for lighting the building, a workshop, store, and smithy.

As mentioned last week, the new works have been designed to provide for a supply 25 years hence to an estimated population of about 54,000 persons, when, upon the present basis, the average quantity required will be about 864,000 gallons per day, and the maximum quantity 1,350,000 gallons.

NOTTINGHAM CORPORATION WATER DEPARTMENT.

The Past Year's Working.

The annual report of the Water Committee of the Nottingham Corporation has been presented. It shows that the total capital expenditure on the water undertaking up to March 31 was £1,335,067; a sum of £8078 having been added during the year. The balance carried to the net revenue account is £71,360. This account shows that £23,139 was paid on the water annuities, £22,352 as interest on consolidated stock, and other payments made up a total of £57,000; this, deducted from the £71,360, leaves £14,360 net profit, which has been transferred to the reserve fund for depreciation, renewals, and the Derwent water scheme. The net profit is higher than it has been for some years previously. No part of it is taken for the relief of the rates. The total



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quantity of water pumped from all the works during the year amounted to 2,764,047,103 gallons. The fluctuation in the consumption is shown by the fact that the maximum weekly quantity of water pumped during the summer amounted to 61,573,866 gallons, whereas during the winter it was 55,794,853 gallons. The average for the year was 53,154,752 gallons, or 7,593,536 gallons a day. The total storage capacity of the various reservoirs is only 13,845,058 gallons, or not quite two days' average requirement. During the year there was a net increase of 4318 supplies, and the total at present is 127,628 domestic and 14,481 trade, together 142,109. The total number of meters in use by the department is 3741; but in accordance with the Committee's decision to abandon the system of supplying water by meter in cases where experience has shown that the annual cost of the water consumed does not equal the meter-rent, arrangements have been made to remove such meters at the cost of the department, and to reduce the charges by 25 per cent. on the present minimum charge by meter. The system will be gradually extended wherever it is found desirable to do so. The population supplied by the Water Department at the present time is 360,769, exclusive of the outlying parishes, which are supplied in bulk through meters. The only matter now causing the Committee anxiety is the fact that colliery workings are rapidly approaching the pumping-stations at Basford, Bestwood, and Papplewick, and the reservoirs at Red Hill and Papplewick. Arrangements are being made with the coal-owners and colliery proprietors for the purpose of minimizing risk of injury or damage.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The meeting of the Waverley Association of Gas Managers in Edinburgh yesterday must be looked upon as a success, from the technical point of view, though, it must be admitted, there was disappointment in the matter of the number present and in the amount of work which was got out of those who did attend. On the latter point, it will be observed that by far the greater part of the speaking in the discussion upon oxide purification was contributed by gentlemen who are not gas managers within the Waverley district. This circumstance being brought under notice, there may be improvement in this respect in the years to come. There was remarkable unanimity of belief that oxide, and oxide only, is the material which should be used for purifying coal gas. Opinions change with the times. It is not many years since oxide was looked upon with much disfavour by many gas managers in Scotland, who could not get away from the view that lime was the only substance which could be relied upon to effectually remove all impurities from gas. I do not question that there are good reasons for the change of opinions. For one thing, the fact that gas examination is less strict now than it used to be makes oxide, or any material which might not require frequent changing, preferable to lime. But if there

is anything which should recommend oxide, it ought to be found in the method which is being wrought by Mr. D. Vass, of Airdrie, whereby the oxide is revived without being taken out of the boxes. If gas managers come to realize that such a consummation can be attained, with no expense attending the process, a very great deal will have been done to establish the claims made on behalf of oxide as a purifying material.

In the Carnoustie Town Council on Monday, ex-Provost Soutar reported that the gas-works were taken over on May 16, and the price of £21,000 was paid the same day. In addition to this, there was a sum due for gas in the holders and gas not yet charged for, as well as accounts outstanding, besides stocks in the works. Mr. A. Yuill, of Dundee, who had been employed to value these for both parties, had given his valuation, which, including half of his fee, amounted to £800 6s. 7d. He moved that this be paid. Of the sum, however, he explained, £688 was for gas, residual products, hire of stoves, &c., which were being charged out now, and this amount would come back to the Council most immediately. Only £112 had to be paid for the actual stock of piping, coal, meters, &c., which was a smaller amount than had been anticipated. Everything was going on very satisfactorily at the gas-works, and, as previously stated, it was the desire of the Town Council to keep in view the fact that, by the decision to discontinue charging meter-rents, they were granting a concession to ordinary meter consumers without giving any concession to prepayment meter consumers. As was previously indicated, it was the intention of the Town Council, as soon as they ascertained the proper data to go upon, to charge only the extra rate for prepayment meters necessary to cover the actual difference in the cost of working the one system as against the other. It was agreed that the Council should inspect the gas-works, and formally take them over, on Monday, the 20th inst. The Council entered into contracts for 2300 tons of coal for the current year at an average price of 14s. 7½d. per ton.

At the annual meeting of the Inverurie Gas Company on Thursday, Colonel Jackson, who presided, said that although the profit for the year was less by £58 than that of the preceding year, it was still sufficient to enable them to pay a dividend of 6½ per cent.

The Leven and Methil Gas Company are paying a dividend of 7½ per cent. The Directors have contracted for the erection of a new gas-holder.

The annual meeting of the Cambuslang Gas Company, Limited, was held on Wednesday. It was reported that the profit for the year was £2782. The Directors recommended that £1620 be set apart for payment of a dividend of 6 per cent., which, with an interim dividend of 4 per cent. already paid, made 10 per cent. for the year; that £550 be set apart for depreciation, and £200 to the reserve; leaving £412 to be carried forward. This was agreed to.

The Keith Gaslight Company have reduced the price of gas from 5s. 10d. to 5s. 5d. per 1000 cubic feet, with 5 per cent. discount to the larger consumers.

On behalf of the Gas Committee of the Sanquhar Town Council, Bailie M'Math reported to the Council at their meeting last week that

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the total make of gas from the 1st of May, 1909, to the 15th of May, 1910, was 2,788,200 cubic feet, and the quantity sold, 2,082,085 cubic feet. Unaccounted-for gas, amounting to 20½ per cent., was considerably less than in the year before. The quantity of coal carbonized was 376 tons—making the yield of gas 7160 cubic feet per ton. The wages of the Gas Manager were advanced 5s. per week.

The Gas Manager at Newport (Fife), in his annual report to the Council, states that there was an increase in the quantity of gas made last year of 1,376,900 cubic feet, and a saving of £21 upon the carriage of coal.

A new water supply for the western district of Fifeshire is in process of being brought into use, the water for which is derived from a large new reservoir at Glenquey, in the Ochil Hills. The construction of this reservoir gave a great deal of trouble, on account of the difficulty of obtaining a suitable foundation for the embankment. The cost of the reservoir amounted to more than £100,000. This week the subsidence of a small portion of the embankment, about 6 feet in diameter and 5 or 6 feet in depth, has been discovered; and as there is more than 200 million gallons of water in the reservoir, the incident has given rise to a great deal of anxiety. Mr. Parker, C.E., of Glasgow, who was latterly responsible for the construction of the reservoir, has been called in to advise as to what is to be done.

Following upon the rejection by Parliament of the Avon water supply scheme for Aberdeen, there have been frequent meetings of parties for and parties against the scheme to consider the situation. The subject was before the Town Council on Monday, when, by the casting vote of Lord Provost Wilson, after a protracted discussion, it was remitted to a Committee to prepare and submit a scheme for the taking of a water supply—first instalment 12 million gallons and second instalment 8 million gallons daily, the same as was provided for in the Avon scheme—from the River Dee; the scheme to include the construction of works capable of providing a supply of pure water. The proposal, which was not adopted, was a remit to consider and report as to an improvement and extension of the present water supply. This proposal would have covered the re-introduction of the Avon scheme. This scheme was the favourite one of Lord Provost Wilson. The opposition to the Avon scheme was chiefly based upon the argument that the present water supply from the Dee could be improved. The fact that Lord Provost Wilson gave his casting vote in favour of the proposal of his former opponents would seem to point in the direction of there being no likelihood, in the near future, of the Avon scheme being revived.

The accounts of the Dundee Corporation Water Department for the past twelve months show that while they opened with a debit balance of £1866, they closed with a credit balance of £942. The total income was £59,355. From the domestic rate, at 9d. per £1, there was realized £18,589; from the public rate, £4845; and from special rates, £35,390. The expenditure of £58,413 included £14,315 for annuities; £17,948 for interest; £9145 for maintenance and management; £5822 for rates and taxes; £8504 for sinking fund; and £500 for reconstruction work at Stobsmuir. The borrowing powers of the Department

amount to £1,059,245, of which powers to the extent of £52,720 are unexercised. It is anticipated that there will not be any change in the rates this year.

The Corporation of Port Glasgow on Thursday paid their annual visit to the water-works; and advantage was taken of the opportunity to formally open a new storage reservoir and other extensions at Harelaw. The opening ceremony was performed by Provost Fyfe and ex-Provost Campbell, the Convener of the Water Committee. The new reservoir, with a surface area of 11 acres, will hold 26½ million gallons of water. The cost of construction has been £13,000.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, June 11.

There has been a good inquiry throughout the week, and all available supplies have been readily taken up at full prices, while in some instances an advance of 1s. 3d. per ton has been scored for immediate delivery. The closing quotations are £11 16s. 3d. to £11 17s. 6d. per ton f.o.b. Hull, £11 17s. 6d. to £11 18s. 9d. per ton f.o.b. Liverpool, and £11 18s. 9d. to £12 per ton f.o.b. Leith. More interest has been shown in the forward position; and it is reported that £11 17s. 6d. per ton f.o.b. Leith has been paid for delivery up to the end of this year. Makers have now advanced their price at that port for July-December to £12 per ton, but no transactions have transpired at the higher figure.

Nitrate of Soda.

The market for this article has become rather dull, and values are barely maintained at 9s. 6d. per cwt. for ordinary and 9s. 9d. for refined quality, on spot.

Tar Products.

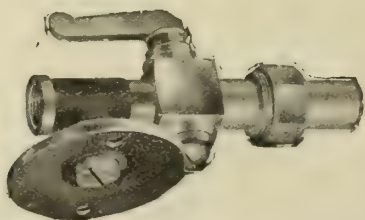
LONDON, June 13.

The markets for tar products have been firm throughout the past week. Pitch has been rather easier; and owing to the sales of Continental pitch on the Continent, it has been very difficult indeed to get buyers to make offers for forward delivery. They appear to be willing to wait and take their chance when they are really buyers. Creosote remains steady, and makers are firm in their ideas of price on this side. It is reported that foreign contracts are being taken at lower figures. In crude carbolic acid, business is still impossible. Solvent naphtha continues steady.

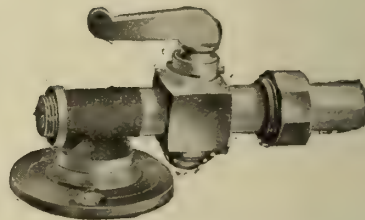
The average values during the week were: Tar, 17s. 9d. to 21s. 9d., ex works. Pitch, London, 40s. to 40s. 6d.; east coast, 38s. 6d. to 39s. 6d., west coast, 37s. 6d. to 38s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 8d. to 8½d.; North, 8d.; 50-90 per cent., casks included, London and North, 9d. Toluol, casks included, London, 10½d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; heavy naphtha,

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Sulphate of Ammonia.

This market is quiet, and buyers in nearly all cases expect to purchase at a little under current prices. Actual Beckton is quoted at £11 17s. 6d., and outside makes upon Beckton terms £11 10s. In Hull, £11 13s. 9d. to £11 15s. is asked; and in Liverpool, £11 15s. to £11 17s. 6d. In Middlesbrough, £11 13s. 9d. to £11 15s. is quoted.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now rather less activity in the coal trade. Prices show the summer ease, and also the effect of the diversion of some contracts at the time of the stoppages here—the delivery under which would have been now taking place. Best Northumbrian steam coals are quiet, and the price is about 10s. 7½d. to 10s. 10d. per ton f.o.b. Second-class steams are from 9s. 6d. to 9s. 9d.; and steam smalls are also rather more dull at from 5s. 9d. to 7s. There is a moderate export at present; and this is the cause of the quietness in the steam coal trade. In gas coals, Durham qualities vary in price from 9s. 7½d. to 10s. 2d. per ton f.o.b. for the usual classes; and up to 10s. 7½d. for "Wear specials." The local demand for gas coals is now just about at its lowest point in the season. But the foreign shipments are fair; and there are a number of small contracts being settled, especially to some of the Mediterranean ports. A sale of 60,000 tons, for delivery over a year, is reported, at the price of 17s. per ton at Genoa; and another of about 40,000 tons for Dublin, at near 9s. 10d. per ton f.o.b., is also named, while others are in treaty. Coke is steady, with good gas coke in moderate supply at about 13s. per ton f.o.b.

Scotch Coal Trade.

There is little change in the market. The demand for shipment coal is slightly better; but orders are still keenly competed for. Steam coal is very plentiful, and prices are easy. Splint is in better request. The prices now quoted are: Ell, 9s. 3d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. to 10s. 3d.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 359,408 tons—an increase of 35,446 tons upon the preceding week, and of 19,101 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,626,678 tons—an increase of 685,763 tons upon the corresponding period.

Kirkby-in-Ashfield Water-Works Extensions.—At a Local Government Board inquiry held last Thursday by Mr. E. A. Sandford Fawcett, M.Inst.C.E., in respect of an application made by the Kirkby-in-Ashfield Urban District Council for authority to raise £7000 for public works, it was stated that £1600 of it was for the erection of a duplicate pumping-station at the water-works. The Council proposed to purchase an additional engine of 65 H.P. for £985. The present plant, when working at its utmost capacity, pumped 20,000 gallons per hour; and it required 20 hours' pumping to supply the district. In case of a breakdown of one of the engines, there would be a serious shortage of water; and the Council felt the necessity of having duplicate plant.

Water Supply of Auckland (N.Z.).—It is reported that the construction of a large reservoir near the Waitakeri Falls, on the river of that name, will shortly have been completed, and that from it the water supply of Auckland will be drawn. This system of supply is only part of a larger scheme. An additional supply will be obtained from the River Nihotapu, and the necessary surveys are to be made without delay. It is estimated that from this river some 700½ million gallons can be drawn by means of two dams. Adding 220 million gallons from the Waitakeri dam, there would be a total supply available of over 920 million gallons, which should more than suffice for the needs of the city, assuming a dry season of three months in each year. The present average daily supply is about 4 million gallons. If it ever became necessary to further increase the water, another river could be effectively tapped for the purpose.

Widnes Water Supply.—At the Widnes Town Hall, last Friday, Mr. H. A. Reed held an inquiry on behalf of the Local Government Board into an application made by the Corporation for sanction to borrow a further sum of £4450 in respect of the Stocks Well pumping-station. The Town Clerk (Mr. H. S. Oppenheim) stated that in 1904 the Corporation obtained powers to borrow £14,000; but a sum of £16,544 had been spent, necessitating further borrowing powers for £2544. In addition, however, certain ground rents had been purchased for £1850, and with legal charges of £56 the total amount was brought up to £18,450. Mr. Isaac Carr, the Corporation Gas and Water Engineer, in the course of his evidence pointed out that Widnes was in a very fortunate position as regards its water supply. There were two pumping-stations—one at Netherley and one at Stocks Well; while they had an undeveloped water estate at Belle Vale. He did not think there was another town in the country where the consumption of water was so much per head of the population. This was largely due to the great quantity used in the town's chemical, copper, and soap works. If the whole of the resources of the Corporation were developed, they would be able to supply 8½ million gallons per day, or 80 gallons per head per day to a population of 100,000, assuming that the growth of the town's works was in proportion to the growth of the population. If the estimate were based upon the ordinary quantity of water used per head in large towns, the Widnes supply would meet the demands of a town of 300,000 inhabitants. Mr. Carr afterwards furnished explanatory details with reference to the undertaking.

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Southport and the Gas Supply of Birkdale.

At the monthly meeting of the Birkdale Urban District Council last Tuesday, Mr. F. J. Hartley obtained permission, on the presentation of the minutes of the Electricity, Lighting, and Licensing Committee, to offer a few observations on the subject of the gas supply of the town, which is now furnished by Southport, through mains which are the property of the Council. In the course of his remarks, he said the annual consumption of gas in Birkdale was about 100 million cubic feet; and the Council were advised that gas could be supplied of a much higher illuminating power and increased calorific value at 2s. per 1000 cubic feet, and still leave a good margin of profit to go to the reduction of the rates. Southport had been making a fine thing out of Birkdale with respect to the gas supply; and this was one of the chief reasons why the rates in the borough were lower than they would otherwise be. It was quite time Birkdale put her house in order in this respect. He moved—"That it be an instruction to the Clerk to notify the Southport Corporation forthwith that it is the intention of the Council to apply in the next session of Parliament for a Bill (*inter alia*) to terminate the privilege granted to the Southport Corporation under section 43 and other sections of the Southport Improvement Act, 1871, to supply gas to Birkdale, and for the use of the Birkdale gas-mains on terms; and that provision be made in the Bill for the acquisition of the gas-mains in the Ainsdale Ward of the urban district, and for the repeal of section 46 and other sections of the Act of 1871 relating to the supply of gas to Birkdale." At the request of the Chairman (Mr. H. Brodrick), Mr. Hartley put his motion in writing, and the minutes were adopted.

Exeter Water-Works Profit.—In presenting the annual report of the water undertaking to the Exeter City Council last Wednesday, Mr. C. E. Rowe described the water-works as a magnificent asset to the city. The income showed steady increase, the receipts from water-rents, meter-rents, &c., amounting to £16,300, compared with £16,164 in the previous year; and the balance of profit was £1889. The Water Committee recommended that £100 be added to the depreciation account and the balance appropriated to the relief of the general district rate. This was equivalent to 1½d. in the pound. The city was to be congratulated on the undertaking, and on the able way in which it was managed by the Surveyor and his staff.

The Late Mr. Frank Wright.—In the "JOURNAL" last week, we recorded the death of Mr. Frank Wright, under circumstances which pointed to self-destruction. An inquiry into the matter was held at the Westminster Coroner's Court on the 6th inst., when the evidence given by Mrs. Wright in regard to the habits of the deceased and his mental condition, and by other witnesses as to the position in which he was found and the state of the room, left no doubt on the subject. A medical man who was called in deposed that when the unfortunate man was found he had been dead for several hours, and that his death was the result of poisoning by coal gas. The Jury returned a verdict of "Suicide during temporary insanity."

Lectures to Cardiff Girls on Cooking by Gas.—Nearly 150 girls drawn from the twelve cookery centres under the supervision of the Cardiff Education Committee, listened with great interest last Friday afternoon to a lecture given by Miss Lillie Miles, at the offices of the Cardiff Gas Company, on "The Use of the Gas-Cooker." Miss Miles made the subject exceedingly interesting, and gave the girls some valuable hints on cooking, as well as on the management of a gas-stove. The Company are offering prizes for the best essays written by the girls on the subject of the lecture.

Suicides by Coal Gas.—An inquiry was recently held at Southend relative to the death of Mrs. Ida Greenbaum, who was found dead in her bedroom. She was lying on the bed, and had in her mouth a tube attached to a wall gas-bracket. Medical evidence was given to the effect that death was due to asphyxiation by coal gas; and a verdict of "Suicide while of unsound mind" was returned. A sensation was caused in the centre of Leeds on Monday last week by the discovery, on the premises of a firm of costumiers, of the dead body of a young man named Walter Dodd, employed as a window dresser. He was found in an upper room with the gas-stove turned on, and his mouth over the outlet—two sheets covering himself and the stove.

Northam Water Supply.—A Local Government Board inquiry has just been held at Northam, by Mr. A. G. Drury, respecting an application by the District Council for permission to borrow £1700 for the construction of two new filter-beds at the water-works. It was stated by the Clerk to the Council that when the Melbury works were constructed in 1902 the water was all that could be desired; but during the past year or two it had been discoloured, and the fact that water had been supplied to Bideford during a period of scarcity in that town had made further demands upon the filter-beds. Mr. W. Thornton, the Water Engineer, said the two filter-beds would have been sufficient if there had been no extra drain. The works were designed for a consumption of 120,000 gallons a day; but on some days last year they ran through as much as 200,000 gallons.

Teignmouth Water-Works Contract.—After correspondence and negotiations extending over more than a year, the Teignmouth District Council arrived last week at a settlement with Messrs. R. C. Brebner and Co., the Contractors who carried out the new water-works. In a letter which was read at a meeting of the Council last Tuesday, Messrs. Brebner agreed to accept the sum certified by the Engineer (£568) in full settlement of their claim. As the amount was due in February, 1909, it was suggested that interest should be added; but Messrs. Brebner did not put this forward as a claim. The Council decided to draw a cheque for the sum named; one of the members remarking that they had spent a considerable sum in legal expenses, and that this must be set against the Contractors' loss of interest. The Clerk, in answer to a question, stated that Messrs. Brebner's contract was for pipe-laying, and the amount was £7147; and their claim for extras brought the total up to £10,379. The Council had paid £6668; so that the amount which had been in question was £3711.

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New Joint-Stock Companies.—The Liss Gas Company, Limited, has been registered with a capital of £10,000, in £10 shares, to carry on the business of a gas and water company at Liss and elsewhere. The English Water-Works Construction and Canalization Company, Limited, has been registered with a capital of £52,500, in 50,000 preference shares of £1 each, and a like number of ordinary shares of 1s. each.

Cheaper Gas for Burton-on-Trent.—At the meeting of the Burton-on-Trent Town Council last Wednesday, Alderman Lowe, the Chairman of the Gas Committee, gave notice of a motion to reduce the price of gas 2d. per 1000 cubic feet to ordinary consumers and 4d. per 1000 cubic feet to slot-meter consumers. The present charges are 2s. 6d. to 2s. 4d. to the former class of consumers, and 3s. 4d. to the latter. At the same time meter-rents are to be abolished.

Higher Gas Profits at Loughborough.—At the meeting of the Loughborough Town Council on Monday last week, Alderman Bumpus, in moving the adoption of the reports of the gas and electricity undertakings, said the profit on the gas revenue account, had increased from £5766 in 1908-9 to £7034 in the year just closed. The increased profit was due to economical management and to getting more gas per ton of coal carbonized. The net result was that they were about £12 to the good.

Plucky Action by Mr. Samuel Glover.—In the early hours of Tuesday morning last, a fire broke out in the subway which has been made along Church Street, St. Helens, to convey the gas and water mains and the electricity and telephone cables. It was caused by the breaking of the live wire of the overhead equipment of the tramways, and it is thought the current earthed and started a fire among the combustible coverings of the cables in the subway. This was quickly extinguished, but gas was escaping at one point, and the subway was filled with dense smoke and gas. The Corporation Gas Engineer (Mr. Samuel Glover) was sent for; and, after reducing the pressure of gas at the works, he donned a smoke helmet belonging to the fire brigade and ultimately succeeded in locating the escape and stopping it.

Bahia Blanca Gas Company, Limited.—In the report to be presented by the Directors of this Company at the third ordinary general meeting on Thursday, the Directors state that the profits for the year ended the 31st of December last amounted to £5259, which, with £915 brought forward, makes an available total of £6174. Out of this they recommend a dividend of 3½ per cent. for the year on the "A" shares, free of income-tax, absorbing £5250, and carrying forward £924. Mr. J. M. Macmorran resigned his position as Secretary, and joined the Board as from the 1st of January last; Mr. W. Upton being appointed Secretary. The Directors state that business generally throughout Bahia Blanca and the surrounding districts has been much affected by the abnormal drought which has existed in these regions, and which undoubtedly has kept back the development of the undertaking. They are glad to add that the prospects for the current year are much more favourable, as the drought has ended.

Warrington Corporation Water Supply.—At the monthly meeting of the Warrington Town Council last Tuesday, the accounts of the water undertaking for the year ended the 31st of March last were presented. They showed that the gross income during the year was £27,530, and the expenditure £7849; leaving a gross profit of £19,681. The interest on loans, bank interest, and contributions to the sinking fund came to £18,216; leaving a profit of £1465, against a net profit of £1095 the previous year. The total expenditure decreased by £430, notwithstanding an increased payment of £184 for rates and taxes. The net profit has been kept in hand to increase the working balance, which now amounts to £5664. The reserve fund has £3988 in hand; and the sinking fund has £453 standing to its credit. The capital account has been overdrawn to the extent of £20,953. The loans, &c., taken up amount to £426,273, and the sum of £47,159 has been paid off; leaving an outstanding debt of £379,114.

APPLICATIONS FOR LETTERS PATENT.

- 13,052.—EARLE, C., "Automatically lighting and extinguishing lamps." May 30.
 13,054.—GRICE'S GAS-ENGINE COMPANY, LTD., and PURSER, W. H., "Suction-gas producers." May 30.
 13,098.—SHEPPEE, F. H., and SHIPPEY, M. W., "Pumps for viscous liquids." May 30.
 13,137.—SAMOJE, L., "Gas-turbines." May 31.
 13,170.—BOSTOCK, F. H., "Coin-freed gas-meters." May 31.
 13,184.—SMITH, E. W., "Coin-freed gas-meters." May 31.
 13,193.—ST. JOHN, L. M., and WARDROP, M. B., "Burners." May 31.
 13,215.—FALK, STADELMANN, AND CO., LTD., and FALK, S., "Inverted incandescent burners." May 31.
 13,234.—SMITH, J. S., "Gas-retorts." June 1.
 13,237.—MERRALL, C. E., "Valves and cocks." June 1.
 13,249.—BRYDEN, H. N., "Coal-conveyors." June 1.
 13,253.—LEA, J. W., and PERRINS, J. H., "Globe-holders." June 1.
 13,284.—CUSS, C. T., "Improved system for incandescent gas lighting, heating, and power." June 1.
 13,322.—ALDRIDGE, J. G. W., and M'MINN, A. C., JUN., "Discharging and charging retorts." June 1.
 13,327.—KOPPERS, H., "Separating ammonia from gases." June 1.
 13,365.—FLETCHER, RUSSELL, AND CO., LTD., and FLETCHER, T. W., "Gas and water taps." June 2.
 13,381.—BERRY, J., and METERS LIMITED, "Gas-meters." June 2.
 13,411.—DUCKHAM, A. M'D., "Gas-tight doors." June 2.
 13,421.—DIEU, E., "Cleaning gas used in engines." June 2.
 13,435.—BIRNGRUBER, G., "Burner and mantle." June 3.
 13,585-6.—HAARMANN, W., "Four-stroke cycle gas-engines." June 4.
 13,591.—HARDINGHAM, G. G. M., "Purifying gases." A communication from Metallurgische Ges.-Akt. June 4.



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The Directors of the Haslingden Union Gas Company announce a reduction in the price of gas to consumers from 3s. 4d. to 3s. 2d. per 1000 cubic feet.

Arrangements are in hand for the formal official opening next month of the Bacup Corporation new water-works at Cowpe, near Waterfoot. The scheme has involved an outlay of over £230,000.

The Mid Sussex Water Board are gradually obtaining the ownership of the water supply of their district. The public contribution last year was £2622, while for the previous year it was £1638. Water-rentals have increased, and the expenditure has decreased; and the profits are equivalent to 5 per cent. on the capital invested.

The Directors of the European Gas Company, Limited, have decided to recommend the payment of the same dividend and bonus as last year—viz., 10s. per share on the fully-paid shares, and 7s. 6d. per share on those on which £7 10s. has been paid, together with a bonus of 2 per cent. on all shares, according to the amount paid thereon.

At a smoking concert held last Wednesday evening, Mr. E. H. Frost, one of the employees of the Ipswich Gas Company, who is leaving to take an appointment at Bognor, was presented with a gold-mounted silk umbrella, suitably inscribed with his monogram, accompanied by the best wishes of the donors for his success in his new position.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

REPRESENTATIVE (LONDON). No. 5212.
GAS MANAGER, Omagh Urban District Council.
Applications by June 28.
MANAGING REPRESENTATIVE (AUSTRALIA). John
Wright and Co., Birmingham.
MAIN AND SERVICE LAYER. No. 5254.

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DISTRIBUTING DEPARTMENT. No. 5248.

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GAS METERS. No. 5251.
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GAS EXHAUSTER AND ENGINE. No. 5253.

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weather, Chancery Lane, W.C.

Stocks and Shares.

CHIGWELL, LOUGHTON, AND WOODFORD GAS COM-
PANY. June 28.

TENDERS FOR

Benzol.

ILFRACOMBE GAS COMPANY. Tenders by June 28.

Coal and Cannel.

BAKEWELL URBAN DISTRICT COUNCIL. Tenders by
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BROADSTAIRS GAS COMPANY. Tenders by July 5.
CARNARVON GAS DEPARTMENT. Tenders by June 24.
EAST RETFORD GAS DEPARTMENT. Tenders by June 30.
EVESHAM GAS DEPARTMENT. Tenders by June 27.
EXMOUTH GAS COMPANY. Tenders by July 4.
FILEY URBAN DISTRICT COUNCIL. Tenders by June 27.
HINCKLEY GAS DEPARTMENT. Tenders by June 25.
HUYTON AND ROBY GAS COMPANY. Tenders by June 18.
ILFRACOMBE GAS COMPANY. Tenders by June 28.
KESWICK GAS COMPANY. Tenders by June 23.
LURGAN GAS COMPANY. Tenders by July 4.
MALTON GAS COMPANY. Tenders by June 20.
MANSFIELD GAS DEPARTMENT. Tenders by June 29.
NEWRY GAS DEPARTMENT. Tenders by June 24.
NORTHWICH GAS COMPANY. Tenders by June 23.
PONTYPRIDD URBAN DISTRICT COUNCIL. Tenders by
June 20.
TEIGNMOUTH GAS DEPARTMENT. Tenders by July 4.

Gasholder Tank (Concrete).

OLDHAM GAS DEPARTMENT. Tenders by June 29.

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Purifier Grids.

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BAKEWELL URBAN DISTRICT COUNCIL. Tenders by
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BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by
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KESWICK GAS COMPANY. Tenders by June 23.
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RETORT SETTINGS, COAL-TESTING PLANT, BOILER FIRING.

Communications should be addressed to
UNDERWOOD HOUSE, PAISLEY.

GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

CITY and Guilds Examinations in Gas
Engineering and Gas Supply. Students who
have done badly at the recent Examinations should join
Mr. Cranfield's Correspondence Classes for next Session.
Assistance ample, individual, and private.
Write at once, 11, Avondale Place, HALIFAX.

ADVERTISEMENT No. 5247.

OWING to the Great Number of Ap-
plications, it will be some little time before the
Appointment is definitely settled.

WANTED, a thoroughly Reliable and
Energetic REPRESENTATIVE for London.
Must have a Connection and good knowledge of the
Gas-Fitting and Incandescent Trade. Good Remunera-
tion to a Suitable Man.
Apply at once, by letter, with full Particulars of Past
Experience and References, to No. 5252, care of Mr.
King, 11, Bolt Court, FLEET STREET, E.C.

THE Omagh Urban District Council
require the Services of a Competent GAS
MANAGER, who will be required to keep a plain set
of Books.
Salary, £120 per Annum, with free House, Coal, and
Gas.
Applications, with copies of Testimonials, must be
lodged on or before Tuesday, the 28th inst.
WM. J. CORKER,
Clerk to the Council.
Urban Council Chambers, Omagh,
June 9, 1910.

MANAGING Representative for
Australasian Colonies wanted by large Gas-
Stove Manufacturers. Permanent and Progressive Post
to Experienced and Capable Man.
Address, stating Age and full Particulars of Ex-
perience and Qualifications, JOHN WRIGHT AND CO.,
Essex Works, BIRMINGHAM.

MAIN AND SERVICE LAYERS.

WANTED, at once, an Experienced
MAIN and SERVICE LAYER. Must be a
thoroughly Practical Man.
Apply, by letter, stating Age, Experience, and sending
copies of Three recent Testimonials, to No. 5254, care
of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SMALL EXHAUSTER WANTED.

WANTED, a Second-Hand Gas-
EXHAUSTER and STEAM-ENGINE capable
of passing up to 5000 Cubic Feet per Hour.
Full Particulars, including Price, Condition, and
Design, to be sent to No. 5253, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

FOR SALE—Forty-nine 21-inch by 15-
inch \square to Round MOUTHPIECES, Self-Sealing,
Fourteen New; being removed on introduction of
Machinery.
Offers to the SECRETARY, Gas Offices, Sutton, SURREY.

GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap for
immediate Sale.
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

FOR SALE—Good Second-Hand Dry
Tin-Cased GAS-METERS, made by the Gas
Meter Company, Limited. One 300-Light; Two 200-
Light; Four 100-Light; One 50-Light. Just been dis-
placed by Electricity.
Apply, by letter, to No. 5251, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

COUNTY BOROUGH OF OLDHAM.

THE Oldham Corporation Gas-Works
Committee invite TENDERS for the Purchase
of the Surplus TAR and AMMONIACAL LIQUOR
produced at their different Works during the Year
commencing July 1, 1910.
Copy of Specification and Form of Tender may be
obtained on Application to Mr. Arthur Andrew, Gas
and Water Offices, Oldham, to whom Tenders are to
be sent not later than Tuesday, June 21, 1910.
J. H. HALLSWORTH,
Town Clerk.

Oldham, June 9, 1910.

COUNTY BOROUGH OF OLDHAM.

THE Oldham Corporation Gas Works
Committee invite TENDERS for the Construc-
tion of a CONCRETE GASHOLDER TANK, 212 feet
in diameter by 41 feet deep, adjoining their Hollinwood
Gas Station.
Copies of Specification and Drawings can be obtained
on Application at the Gas Offices, Greaves Street, Old-
ham, on payment of Two Guineas, which sum will be
returned on receipt of a *bond fide* Tender.
Tenders will be received up to and including June 29,
1910.

J. H. HALLSWORTH,
Town Clerk.
Oldham, June 9, 1910.

BOROUGH OF EVESHAM.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Evesham Corporation invite
TENDERS for the Supply of from 1000 to 3000
Tons (or less if required) of Best Screened GAS COAL,
during the Year ending June 30, 1911, to be delivered on
Rail at Evesham.
Tenders, to be marked "Tender for Gas Coal," to be
sent to me not later than the 27th day of June inst.
and to include full description as to Coal and Price.
No Form of Tender supplied.
The Corporation do not bind themselves to accept the
lowest or any Tender.

THOS. A. COX,
Town Clerk.
Town Clerk's Offices,
Evesham, June 4, 1910.

MALTON GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for the
Supply of 4500 to 5500 Tons of GAS COAL in the
Twelve Months ending June 30, 1911.
Delivery to be made at the North-Eastern Railway
Company's Depot, Malton.
The Coal must be of Good Quality, suitable for Gas-
making, and free from Bats, Pyrites, and other Refuse.
The Tender may be for Screened, Unscreened Coal,
or Nuts.
Payments will be made Monthly.
The following are the approximate Monthly Quanti-
ties required:—

| 1910. | | 1911. | |
|------------|-----------|-----------|-----------|
| July . . . | 200 Tons. | Jan. . . | 650 Tons. |
| Aug. . . . | 350 " | Feb. . . | 500 " |
| Sep. . . . | 450 " | March . | 450 " |
| Oct. . . . | 450 " | April . . | 350 " |
| Nov. . . . | 500 " | May . . | 350 " |
| Dec. . . . | 650 " | June . . | 250 " |

2600 " 2550 "
Tenders to be addressed to the undersigned and sent
in on or before Monday, the 20th of June inst.
HENRY TOBEY,
Engineer.
Malton, Yorks.

HINCKLEY URBAN DISTRICT COUNCIL. (GAS DEPARTMENT.)

THE above Council invite Tenders for GAS COAL or NUTS, to be delivered at Hinckley Station.

Tender Forms may be obtained from Mr. Fred Lee, Gas Manager.

Endorsed Tenders to be delivered to me on or before Saturday, the 25th day of June, 1910.

A. S. ATKINS,

Clerk to the Council.

Council Offices, Hinckley,
June 9, 1910.

MALVERN URBAN DISTRICT COUNCIL. (GAS AND ELECTRICITY DEPARTMENT.)

THE above Council invite Tenders for Additional PURIFIERS and ALTERATIONS to Existing Purifiers at their Gas-Works, Malvern Link.

Specification and Form of Tender can be obtained from the undersigned on payment of 10s. 6d., which will be returned on receipt of a *bona-fide* Tender.

Tenders, endorsed "Tender for Purifiers," to be returned to the Clerk, Henry Lawson Whatley, Esq., Council Offices, Malvern, not later than Ten a.m. on Thursday, the 23rd day of June, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

W. J. RENDELL BAKER,
Engineer and Manager.

BOROUGH OF EAST RETFORD.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Supply and Delivery at the Sidings of the Great Northern or Great Central Railway Companies, Retford, of 8000 Tons of Best Screened GAS COAL or NUTS during the Year ending June 30, 1911.

The Coal must be Freshly Worked and free from Bats, Bind, or other objectionable matter.

Sealed Tenders, Specifying the quality of the Coal and the name of the Pit from which it is raised, to be sent in on or before June 30, 1910, addressed to the Chairman of the Gas Committee, endorsed "Tender for Gas Coal."

Forms of Tender and any further Particulars may be obtained from the undersigned.

J. B. FENWICK,
Engineer and Manager.

Gas and Water Office,
Retford, June 9, 1910.

TENDERS FOR GAS COAL.

THE Gas Committee of the Carnarvon Corporation invite TENDERS for the Supply of 3000 Tons of Best Screened GAS COAL NUTS and 200 Tons of Screened CANNEL, to be delivered free as required in Trucks on the Gas-Works Siding, Carnarvon, during the Twelve Months ending the 31st of August, 1911.

Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas Committee, Guildhall, Carnarvon, to be delivered on or before Friday, the 24th inst.

The Committee reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Forms of Tender and Specification to be had on Application to the undersigned.

WILLIAM M. RUXTON,
Manager.

Gas Offices, Carnarvon.
June 9, 1910.

TENDERS FOR COAL, CANNEL, AND SLACK.

THE Huyton and Roby Gas Company are prepared to receive TENDERS for the following—viz.:

2600 Tons of GAS COAL, in the form of Nuts or Slack.

250 Tons of Best Round CANNEL.

250 Tons of STEAM SLACK.

To be delivered during the Year ending June 30, 1911, at the Gas-Works Siding, Huyton Quarry, in such Quantities and at such times as may be required by the Company.

The Company will provide their own Waggon for the transit of a portion of the Coal.

Tenders, Specifying the Description of the Coals, &c., the name of the Pit from which they are raised, and endorsed "Coals," may be sent in to the undersigned not later than the 18th inst.

The Directors do not bind themselves to accept the lowest or any Tender.

FRED. PRITCHARD,
Secretary and Manager.

June 9, 1910.

EXMOUTH GAS COMPANY.

THE Directors of the Exmouth Gas Company invite TENDERS for the Supply of about 6000 Tons of Best GAS COAL (Screened or Unscreened), to be Delivered in such Quantities and at such times as may be required from the 1st of August, 1910, to the 31st of August, 1911, and to weigh 20 cwt. to the Ton over the Gas Company's or Dock Company's Weighbridge, the Coal to be Fresh Wrought, Dry, and free from Hards, Snudges, Shale, and Pyrites.

Tenders to be accompanied by Practical Working Analysis.

Prices may be quoted c.i.f. or f.o.b. (by Sailing Vessels only) Exmouth Docks, or f.o.r. Exmouth Railway Station (London & South Western Railway).

Sealed Tenders, endorsed "Tender for Coal," to be sent to the undersigned not later than Monday, the 4th of July, 1910.

The Directors do not bind themselves to accept the lowest or any Tender.

Special Tender Forms are not provided or required.
JAMES T. FOSTER,
Secretary and Manager.

Gas-Works, Exmouth,

June 6, 1910.

ILFRACOMBE GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the Supply of GAS COAL and BENZOL from the 1st of July next.

Particulars and Conditions may be obtained from the undersigned, on receipt of a Stamped Addressed Envelope.

Sealed Tenders, endorsed "Contracts," addressed to the Chairman, and delivered to the undersigned, not later than Tuesday, June 28, 1910.

The Directors reserve to themselves the right to accept the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

J. ARMSTRONG,
Manager.

Gas-Works, Ilfracombe,
June 6, 1910.

LURGAN GAS, LIGHT, AND CHEMICAL COMPANY, LIMITED.

THE Directors invite Tenders for the

Supply of about 3500 Tons of Best Quality Screened GAS COAL, delivered into the Works at Lurgan, or placed on Lighters or on Rail at Belfast.

The Coal must be delivered in such Quantities and at such times as the Directors may fix; and the weights as shown on the Company's Weighbridge to be accepted by the Contractor. Each Cargo to be accompanied by a Certificate as to place of origin.

Tenders (no Special Form in use), accompanied by Reference to Gas-Works using the Coal offered, should reach me not later than Monday, July 4, 1910, at Ten o'clock a.m.

The Directors do not bind themselves to accept the lowest or any Tender.

FRED. W. MAGAHAN,
Secretary.

Gas-Works, Lurgan,
June 6, 1910.

PONTYPRIDD URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for

the Supply of GAS COAL and CANNEL as required for their Gas-Works, and also for WASHED NUTS, as required for their Electricity Works for the Twelve Months ending June 30, 1911.

All the above are to be delivered at the Gas-Works Siding, on the Alexandra (Newport and South Wales) Docks and Railway Company's Line, Glyntaff.

Forms of Tender and Specification may be obtained, for Gas Coal and Cannel, on Application to Mr. E. H. Swain, Engineer, Gas-Works, Treforest, Pontypridd; and for Washed Nuts to Mr. J. E. Teasdale, A.M.I.E.E., Engineer, Electricity Works, Treforest, Pontypridd.

Tenders, endorsed "Gas Coal," "Cannel," or "Electricity Coal" (as the case may be), must be received by the undersigned on or before Monday, June 20, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

J. COLENSO JONES,
Clerk to the Council.

Municipal Buildings, Pontypridd,
June 7, 1910.

FILEY URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE Council invite Tenders for the Supply of 1800 to 2000 Tons of GAS COAL, in the Twelve Months ending the 30th of June, 1911.

Delivery to be made at the North-Eastern Railway Company's Depot, Filey.

The Coal must be of good quality, suitable for Gas Making, and free from Bats, Pyrites, and other Refuse. The Tender may be for Screened, Unscreened Coal, or Nuts.

Payments will be made Monthly.

The following are the approximate Monthly Quantities required:—

| 1910. | | 1911. | |
|-------|----------|-------|-----------|
| July | 160 Tons | Jan. | 170 Tons. |
| Aug. | 250 " | Feb. | 140 " |
| Sept. | 200 " | March | 140 " |
| Oct. | 160 " | April | 110 " |
| Nov. | 160 " | May | 110 " |
| Dec. | 190 " | June | 100 " |

Tenders to be addressed to the Chairman, Urban Council, Filey, and to be sent in on or before the 27th of June, 1910.

HENRY TOBEY,
Engineer.

Malton.

MANSFIELD CORPORATION. (GAS DEPARTMENT.)

TENDERS FOR GAS COAL, CANNEL, AND LIME,

AND

TENDERS FOR SURPLUS TAR.

COAL.

THE Gas Committee are prepared to receive TENDERS for 1000 Tons of CANNEL and 12,000 Tons of Best Screened GAS COAL, Delivered at Mansfield Station for One Year from the 1st of July, 1910, to the 30th of June, 1911.

LIME.

For the Supply of about 150 Tons of Best Hand Picked LIME. Delivered as above.

TAR.

TENDERS for Surplus TAR made from the 1st of July, 1910, to the 30th of June, 1911.

Tenders, endorsed "Coals," "Lime," or "Tar," as the case may be, to be sent to J. Harrop White, Esq., Town Clerk, Mansfield, on or before June 29, 1910.

Particulars and all other Information from the undersigned.

NOTE: No Special Forms of Tender provided.

The Committee do not bind themselves to accept the lowest or any Tender.

ARTHUR GRAHAM,
Engineer and Manager.

Gas-Works, Mansfield,
June 8, 1910.

BRIDGEWATER COLLIERIES COKE-WORKS. (THE EARL OF ELLESMERE.)

TENDERS are invited for the Tar pro-

duced at the above Works for a period of Six or Twelve Months from the 1st of July, 1910, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding, Little Hulton Mineral Branch of the London and North-Western Railway.

The estimated quantity is about 2600 Tons per Annum. Tenders, endorsed "Tender for Tar," to be addressed to Mr. THOMAS M. BROWN, Bridgewater Coal Offices, 4, Chapel Walks, MANCHESTER, not later than the 20th of June.

Manchester, May 31, 1910.

BROADSTAIRS GAS COMPANY.

THE Directors of the above Company

invite TENDERS for the Supply of about 6500 Tons of Best Durham or Yorkshire GAS COALS, to be delivered between the 1st of August, 1910, and July 31, 1911.

Sealed Tenders, endorsed "Gas Coal," addressed to the Chairman of the Company, Gas Offices, Broadstairs, to be sent in not later than the 5th of July, 1910.

The Directors do not bind themselves to accept the lowest or any Tender.

Further Particulars and Form of Tender may be obtained from

F. HIGGINSON,

Engineer, Manager, and Secretary.

Gas Offices, Broadstairs,
June 3, 1910.

URBAN DISTRICT COUNCIL OF NEWRY.

TENDER FOR GAS COAL.

THE Gas Committee of the above Council invite TENDERS for the Supply and Delivery of about 5000 Tons of GAS COAL, Screened and Unscreened, for Twelve Months commencing July 1 next.

Specification and Form of Tender may be obtained on Application to Mr. B. Gibson, Gas Manager.

Sealed Tenders, endorsed "Coal," to be forwarded to the Chairman, Gas Committee, Town Hall, Newry, not later than Friday, the 24th inst.

The lowest or any Tender not necessarily accepted.

WM. M. CHOMIN,

Town Clerk.

Town Hall, Newry,
June 10, 1910.

BOROUGH OF ROCHDALE. (GAS DEPARTMENT.)

THE Gas and Electricity Committee of the above Corporation invite TENDERS for the Supply of about 11,800 Superficial Feet of 2-inch WHITE DEAL PURIFIER GRIDS, with Oak sides, made to dimensions supplied.

Particulars may be obtained on Application to Mr. T. Banbury Ball, the Manager, at the Gas-Works, Dane Street.

Tenders, endorsed "Purifier Grids," and addressed to the Chairman of the Gas and Electricity Committee, must be sent in to me not later than noon on Wednesday, June 23, 1910.

By order,

WM. HENRY HICKSON,
Town Clerk.

Town Hall, Rochdale,
June 10, 1910.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

THE Gas Department of the above

Council invite TENDERS for the Supply of 4000 Tons of Best Durham or other good GAS COAL, Screened or Unscreened. The same to be supplied to the requirements of the Council between the 31st day of July, 1910, and the 30th day of June, 1911.

The Coal must be fresh Wrought and free from all impurities.

No Special Tender Form will be issued.

Tenders must be accompanied by a full Description, and Practical Working Analysis of the Coals quoted and may be either l.o.b. at port of shipment, Teignmouth Harbour, f.o.r. Teignmouth Railway Station, or delivered into the Gas-Works Store.

Sealed Tenders endorsed "Gas Coals," to be addressed to A. Percival Dell, Esq., Clerk to the Council, Town Hall, Teignmouth, and delivered not later than Monday, the 4th day of July, 1910.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,

J. ALEX. GRAY,
Gas Manager

Gas-Works, Teignmouth,
June 11, 1910.

READING GAS COMPANY.

TENDERS FOR TAR.

THE Directors of the Reading Gas Company invite TENDERS for the Purchase of their Surplus Coal-Gas TAR and Carburetted Water-Gas TAR, for One Year, commencing on the 1st of July next.

Specifications for the Contract will be forwarded on Application to the Engineer and Manager, Mr. Douglas H. Helps, Assoc. M.Inst.C.E.

Under the Conditions of the Contract, an allowance will be made for all water that may be found in the Tar in excess of 5 per cent.

Railway and River Communication direct to the Works.

Tenders, endorsed "Tender for Tar," and addressed to the undersigned, must be delivered not later than Monday, the 20th inst.

The Directors do not bind themselves to accept the highest or any Tender.

A. CANNING WILLIAMS,
Secretary.

159, Friar Street, Reading,
May 31, 1910.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the Supply of about 7000 Tons of GAS COAL during the Year ending June 30, 1911.
Full Particulars and printed Form of Tender may be had on Application to the undersigned.
Tenders, endorsed "Coal," are to be sent in addressed to the Chairman, by Thursday, June 23, 1910.
SAML. S. MELLOR,
Manager and Secretary.
Gas-Works, Northwich.

THE Directors of the Keswick Gas Company invite TENDERS for the Supply of 2000 Tons of Best Screened GAS COALS or NUTS, to be delivered at Keswick Railway Station between the 1st day of July, 1910, and the 1st day of July, 1911, in such Quantities and at such times as may be required.
Tenders, stating Price per Ton, endorsed "Tender for Coal," to be sent to the undersigned not later than the 23rd inst.
The Directors do not bind themselves to accept the lowest or any Tender.
No Form of Tender supplied.

J. H. BRODIE,
Secretary.

Main Street, Keswick,
June 10, 1910.

THE Directors of the Keswick Gas Company invite TENDERS for their Surplus TAR and AMMONIACAL LIQUOR for Twelve Months from the 30th inst., at per Ton delivered into Contractors' Tanks at Keswick Railway Station.
Tenders, endorsed "Tender for Tar," or "Tender for Liquor," will be received by the undersigned up to Four p.m. of Thursday, the 23rd inst.; but the Directors do not bind themselves to accept the highest or any Tender.
Forms of Tender are not supplied.

J. H. BRODIE,
Secretary.

Main Street, Keswick,
June 10, 1910.

FARNWORTH AND KEARSLEY GAS COMPANY.

THE Directors are prepared to receive TENDERS for their Surplus Make of TAR and AMMONIACAL LIQUOR for a Term of One Year commencing the 1st of July, 1910.
Sealed Tenders to be addressed to James Fletcher, Esq., J.P., Chairman, Gas Offices, Cross Street, Farnworth, near Bolton, and delivered not later than Wednesday, the 29th of June next.
Forms of Tender and any further Information required may be obtained from Mr. H. Pickford, Manager.
W. BROMLEY,
Secretary.
Gas Offices, Farnworth,
June 10, 1910.

BAKEWELL URBAN DISTRICT COUNCIL.

TENDERS are invited for the Supply of COAL—1300 to 1500 Tons—and 200 Tons of CANNEL for One Year, delivered at Bakewell Station (Midland).
Forms of Tender and Particulars can be obtained from the undersigned, to whom Tenders must be sent by the 30th of June.
Also for the Purchase of Surplus TAR and LIQUOR during Twelve Months from July 1, next. Delivery free in Purchasers' Tanks at Bakewell Station (Midland).
Endorsed Tenders to reach undersigned by June 30.
V. R. COCKERTON,
Clerk.

Bakewell.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 15, FINSBURY CIRCUS, E.C.

By order of the Directors of the
CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

NEW ISSUE OF
£2000 CONSOLIDATED ORDINARY STOCK AND
£1000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, June 28, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 15, FINSBURY
CIRCUS, E.C.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the
TRANSFER BOOKS of this Company, relating
to DEBENTURE STOCK ONLY, WILL BE CLOSED
on the 23rd of June, 1910, and RE-OPENED on the 1st
of July, 1910.

By order of the Board,
ERNEST W. DREW,
Secretary.

6 & 7, Queen Street,
London, E.C., June 8, 1910.

CITY OF CHICHESTER GAS COMPANY.

NOTICE is Hereby Given, that the
TRANSFER BOOKS of the FOUR PER CENT.
PERPETUAL DEBENTURE STOCK of this Com-
pany WILL BE CLOSED from the 17th of June to the
30th of June, 1910, both inclusive.
By order,
VICTOR V. VICK,
Secretary.
Offices: Stockbridge Road,
Chichester, June 6, 1910.

THE Proprietor of Letters Patent
No. 12,751 of 1907, relating to "Apparatus for
Washing and Cooling Gas," desires to DISPOSE of the
Patent, or to Grant LICENCES to interested Parties
on Reasonable Terms, with a view to the adequate
Working of the Patent in this Country.
Enquiries to be addressed to CRUIKSHANK AND FAIR-
WEATHER, LIMITED, International Patent Agency,
65-66, Chancery Lane, LONDON, W.C.

THE Proprietor of the Patent No.
19,146 of 1906, for "IMPROVEMENTS IN RE-
GENERATING COKE-OVENS," is desirous of entering
into Arrangements by way of LICENSE and otherwise,
on Reasonable Terms, for the purpose of EXPLOITING
the same and ensuring its Full Development and
Practical Working in this Country.

All Communications should be addressed in the first
instance to HASELTINE, LAKE, AND CO., Chartered
Patent Agents and Consulting Engineers, 7 & 8, South-
ampton Buildings, Chancery Lane, LONDON, W.C.

THOMAS DUXBURY & CO.,

16, DEANS GATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illu-
minating Power, Large Yield per ton, and
reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

ALL the BOYS CALORIMETERS

which have been in daily use in all the Official
Testing Stations in London for the last Four Years

WERE MADE BY

JOHN J. GRIFFIN & SONS, LTD.

Those desiring to obtain Gas Calorimeters as used
in the Official Testing Places should see that the
apparatus bears the name of the original makers

JOHN J. GRIFFIN & SONS,
KEMBLE STREET, LTD.
KINGSWAY, LONDON, W.C.

Each
Apparatus
should be
marked thus:

PRICE GREATLY REDUCED.

Terms on Application.



TROTTER, HAINES, & CORBETT,
BRETTLE'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

THOMAS TURTON

AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
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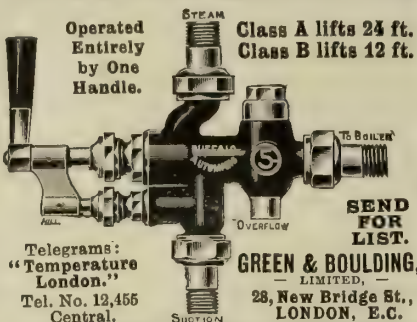
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Sperm Value 878·85 lbs. per Ton.

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FIRE-BRICKS, LUMPS, TILES,
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RETORTS CAREFULLY PACKED
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MIDLAND ENAMELLING CO.,

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For Gas, Water, Electric, &c., Meters.

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STOP WASTE AND LEAKAGE

They are guaranteed not to contract and do not
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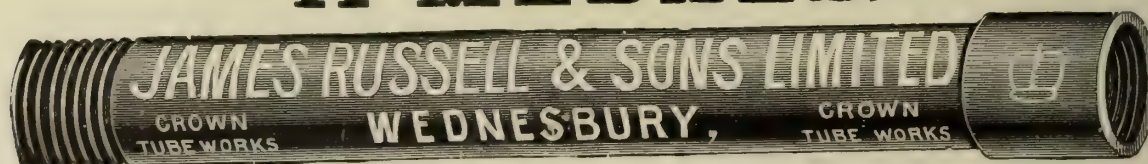
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Important Improvements.



BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

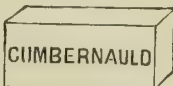
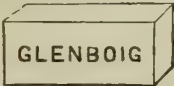
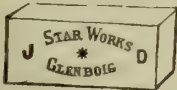
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

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Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

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Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET,
LONDON, E.C., September 21st, 1909.

DEAR SIR,
I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

| | Raw. | Fired. |
|--------------------------------|--------|--------|
| Silica, free | 8.03 | 3.49 |
| Silica, combined | 43.20 | 49.77 |
| Alumina | 36.55 | 42.10 |
| Ferric oxide | 1.80 | 2.08 |
| Titanic oxide | 1.30 | 1.50 |
| Lime | trace | trace |
| Magnesia | trace | trace |
| Alkaline oxides | trace | trace |
| Sulphates as trioxides | 0.92 | 1.06 |
| Loss on Ignition | 13.20 | — |
| | 100.00 | 100.00 |

PHYSICAL RESULTS.

| | |
|-------------------------------------|-----------------------------|
| Density | 2.65 |
| Volume weight | 1.90 |
| Porosity | 15.4 % |
| Linear shrinkage at 100° C. | 3.70 % |
| " " " 1050° C. | 4.76 % |
| " " " Total | 8.46 % |
| Volume shrinkage at 100° C. | 10.7 % |
| " " " 1050° C. | 12.6 % |
| " " " Total | 23.3 % |
| Plasticity | 20.0 % |
| Fire Stability | 1850° C. equiv. 3362° F. |

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,
JOHN T. NORMAN.



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SOLE MAKERS AND LICENSEES OF THE

**"Simplex" AUTOMATIC GAS LIGHTER
AND EXTINGUISHER.**

Some of its Special Advantages are:

1. It is instantaneous in Lighting and Extinguishing without shock to Mantle, and can be set to its pre-determined times in a few seconds.
2. The Mechanism will act correctly, even though the Lamp-post and Controller be out of the perpendicular.
3. **THE VALVE.**—As this never leaves its seat, and the gasways being away from the seating, no impurities can collect between the valve and the seating, and by simply removing

a small cap, the gasways can be freed of Naphthalene or any other matter.

4. The leakage of gas into the Clock Mechanism and its resultant troubles are entirely done away with.
5. Vibration of any description will not cause the Mechanism to operate prematurely.
6. The "Simplex" Clock also has the advantage of a Lever Escapement.

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Telegraphic Address:
"Gasometer Nottingham."

Telephone:
204X Nottingham.

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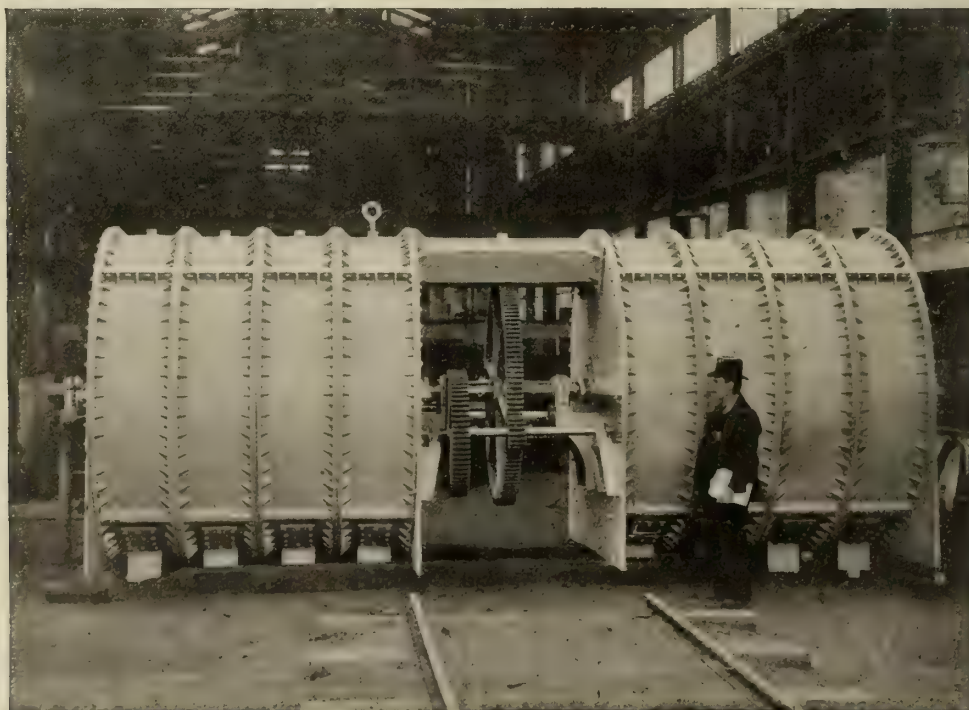
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"Gasometer London."

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2044 Hop.

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Works: DARLINGTON.



"Whessoe" Rotary Washer-Scrubber, with Central Driving arrangement, Patent No. 27,158, 1904, as supplied to The Stourbridge Gas Company.

London Office: 106, CANNON STREET, E.C.

Welsbach

LIGHT

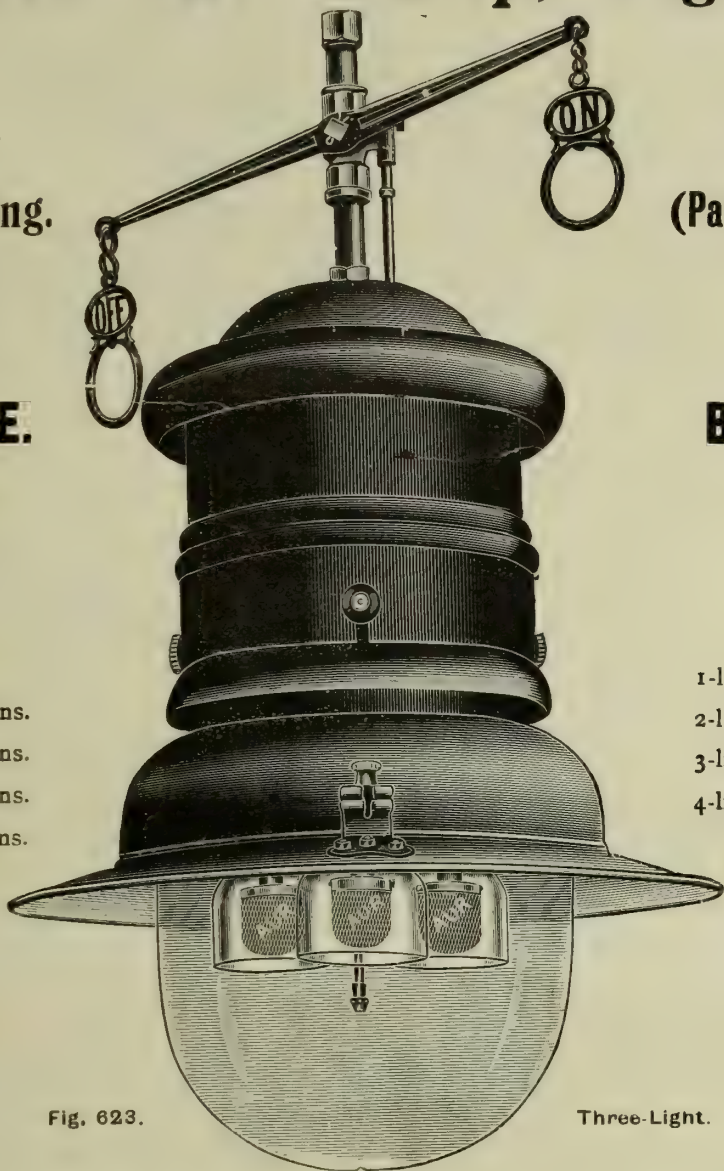
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 8 ins. |
| 2-light | . . . | 2 ft. 4 ins. |
| 3-light | . . . | 2 ft. 4 ins. |
| 4-light | . . . | 2 ft. 7 ins. |

Width over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in. |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

| | Gas per hour. | C.P. | Steel. | Copper Case. | | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
| 2-light | 8 feet | 260 | 47/6 | 6/- extra. | 4-light | 16 feet | 550 | 72/6 | 9/- extra. |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

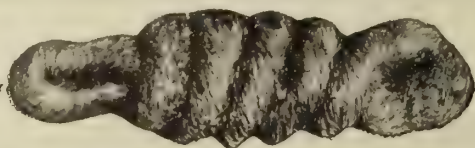
RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

| | 1-Light. | 2-Light. | 3-Light. | 4-Light. | | 1-Light. | 2-Light. | 3-Light. | 4-Light. |
|---------------------------------|----------|----------|----------|----------|----------------------------|----------|-------------------|----------|--------------|
| Clear Glass Globes, each | 2/3 | 5/9 | 5/9 | 9/- | Wired Globes, extra | each | 2/- | 2/- | 2/9 3/6 |
| " " " " In Case lots per dozen. | 19/6 | 57/9 | 57/9 | 93/- | Parabolic Reflector, extra | " | 3/6 | 6/- | 7/6 Not made |
| Case contains . . . | 80 | 18 | 18 | 12 | Welsbach Mantles, each | 6d. | subject as usual. | | |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.
Telegrams and Cables: "WELSBACH LONDON."
Telephone 2410 NORTH.



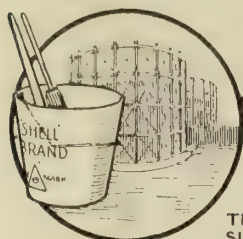
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Every Skein of equal weight and length.
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Lead Wool requires no melting and can be used in water without risk.

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POSSESS ALL THE PROPERTIES WHICH CHEAP PAINTS LACK.

Prices and particulars on application.

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Possilpark, Glasgow.



FIG. 1. The Old Style with the Old Trouble.
Note the Pin A.



FIG. 2. Evered's Patent: "Safety Stop." No Pin.
No trouble.

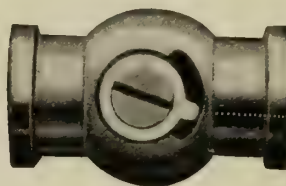


FIG. 3. Underside showing "Safety Stop" in lieu of Pin.

EVERED'S PATENT "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

EVERED'S PATENT "SAFETY STOP"

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked **B**, working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

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Size, 16 x 12 x 8 ft. deep.

PATENT PRESSED STEEL TANKS.
MADE FROM FLANGED PLATES 4 FT. SQUARE.
ANY CAPACITY IN MULTIPLES
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PATENT HYDRAULIC MACHINERY

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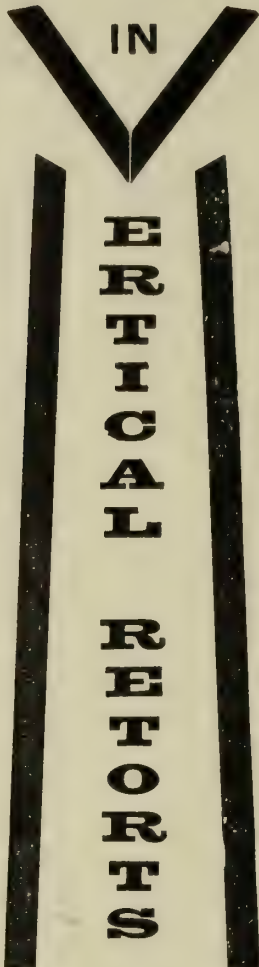
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See "JOURNAL OF GAS LIGHTING," Nov. 2, 1909.

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LONDON, JUNE 21, 1910.

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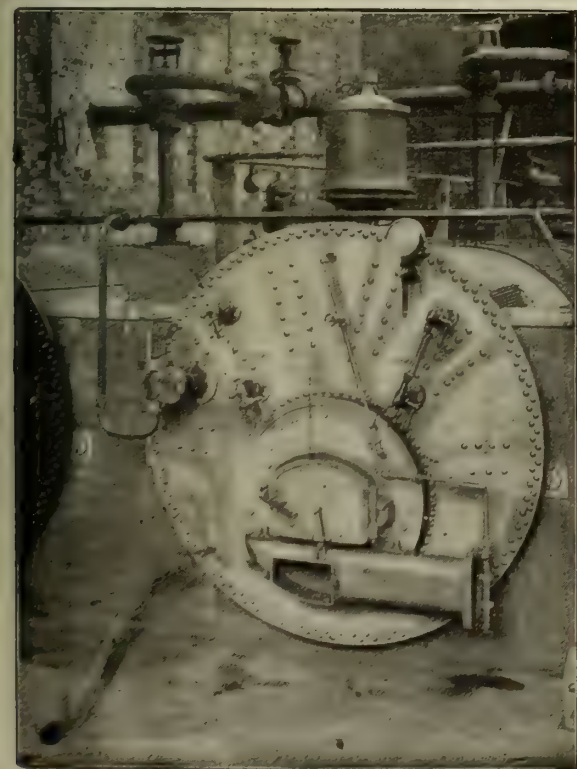
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Construction of Entire Gas-Works & Coke Oven Plants, Retort Furnaces,

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With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

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"I am pleased to be able to state that the Scrubber Washer you erected at Harpenden has given every satisfaction. It has Five Chambers, and the Gas is divided into small streams, at each of these Chambers; water flows in at the top and all the Ammonia is eliminated without the aid of any other Plant. . . . The Liquor can be worked up to almost any desired strength. And the Plant has not been cleaned out since you fixed it, and has given us no trouble."

December 2nd, 1908.

"I cannot speak too highly of Cockey's Washers, they are simply invaluable. I gave full Information at the Meeting of an Association of Gas Managers, when President, at Southampton.

If you have plenty of room, I should have an Horizontal one, if short—why then a Vertical one.

The action of the Washer removes every trace of Ammonia."

December 28th, 1908.

"You asked some time ago as to the Tar Extractor. I am pleased to say it has been working for about six months giving great satisfaction.

The whole of the Gas was passed through for over a month, without the aid of any other Washing Plant (whilst the old Plant was being moved) and I was surprised at its being able to cope with the Gas so well, at this time of the year."

December 2nd, 1908.

"In reply to yours of the 1st inst., we have had Two 'Cockey's' Washers erected here, and if another was required, I should certainly put it down in preference to any other make.

It is absolutely certain in action, easy to control, and visible in working. I am sure you could not put down a better Machine. By paying proper attention to the Water supply not a particle of Ammonia passes the last Chamber.

I shall be pleased to answer any further questions on the matter, and if you like to run over and see the Apparatus in work, I shall be pleased to show you our results."

December 2nd, 1908.

"In reply to yours of the 28th ult., just to hand, I may say that the 'Cockey's' Washer was erected for the purpose of removing the last trace of Tar, and dealing with CO₂ and H₂S in the two Bottom Chambers by means of Ammoniacal Liquor, the three Upper Chambers being used for removing NH₃, intending at a later date to erect a supplementary Scrubber. At the present time the 'Cockey's' Washer is doing the whole of the work, and we have not found any difficulty in removing the last trace of NH₃. We have passed equal to 300,000 cubic feet per diem.

The only trouble we find in working, is a stopping up of the teeth of the Washing Hoods with Naphthalene, but these are easily cleaned by removing a Hand Cover and applying a stiff Brush. The Overflows work well, and a little attention occasionally is all that is required."

December 2nd, 1908.

"Replying to your Letter of yesterday's date, I have very much pleasure in giving you my opinion of Messrs. E. Cockey and Sons' Vertical Washer, one of which I have here (to pass 500,000 cubic feet per day).

I consider the apparatus a most valuable one, very efficient and does all the work that one can wish, leaving very little Ammonia for the Tower Scrubber to deal with.

Should you desire any further Information, please do not hesitate to ask me for it, and I should be very pleased to show you the Washer at any time you might care to pay me a Visit."

For Prices and all Particulars apply to the Sole Makers—

EDWARD COCKEY & SONS, LIMITED, FROME, SOMERSET.

JOSEPH EVANS & SONS, CULWEL WORKS, WOLVERHAMPTON

(WOLVERHAMPTON) LTD.

London Address:

Salisbury House, London Wall, London, E.C.

PLEASE APPLY

FOR CATALOGUE No. 8.

TRADE

FIRST AWARDS

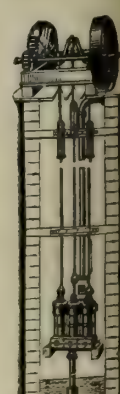
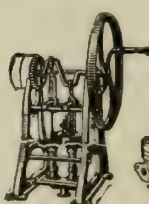
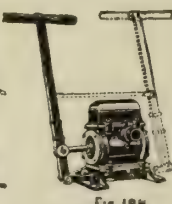
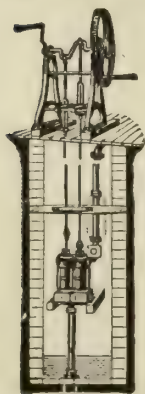


MARK.

EVERYWHERE.

Telegrams:

"EVANS, WOLVERHAMPTON,"
National Telephone No. 39.



See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

THE BARROWFIELD IRON-WORKS, LIMITED, GAS ENGINEERS & CONTRACTORS, GLASGOW.

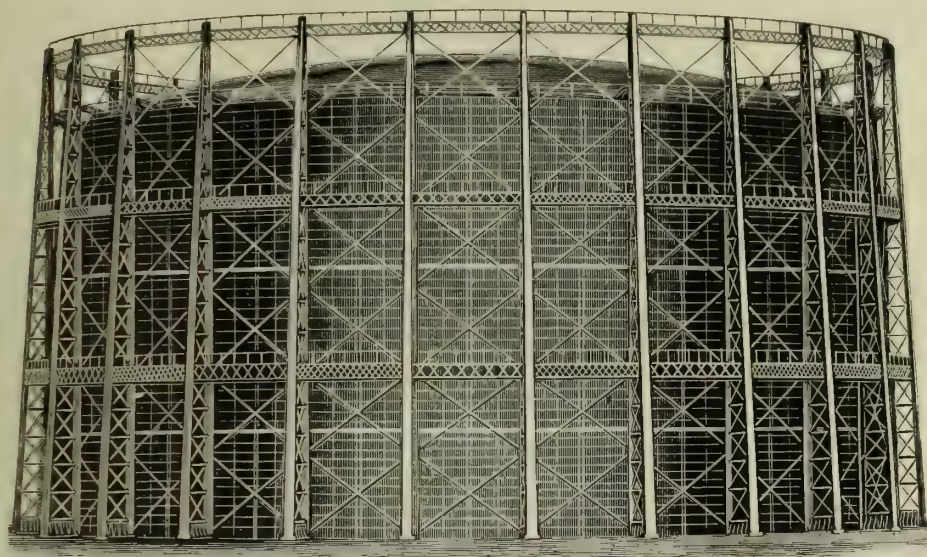
Telegrams: "GASOMETER GLASGOW."

OIL PLANT
AND CHEMICAL
APPARATUS.

BRIDGES,
GIRDERS,
WHARVES,
PIERS.

ROOFING
OF
EVERY STYLE.

PIPES, VALVES,
AND
CONNECTIONS.



GAS APPARATUS
OF EVERY
DESCRIPTION.

RETORTS,
CONDENSERS,
SCRUBBERS,
PURIFIERS.

GASHOLDERS
AND
TANKS.

ENGINES,
EXHAUSTERS,
STEAM BOILERS
AND
FITTINGS.

Three-Lift Gasholder. Capacity, Six Million cubic feet.
240 feet Diameter by 45 feet deep each Lift. Erected at Glasgow.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

Telegrams: "Gasmeter, Coventry."

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GEORGE WILSON,

Have you tried WILSON'S

DOUBLE COIN PREPAYMENT METERS?

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Sole Agent for Scotland: DANIEL MACFIE, 1, North St. Andrew Street, EDINBURGH.

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R. & G. HISLOP,

Gas Engineers, Retort Builders, Contractors, &c.

RETORT SETTINGS. COAL TESTING PLANT. BOILER FIRING.

COMMUNICATIONS SHOULD BE ADDRESSED TO
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BARRY, HENRY, & CO.,

— LIMITED. —

Specialities :

TRANSMISSION

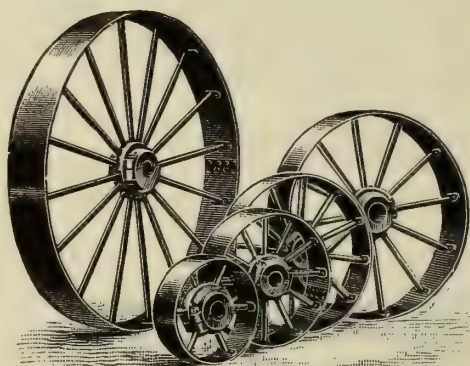
OF

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Rope & Belt Pulleys,
Spur & Bevel Wheels,
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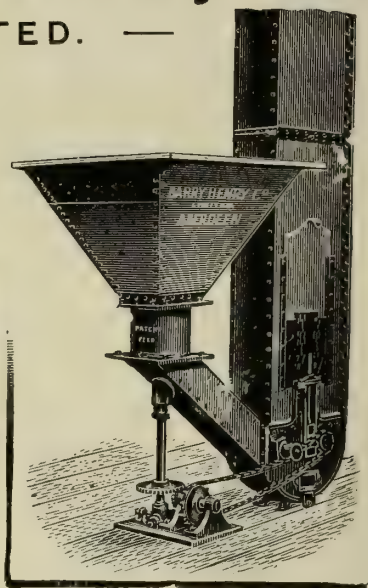
OF

MATERIALS.

Conveyors,
Elevators,
Grinding Machinery,
Motors.

AND

**64, MARK LANE,
LONDON, E.C.**



NEWTON, CHAMBERS, & CO.,

LIMITED.

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

LONDON OFFICE: **Brook House, 10-12, Walbrook, LONDON, E.C.**

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National Telephone No. 2200.

GAS ENGINEERS, IRONFOUNDERS, and CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.

RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.

IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.

CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

**PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND
SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.**

STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.

GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (special quality) for Engine Cylinders. **GAS COAL** famous for its Unrivalled excellence.

Established 1792.

Efficient
&
Economical.

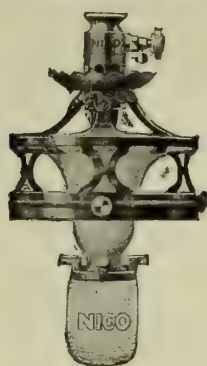
"NICO"

Decorative
&
Durable.

THE ORIGINAL INVERTED GAS BURNERS & MANTLES



No. 4.
Standard "Large" Size.
75-Candle Power.



No. 6.
Medium Size.
55-Candle Power.



No. 5.
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30-Candle Power.

LEADING

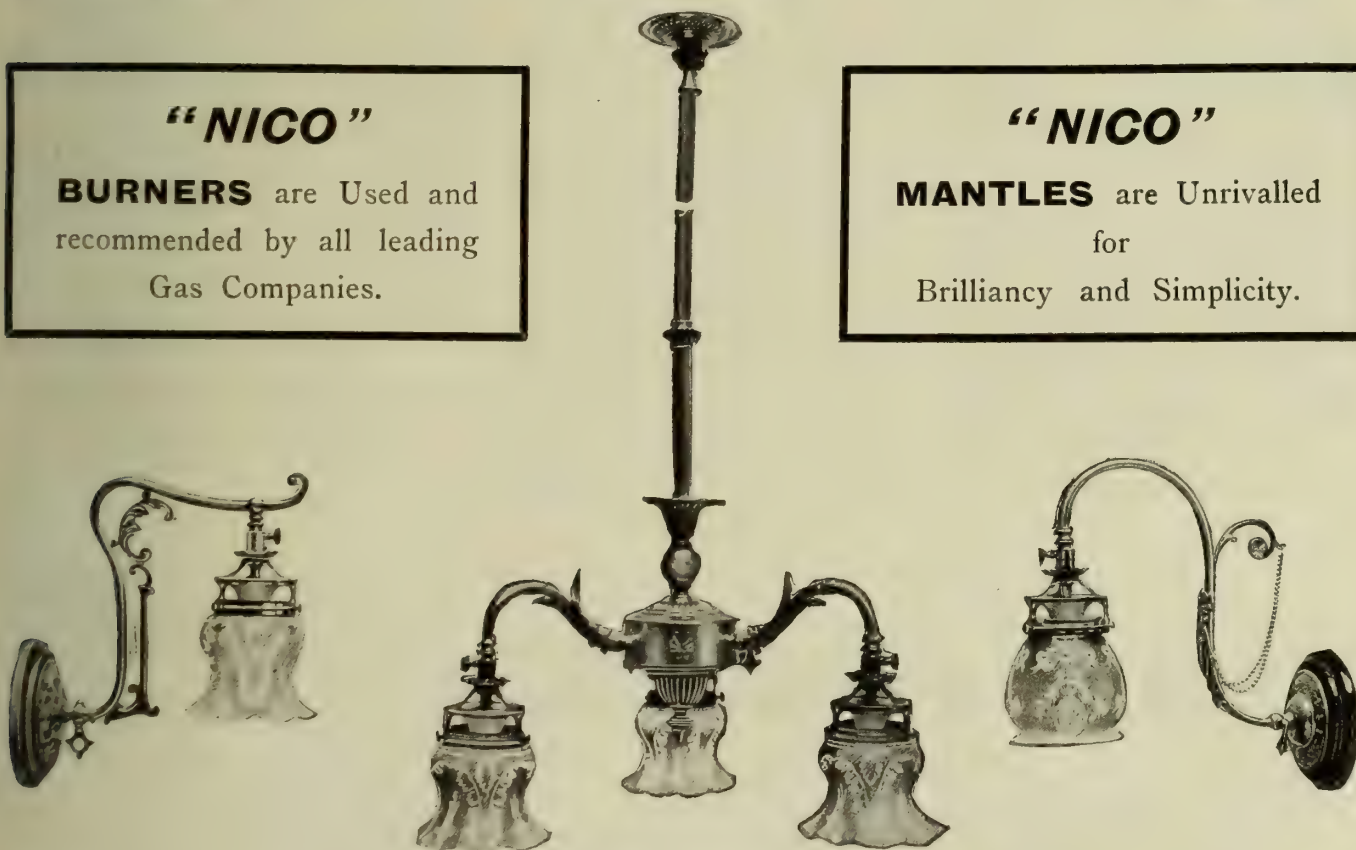
LINES.

"NICO"

BURNERS are Used and
recommended by all leading
Gas Companies.

"NICO"

MANTLES are Unrivalled
for
Brilliancy and Simplicity.



PATENTEES AND MANUFACTURERS—

New Inverted Incandescent Gas Lamp Co., Ltd.

19 and 23, Farringdon Avenue, London, E.C.

ROSCAR WORKS, SUMMER HILL ROAD, BIRMINGHAM.

GEORGE ORME & CO.,

Atlas Meter Works,

Telegraphic Address: "ORME, OLDHAM."
Telephone: No. 93 OLDHAM."

PARK STREET, OLDHAM.

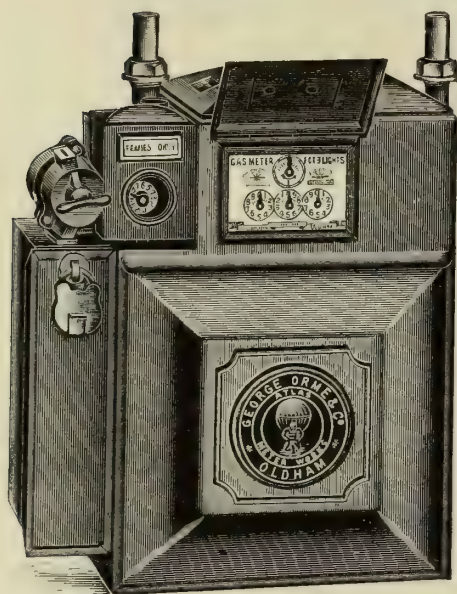
"NEW CENTURY" IMPROVED PATENT COIN PREPAYMENT GAS-METERS

FITTED WITH DETACHABLE ATTACHMENTS.

ARRANGED FOR 1d., 6d., 1s., OR ANY OTHER COIN DESIRED.

These Meters are giving Universal Satisfaction wherever adopted.

Guaranteed for Five Years.



Dry Meter in Tin-Plate Case, fitted with Attachment.

Price changed *in situ* by means of
One Crown Wheel only.

COMPACT,
DURABLE,
RELIABLE,
SIMPLE.

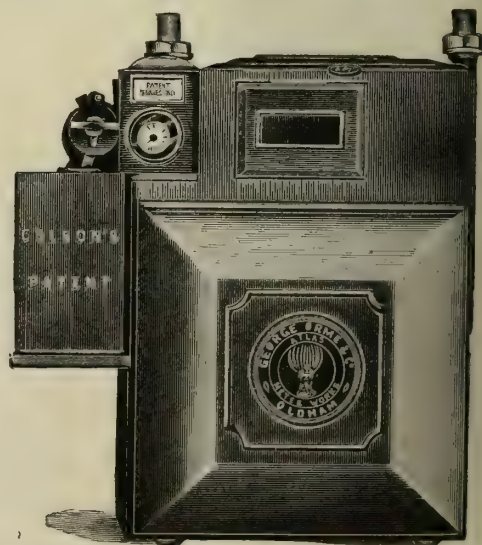


Wet Meter in Cast-Iron Case, with Attachment Removed.

Meters fitted with
COLSON'S PATENT CASH-BOX

(AS ILLUSTRATED)

**ENSURES
ABSOLUTE SECURITY
AGAINST THEFT.**



ANY FURTHER PARTICULARS WILL BE SUPPLIED UPON APPLICATION.



Coke Barrows and Movable Plant.

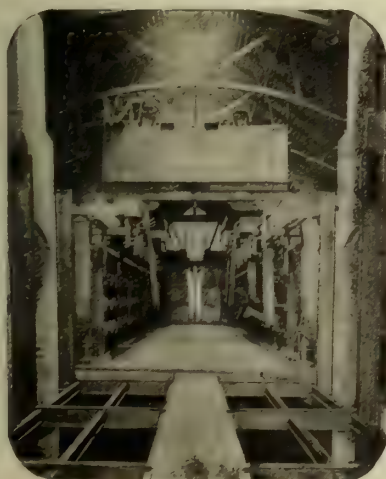
REGENERATIVE, GENERATIVE,
AND
DIRECT FIRED SETTINGS,
WITH
ALL BENCH BRACINGS
AND MOUNTINGS



STEEL ROOFS,
STRUCTURAL
IRONWORK.



GEO. R. LOVE'S,
INCLINES AT
45°



WINSTANLEY & CO.,
Murdoch Works,
KING'S NORTON.

Telegrams: "WINSTANLEY, BIRMINGHAM."

Telephone: 88 KING'S NORTON.

ALDER & MACKAY,

MAKERS OF

WET AND DRY PATENT PREPAYMENT METERS.

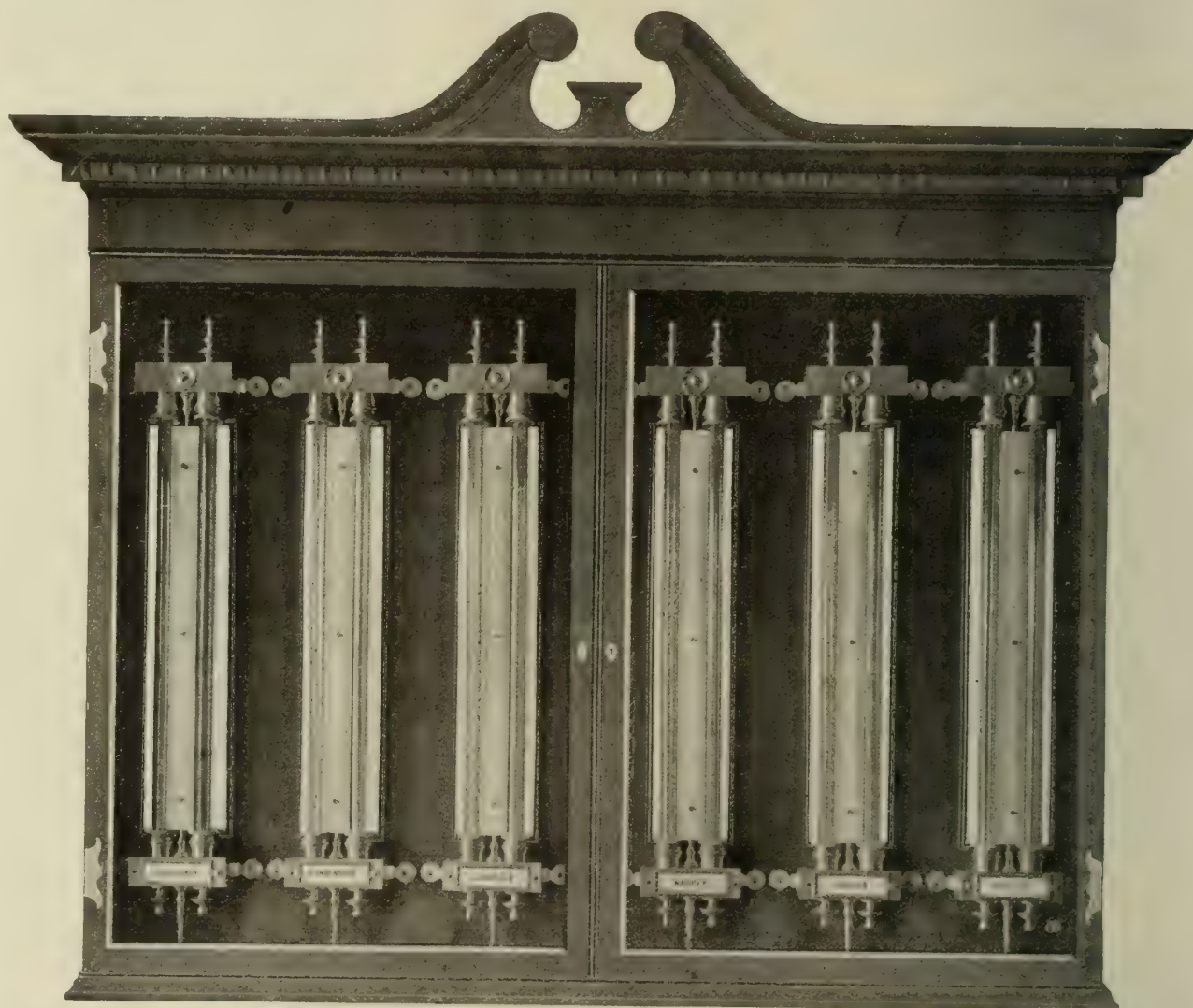
Made for any Coin.

Noted for Reliability.

PRICE EASILY AND ACCURATELY CHANGED *IN SITU*.

Simple in Construction.

Ensured Durability.



Cabinet of Pressure Gauges with Glazed Doors.

**Pressure Gauges of the Best Make and Finish
in every Style to suit Large or Small Works.**

FULL PARTICULARS, DRAWINGS, AND PRICES ON APPLICATION.

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EDINBURGH.

Telegrams: "ALDER EDINBURGH."
Telephone: 1481 CENTRAL.

VENTNOR STREET WORKS,
BRADFORD.

Telegrams: "ALDER BRADFORD."
Telephone: 1222.

13, VICTORIA STREET,
WESTMINSTER,
LONDON, S.W.

Telegrams: "ALDERUGI LONDON."
Telephone: 9643 GERRARD.

CENTRAL HOUSE,
NEW STREET,
BIRMINGHAM.

Tele.: "ALDERUGI BIRMINGHAM."

ALDER & MACKAY,

MAKERS OF

TEST AND EXPERIMENTAL METERS

FOR ALL PURPOSES.



Test Meter with a Capacity of One Cubic Foot per Revolution.

Patentees and Manufacturers of . .

AUTOMATIC LIGHTING AND EXTINGUISHING APPARATUS

For Street Lighting controlled from the Gas-Works.

ALSO HURRICANE-PROOF LANTERNS.

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Telegrams: "ALDER EDINBURGH."
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Telegrams: "ALDER BRADFORD."
Telephone: 1222.

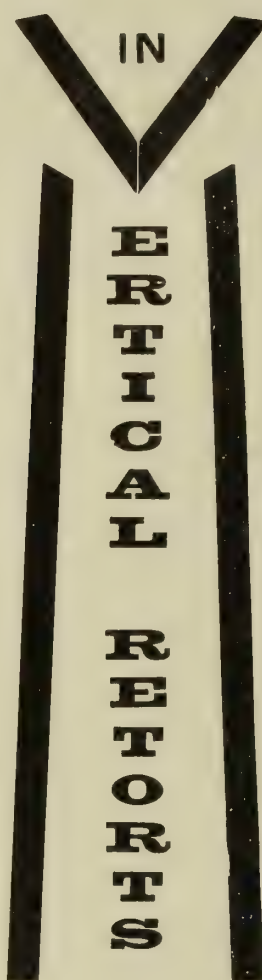
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WESTMINSTER,
LONDON, S.W.

Telegrams: "ALDERUGI LONDON."
Telephone: 9643, GERRARD.

CENTRAL HOUSE,
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Tele.: "ALDERUGI BIRMINGHAM."

CONTINUOUS CARBONIZATION



**GLOVER-WEST
PATENTS.**

*Description and
Particulars of Tests
will be forwarded
on request.*

COST OF LABOUR

REDUCED TO

2 $\frac{3}{4}$ d. PER TON OF COAL CARBONIZED.

See "JOURNAL OF GAS LIGHTING," Nov. 2, 1909.

WEST'S GAS IMPROVEMENT CO., LTD.,

104, QUEEN VICTORIA STREET,
LONDON, E.C.

Engineers,

Telegrams—"STOKER, MANCHESTER."
"RADIARY, LONDON."

Telephones—Nos. 1339 and 5520 Manchester (Central.)
No. 14,406 London (Central).

MILES PLATTING, MANCHESTER.

London, 1851.

Paris, 1865.

Paris, 1867.

London, 1862.



New York, 1853.



THE

GAS METER CO., LTD.,

Works:



Dublin, 1865.

LONDON, OLDHAM, DUBLIN, MANCHESTER.

Manufacturers of Patent

WET AND DRY GAS METERS, STATION METERS, GOVERNORS, GAS APPARATUS, &c., &c.

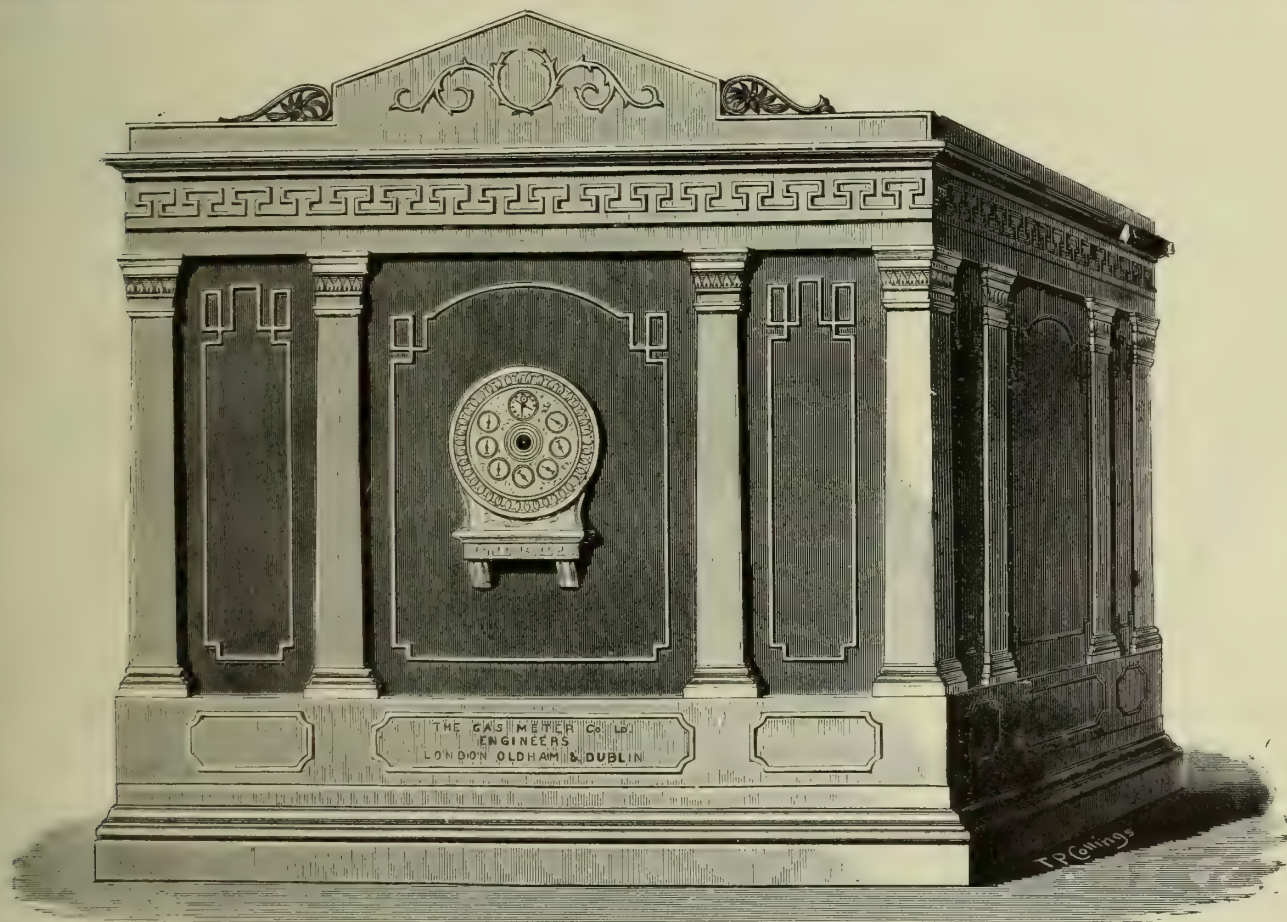
Sole Manufacturers of CROLL'S PATENT IMPROVED DRY METERS, AUTOMATIC METERS (for any Coin), WITH EITHER CHANGE WHEELS or PRICE CHANGER, VALON'S PATENT PREPAYMENT METER.

The UNVARYING WATER LINE WET GAS METERS (Sander's and Donovan's Patent),

The PATENT RELIANCE WET GAS METERS (with Sander's and Donovan's Float).

The IMPROVED ENCLOSED FLOAT WET GAS METERS.

WET METERS IN CAST-IRON CASES.



Station Meters Manufactured at

THE OLDHAM WORKS.

(LATE WEST & GREGSON.)

STATION METERS IN ALL SIZES, WITH PLANED JOINTS, ROUND, OR SQUARE CASES.

The Gas Meter Company have a most extensive experience in Station Meter work, and have erected the largest Meter yet made. Their Oldham Works are specially laid out for this class of work; also their Improved Station Governors are largely in demand.

Telegraphic Addresses:—

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"METER, OLDHAM."
"METER, DUBLIN."
"METER, MANCHESTER."

F. W. CHURCH, Secretary.

THOMAS WILKINS, Manager.

238, KINGSLAND ROAD, LONDON, N.E.
UNION STREET, OLDHAM.
7, & 8, HANOVER STREET, DUBLIN.
18, ATKINSON STREET, DEANS GATE, MANCHESTER.

National Telephone 142 Dalston.

Telephone 340 Oldham.

Telephone 1995 Dublin.

Telephone 2918 Manchester.

THOS. CASH & Co.,

Gas Coal and Cannel Proprietors,

7 & 8, WARWICK CHAMBERS,

CORPORATION STREET, BIRMINGHAM.

Telephone No. 4610.

Telegraphic Address: "CASHED, BIRMINGHAM."

SOLE LICENSEES FOR
HUDSON PATENT
PRODUCER.

O'NEILL'S OXIDE

SUPPLIED ON LOAN OR PURCHASE.

SPENT OXIDE BOUGHT IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LTD.,

Telegrams:
"PURIFICATION LONDON."

PALMERSTON HOUSE, LONDON, E.C.

Telephone:
LONDON WALL 914.

Three Strong Favourites for Public Lighting.

Welsbach

Fig. 35. Welsbach Cylindrical Lantern, Shadowless and Wind-proof. Suitable for One or Two Burners. Lighting Capacity with One Mantle, 100 Candle Power.



Fig. 55. Long Body Lantern, with Copper Ornament, Square Reflector, Porcelain or Enamelled Iron, Painted Three Coats and Glazed, with Cast-Iron Base, with Special Lamp Cock fitted, and Brass Roller Trap for "Torch Lighting."

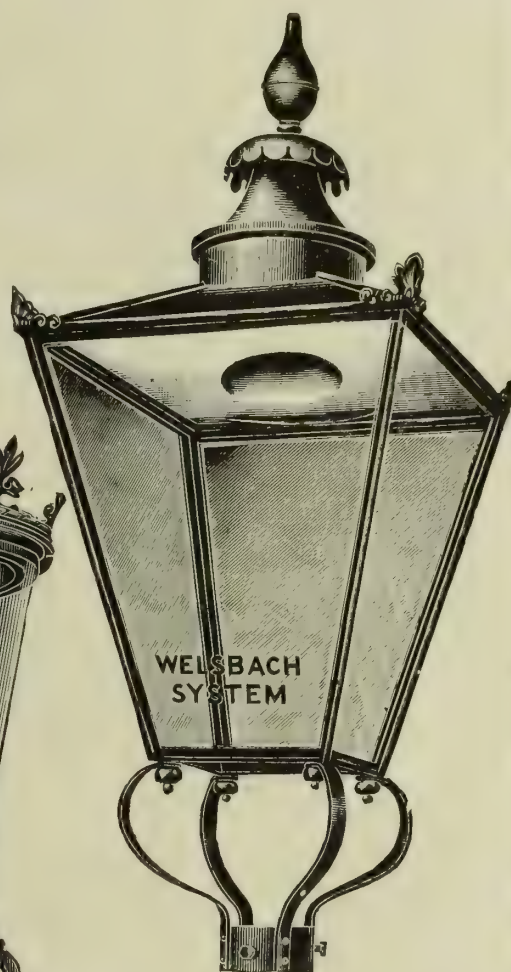


Fig. 54. Seventeen inch Long Body Street Lantern, fitted with Copper Top, and Enamelled or Porcelain Reflector. The finest inexpensive Street Lamp obtainable.

The Welsbach Company hold the largest and most varied Stock of Arc Lamps, Self-Intensifying Lamps, and Street Lanterns in Square, Circular, Hexagon, &c., Patterns, to give light from 60 to 600 Candle Power from a single Welsbach Mantle.

The Welsbach Company invite Inquiries from Officials and Public Bodies as to their Improved System of Street Lighting, both Upright and Inverted. Comparative details and details of the Lighting Costs provided. Special Prices.

Every Lamp and Mantle is guaranteed by the Company.

The Welsbach Mantles are "C," "CX," and "Plaissetty," Price 4½d. each, subject.

THE WELSBACH INCANDESCENT GAS LIGHT COMPANY, LTD.,

Public Lighting Show-Room:— 344-354, Gray's Inn Road, King's Cross, London, W.C.

Telegrams and Cables: "WELSBACH, LONDON."

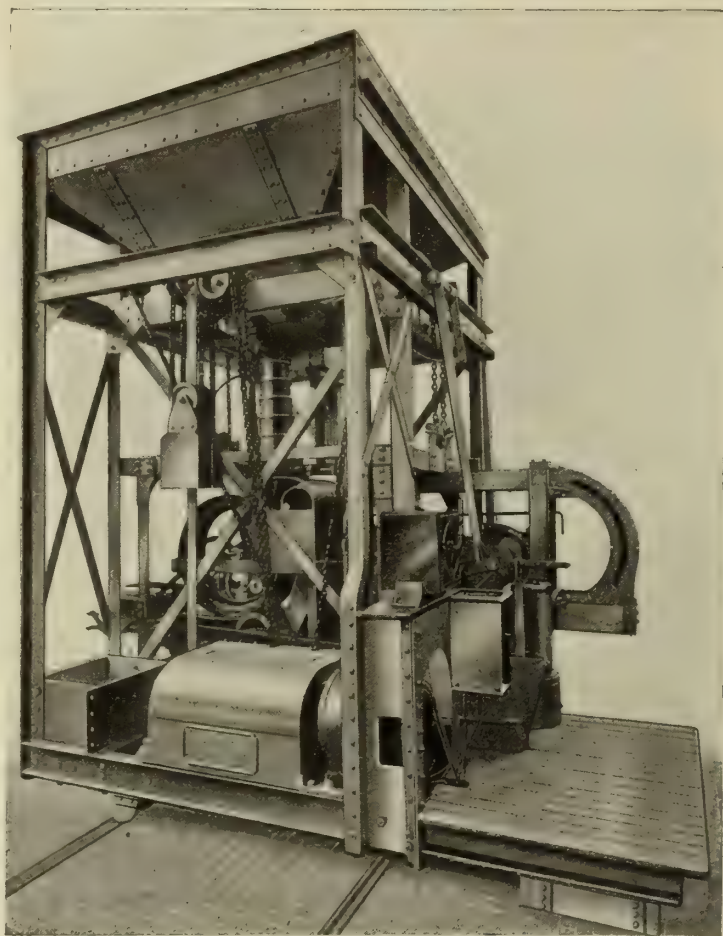
Telephone: 2410 North (four lines).

LOWEST CARBONIZING COST ON RECORD

ONE PENNY

per thousand cubic feet of gas SOLD

This Result was obtained at Lancaster (*C. ARMITAGE, Esq., Engineer*)
by the use of



Jenkins D.B. Patent "Complete Stoker."

D.B.

Stoking Machines AND Coke Conveyors.

The best Results are obtained by
working with

HEAVY CHARGES

Largest make per ton and better Coke.
No trouble with stopped Pipes.

Lowest Working Costs.

D.B. Machines do not require
Special Retorts to obtain Heavy
Charges but will work on any section
and **WILL**

FILL THE RETORTS.

SOLE MAKERS:

W. J. JENKINS & CO., LIMITED,

RETFORD, NOTTS.

Telephone: No. 44.

Telegrams: "Jenkins, Retford."

Codes: A.B.C. 5th Edition
Western Union.

ANOTHER RECORD !!

DE BROUWER HOT-COKE CONVEYOR

UPWARDS OF

6 MILES

AT WORK.

LOWEST MAINTENANCE AND WORKING COSTS.

SEE PRESIDENTIAL ADDRESS BY P. C. HOLMES HUNT, Esq.

(Victorian Gas Managers' Association),

"JOURNAL OF GAS LIGHTING," Feb. 15th, 1910.

TRANSPORTERS

FOR

Coal and Coke

etc., etc.

Large Installations

now

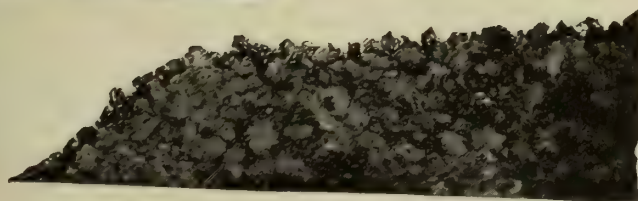
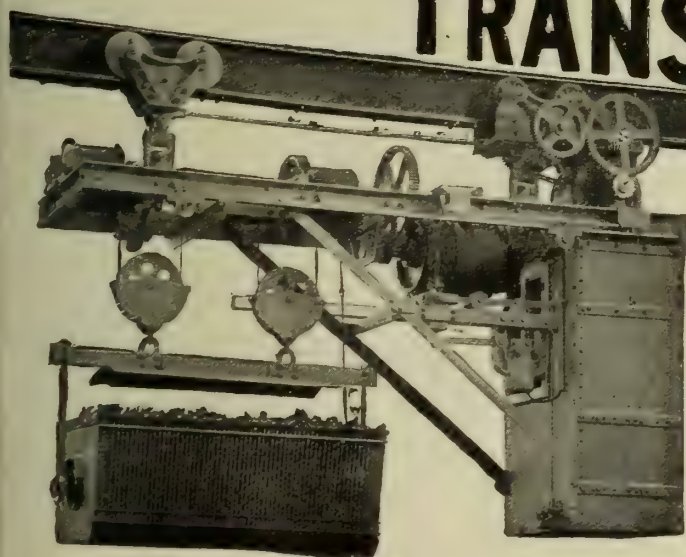
at work and

on order.

WRITE FOR PARTICULARS TO—

W. J. JENKINS & CO., Limited,

ENGINEERS, RETFORD, NOTTS.



WILLEY & CO., LTD.,

Gas Engineers, Ironfounders, and Contractors,
LONDON & EXETER.

Actual Makers of every description of all

GAS PLANT AND CONSTRUCTIONAL WORK.

RETORT SETTINGS

ALL THE LATEST IMPROVEMENTS.

CONDENSERS

ATMOSPHERIC AND WATER COOLED.

LIVESEY WASHERS

ORIGINAL MAKERS.

PURIFIERS

BEST AND CHEAPEST CONSTRUCTION.

CENTRE VALVES

PICKERING'S PATENT, COMPACT, COMPLETE, CONVENIENT.

GASHOLDERS

SPIRAL AND STANDARD GUIDED.

STATION GOVERNORS

PATENT EQUILIBRIUM VALVE, PRESSURE ABSOLUTELY CONSTANT. ANY SIZE.

STATION METERS

IN CYLINDRICAL CASES TO 30,000 FEET PER HOUR, IN SQUARE CASES UP TO 200,000 FEET PER HOUR.

WET AND DRY METERS

OF THE HIGHEST EXCELLENCE IN MATERIALS AND WORKMANSHIP.

SLOT METERS

FROM 2-LT. TO 100-LT. FOR ANY COIN, POSITIVE IN ACTION, ABSOLUTELY ACCURATE, HUNDREDS OF THOUSANDS IN USE.

**GAS FITTINGS AND
MAIN COCKS**

A SPECIALITY.

SLOT INSTALLATIONS

PIONEERS OF THE SYSTEM FOR FITTING UP SERVICES, METERS, STOVES, AND GAS-FITTINGS.

SHOW-ROOMS { London: 18, Adam Street, Adelphi, W.C.
 Devonport: 93, Fore Street.

A WORLD'S RECORD

IN LARGE METERS.

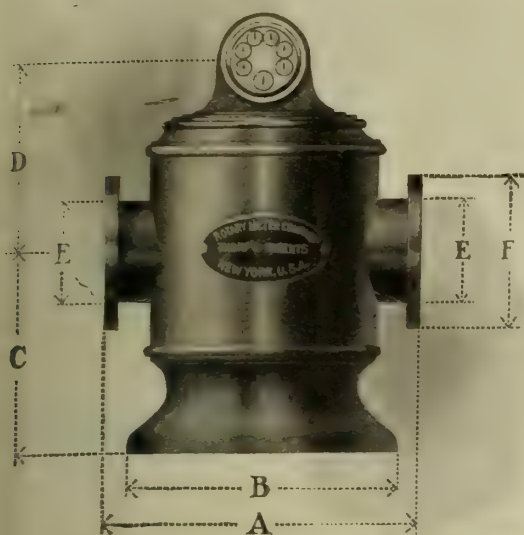
Our English Works

ALONE

HAS SUPPLIED

THE

Following Station Meters.



ROTARY STATION METER.

For Coal Gas, Water Gas, or mixed Coal and Water Gas.



SPECIAL METER.

For Coke Oven Gas, and Fuel Gas.

Two 60,000 cubic feet per hour
and One 30,000 cubic feet per
hour Meters.



Putting on the finishing touches.



Ready for shipment.

2 for 500,000 Cubic Feet Per Hour.

6 „ 250,000 „ „

9 „ 180,000 „ „

11 „ 100,000 „ „

24 „ 60,000 „ „

25 „ 45,000 „ „

42 „ 30,000 „ „

20 „ 20,000 „ „

35 „ 15,000 „ „

101 „ 10,000 „ „

19 „ 7,500 „ „

112 „ 5,000 „ „

31 „ 3,500 „ „

146 „ 1,500 „ „

30 „ 750 „ „

THE ROTARY METER COMPANY, of NEW YORK,

HAS ALSO MADE A

RECORD THIS YEAR.

YOUR ORDERS OR ENQUIRIES
SOLICITED.

T. G. MARSH,

28, Deansgate,

MANCHESTER.

Telegrams—

“ROTARY, MANCHESTER.”

Telephone—

5029 CITY.

JOSEPH TAYLOR & Co.,

Central Plumbing Works,

BOLTON.

CENTRIFUGALS & SULPHATE CONVEYORS.

Modern Methods.



OVER 320

SATURATORS DELIVERED.

Repairs a Speciality.

SEE FACING PAGE.

Telegrams :

"SATURATORS, BOLTON."

Telephones :

Nos. 848 and 119.



Saturator Supplied to the Sunderland Gas Company,
Sept. 1899.

STILL IN.



Saturator supplied to above Company in 1907.

Exactly similar one in Building for The Consett
Iron Company, Ltd., for their Coke-Oven Plant.

WILLIAMSON, CLIFF, LTD.,

MANUFACTURERS OF

BRICKS AND RETORTS

To withstand abrasion, to radiate heat, or to take exceptional Fire.

The most modern Equipment.

Make impartial Tests and specify our Products.

WILLIAMSON, CLIFF, LTD., STAMFORD.

FOR POLISHING AND CLEANING GAS COOKERS

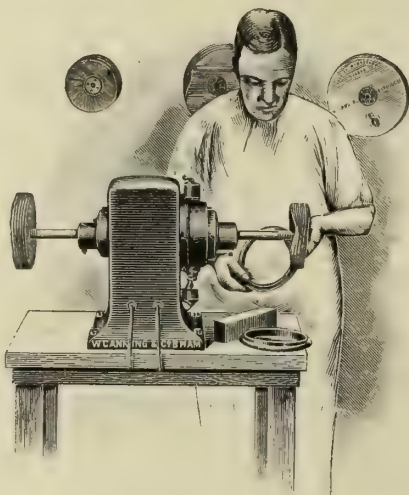
AND

BRASS GAS FITTINGS

WRITE TO

W. CANNING & Co., BIRMINGHAM,

OR ST. JOHN'S SQUARE, CLERKENWELL, LONDON,
for Catalogue "G4."



*Actual Manufacturers of Machinery and Materials for
Polishing and Lacquering.*

Our Goods are used by all the Leading Manufacturers. Goods Specially Packed for Export.

HOLMSIDE GAS COALS.

LABORATORY ANALYSIS: By Messrs. J. & H. S. Pattinson.

| | | | |
|-------------------------|----------------------------|--|-------------------|
| Yield of Gas per ton .. | 10,500 Cubic Feet. | Illuminating Value expressed in Sperm .. | 612 lbs. per ton. |
| Illuminating Power .. | 17 Standard Sperm Candles. | Coke | 68.8 per cent. |
| | Volatile Matters | | 31.2 per cent. |

HOLMSIDE GAS COALS are supplied to the principal Gas Companies at Home and Abroad, the daily produce being about 5500 tons. These Coals are well-known to be amongst the best produced in the County of Durham, and are shipped on the River Tyne in Tyne Dock, and at Dunston Staiths; also at North and South Docks, Sunderland.

SOUTH MOOR PELTON GAS COALS

Are of equal quality to the "Holmside" Coal and are also largely used by Gas Companies at Home and Abroad. They are shipped in Tyne Dock, and Dunston Staiths; and at North and South Docks, Sunderland.

Both descriptions can be bought through the principal Merchants in England, or from

MR. MARK ARCHER, HOLMSIDE AND SOUTH MOOR OFFICES, NEWCASTLE-UPON-TYNE

From whom copies of Analysis and further Particulars may be obtained.

FACTS THAT SPEAK FOR THEMSELVES

1904.

We Manufactured and Erected these Purifiers, which are 30 ft. square, together with the Steel Structure, Roof, and Oxide Handling Plant.

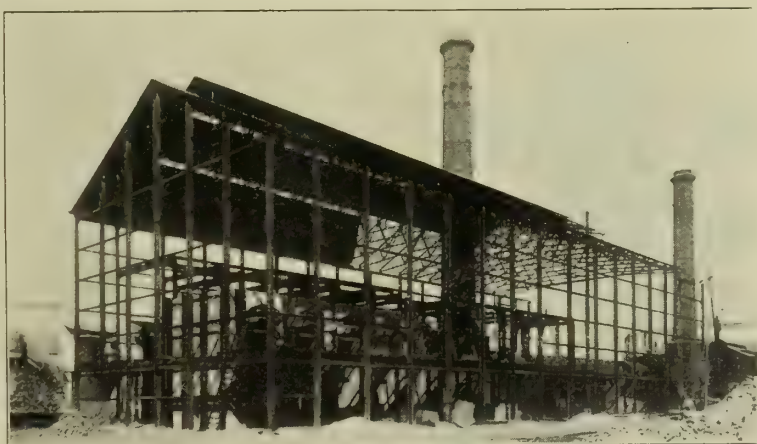


1910.

We have just extended the above Plant by adding 4 more Purifiers, 40 ft. \times 30 ft. with Structure, Roof, and Oxide Plant. This illustration shows the work in course of erection.

1908.

We Supplied and Erected this Steel Retort House and Roof. The Building was arranged for 12 Through Beds of 8 Retorts 20 ft. long, six of which we built complete with Ironwork and Coal Handling Machinery.



1910.

We completed the remaining 6 Beds in the House shown above.

We have also just Erected a similar Retort House and Roof with 10 Through Beds of 8 Retorts, 20 ft. long, with Ironwork and Coal Handling Machinery complete. This photo was taken during the erection of the Plant.

DRAKES LIMITED, HALIFAX.

J. & J. BRADDOCK

(BRANCH OF METERS LIMITED),

Globe Meter Works, OLDHAM.

Telegrams: "BRADDOCK, OLDHAM."

National Telephone No. 815.

AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E.

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Braddock's Patent PREPAYMENT METERS.

WITH CHANGE WHEELS OR
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See our Descriptive Sheets.

Fitted with Colson's Patent Cash Boxes when required.

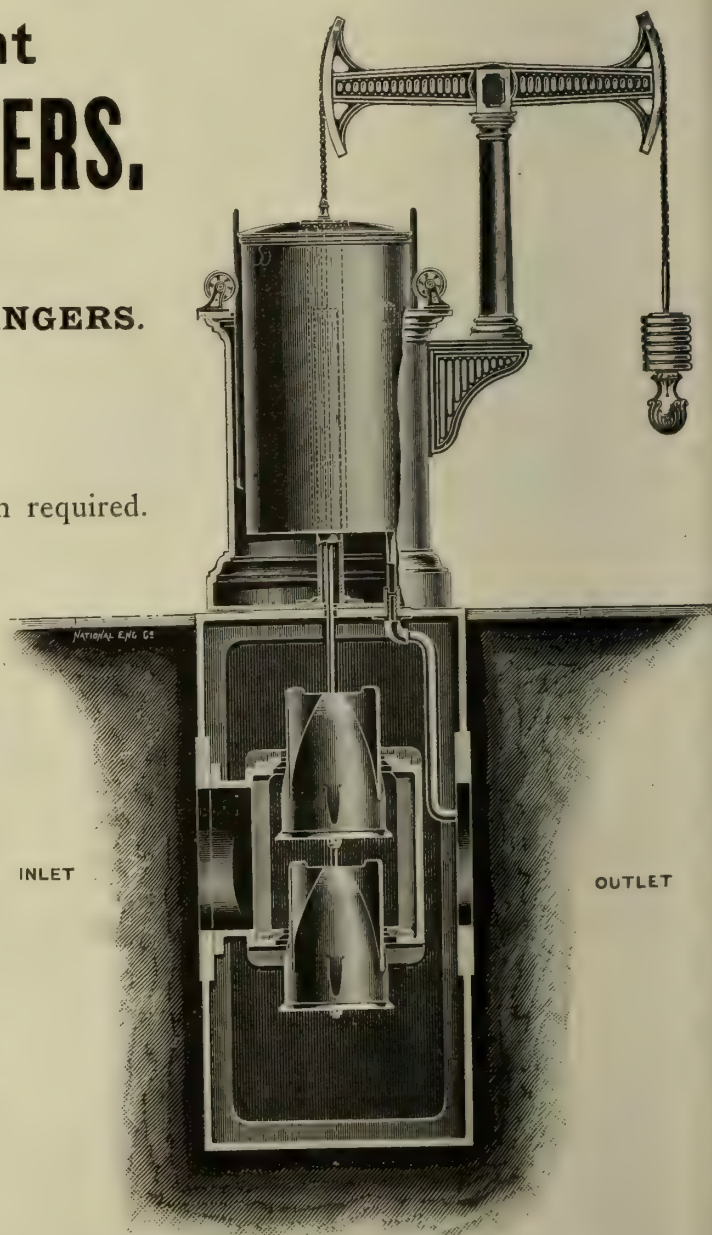
BRADDOCK'S PATENT

GAS STATION GOVERNORS
MOST COMPACT AND CONVENIENT.
EXTENSIVELY USED.

BRADDOCK'S ENCLOSED

RETORT-HOUSE GOVERNORS
ARE UNSURPASSED.

See our Illustrated Sheets for Further
Particulars.



GOVERNOR, No. 190 Type.

IMPROVED GAS STATION METERS

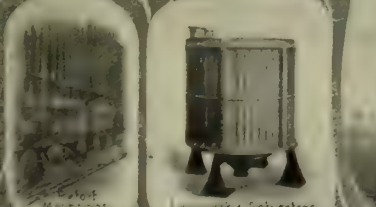
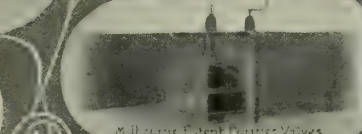
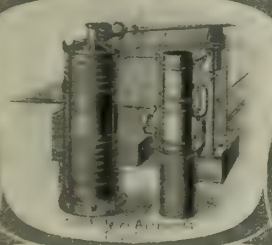
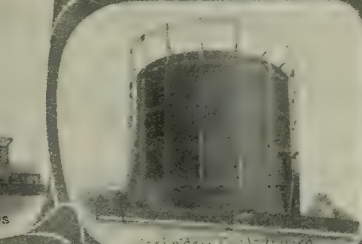
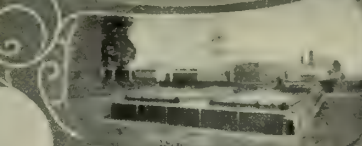
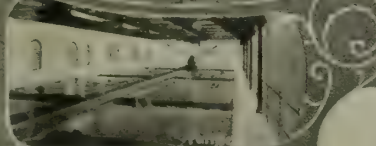
(OF ALL CAPACITIES UP TO 300,000 CUBIC FEET PER HOUR).

OF SUPERIOR QUALITY AND CONSTRUCTION. ABSOLUTELY RELIABLE.

SUBSTANTIALLY MADE.

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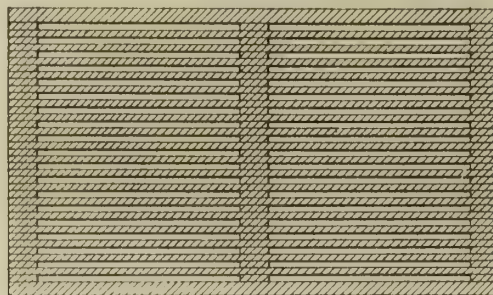
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LONDON OFFICE: 111, FINSBURY STREET, E.C.2.

J. HAWLEY & SONS,

Manufacturers of **WOOD SIEVES FOR GAS PURIFIERS,**
WITH PATENT SQUARE IRON BOLTS.

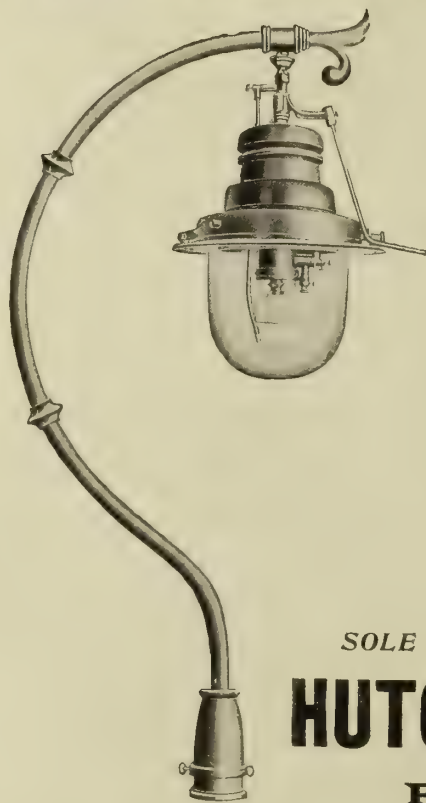
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BOARD FILLING
IN SECTIONS
FOR SCRUBBERS.

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PRICES ON APPLICATION.

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WITH
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The best Lamp on the Market.
Made of Solid Cast Aluminium.
Gives excellent distribution of Light.
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Very low in upkeep, Mantles lasting Three Months.
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Can be fitted with Automatic Controllers.

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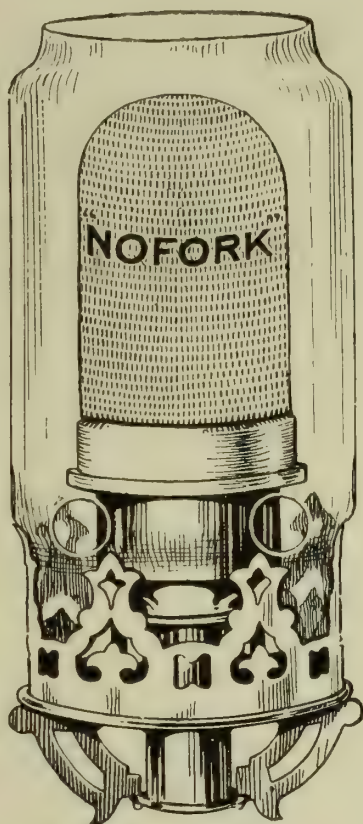
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Manufacture best quality only of every description of Inclined, Horizontal, and
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AN "ALL-BRITISH" MANTLE

A NEW IDEA—STANDS ALONE—A BRIGHT IDEA



PATENT

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LOOKS WELL.

EASY TO ADJUST

NO FORK REQUIRED.

FITS ANY "C" BURNER.

RADIANT LIGHT.

LONGER LIFE.

IMPROVED APPEARANCE.

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UPRIGHT POSITION.

FOR "C" BURNERS.

EASY TO ADJUST.

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ASK YOUR FACTOR FOR IT.



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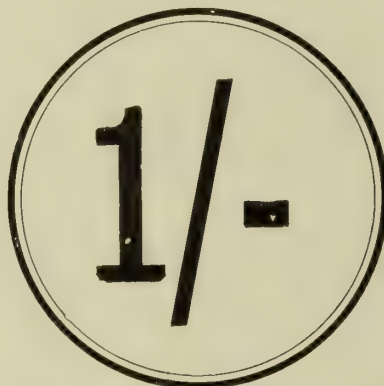
Three Times the Quantity of Coal Carbonized Daily
over any other System on the Market.

Guest-Gibbons Charging & Pushing Machine

Places 16 to 17 cwt. in the Retorts at One Operation, perfectly Light and Level, and without any possible risk of becoming jammed in the Retorts.

With these combined advantages we will undertake, on large Installations, to find all **LABOUR** from Coal Elevator Boot to Coke Yard at

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to include all Repairs and Renewals to Retort Bench and Machine for 7, 10, or 20 Years.

INCREASED MAKE OF GAS AND COKE ENSURED.

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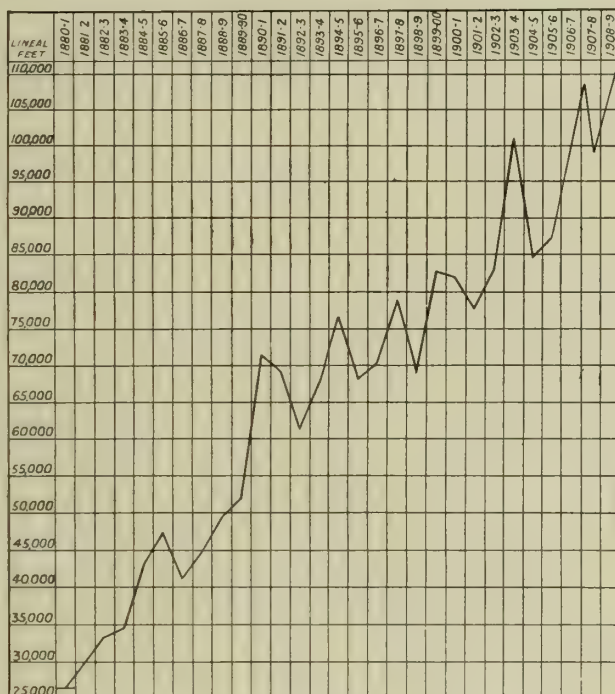
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GAS RETORTS

(Horizontal, Inclined, and Vertical, all Made by Patent Machinery)
IN THE WORLD,

We have always endeavoured to satisfy our customers by improving the quality of our material, and the adjoining diagram shows that a steady increase of business has resulted.

We fully realise the further strain that is being put on this material through heavy charges, pushing - out machines, and higher heats, and we are determined to produce Retorts of the highest possible quality, which, we venture to think, will excel all others in refractoriness and durability.



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All Descriptions of

FIRE-CLAY GOODS,

INCLUDING

SPECIAL TILES for GENERATOR and REGENERATOR RETORT SETTINGS.

(Every well-known system of above made by us.)

**E.P.C. "INSPECTION" Covers and Seating Blocks
FOR ALL KINDS OF BOILERS.**

NOTE.—By using, the above, Boilers can be Prepared for Inspection at a Cost of **4d.** each.

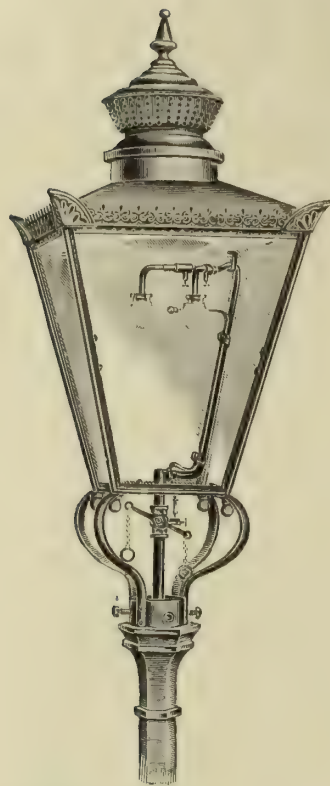
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Also for the Construction of Furnaces for Annealing, Enamelling, etc., etc.

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Inverted Adaptations to Fit any Size Lantern.



MAXIMUM LIGHT
FOR A
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ANGLE BURNERS.

NO INNER CHIMNEYS OR
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Samples for Trial on Application.

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"RAPID" MANUAL AND POWER CHARGING MACHINES.

SIMPLE AND INEXPENSIVE.



"RAPID" MANUAL CHARGER AND SCOOP CARRIAGE WORKING AT
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INCREASED
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REDUCTION
OF FUEL
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Also for name of Works where you
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GAZINE

(Registered in England and Abroad.)

A Radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services. It is used also for the Enrichment of Gas.

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FENLON'S "C.C. Fleet" CIRCULATOR

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THERMOSTATIC VALVE.

Distinctive Point:—
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SUPPLIED TO 12 GOVERNMENTS, PRINCIPAL RAILWAYS, AND LEADING GAS WORKS AND FIRMS IN GREAT BRITAIN.

(WALLWORK AND WELLS' PATENTS).

PAINTING BY MACHINE.

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The paint is sprayed evenly and continuously through a flexible tube and nozzle supplied with compressed air, either from existing air main or from our special Compressors.

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LIME AND COLOUR WASHER.

A Great Saving of Time, Labour, and Money.
NO OUTSIDE POWER REQUIRED.

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Saves its Cost in a Few Days.

Over 4000 Sold.

Lime, Whiting, or Cold Water Paints

applied at a speed of from 10 to 20 square yards per minute, in a manner superior to brushwork. One coat with the machine on rough surfaces is equal to two applied with brushes. The material is applied in the form of a spray, and is driven into corners and difficult places where a brush would not reach.



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Fitted with Patent "Sight-Feed" Syphons.

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Money Savers to any Users of Machinery.



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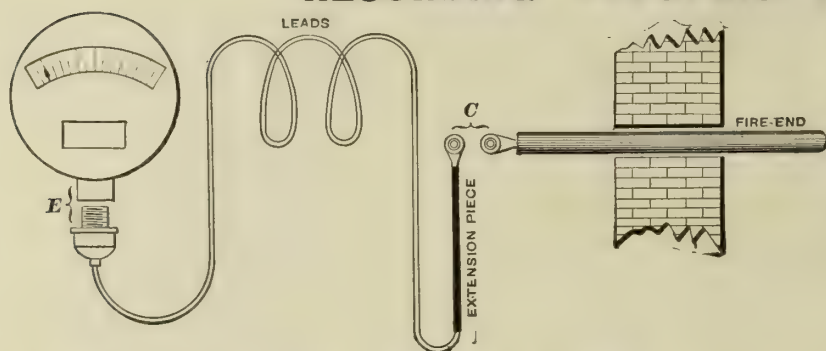
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For Steam, Gas, Air, Water and Vacuum.
Switchboard and Portable, with 8 in. and 12 in. Dials.
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The most complete line of Recorders in the world, the result of 20 years' steady progress.

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CANNON STREET,

"LUX"

Gas Purifying Material.

Further Reduction in Cost of Gas Purification.

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Purifier changes are less by over one-half when using "LUX" as compared with Bog Ore, and it requires considerably less turning than Bog Ore for revivification.

As a labour saver, this speaks for itself, but in addition there is lessened risk, worry, and anxiety for the management.

"LUX" is easily charged with Sulphur 55/60°. Once used, always used, is the verdict of many Gas Engineers in this country who have tried it during the past 18 months.

Descriptive Circular and Laboratory Sample free on Application.

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GAS LIGHTING ENGINEERS AND PATENTEES, HIGH POWER LIGHTING SPECIALISTS,
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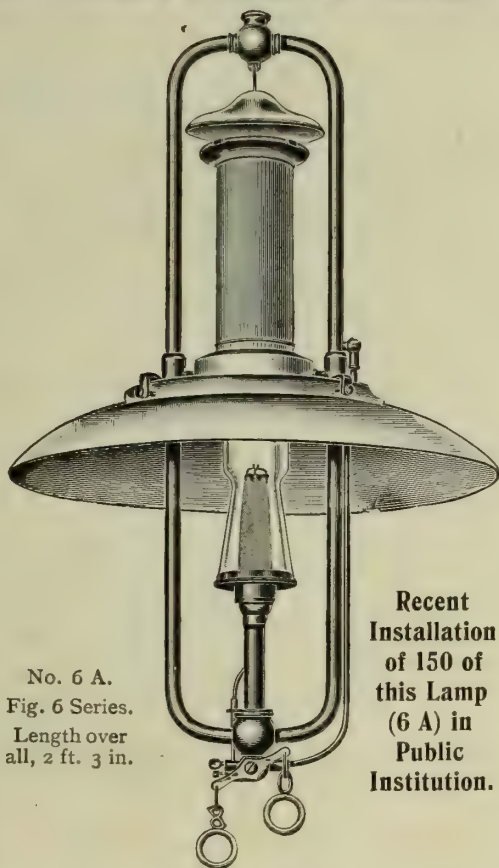
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FOR ALL COUNTRIES.

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SCHOOL LIGHTING

Absolutely the best and most Efficient System of inside lighting for dusty positions.



No. 6 A.
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Length over all, 2 ft. 3 in.

Recent Installation of 150 of this Lamp (6 A) in Public Institution.

A SPECIALITY.

We have recently lighted a Black Lead Powder Mill and a Flour Mill with this Lamp.

We are now in a position to convert and bring up to date any well made Street Lantern from Upright to Inverted Lighting (by our system). Send a Lamp to be adapted to our system as a trial.

THE IDEAL LAMP

For Gas Companies' Hire Purchase System.

EVERY PART RENEWABLE.

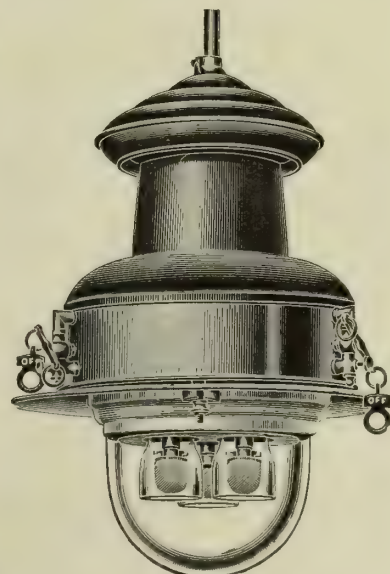
Over 30 c.p. per cubic foot consumption per Burner.



2003 M.G.



CAN BE USED WITHOUT GLOBE OR INNER CYLINDER GLASSES.



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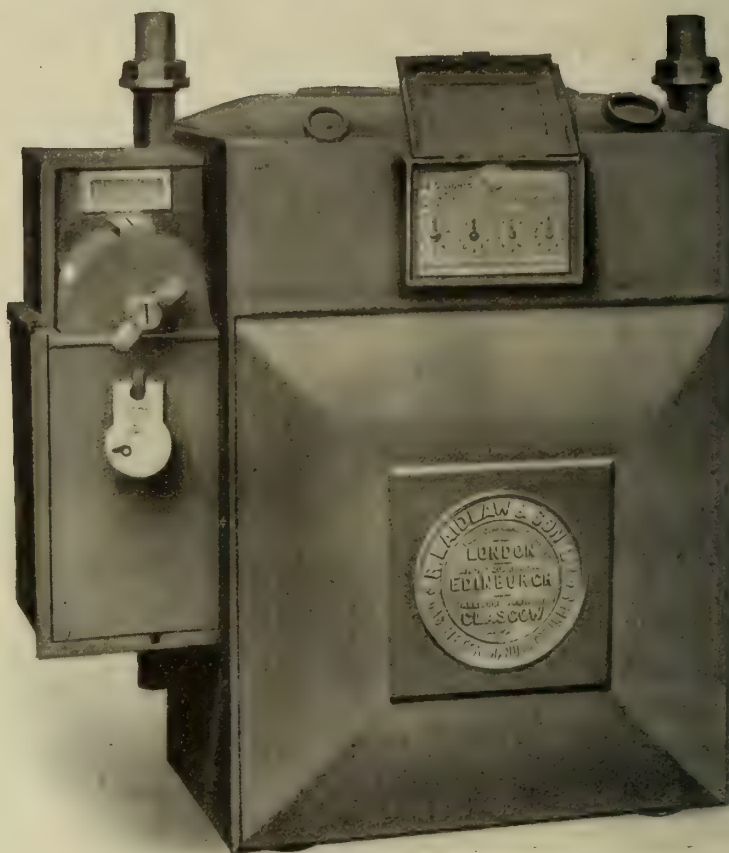
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Gas
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P.P. METER WITH PATENT REVERSIBLE
CASH BOX.

PREPAYMENT & ORDINARY GAS METERS

In Tinsplate and Cast Iron Cases
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For Public Lighting.

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ONE TON CAPACITY ELECTRIC TELPHERS HANDLING HOT COKE,
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For the **RAPID**
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LOW RUNNING COST.

MAINTENANCE
REDUCED to a
MINIMUM.

Specially suitable for
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The rapidly increasing adoption by
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Patent Mantle is proof positive that it is
better than any other Mantle they have
used hitherto.

It is, therefore, not surprising that
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during the first five months of this year
have already exceeded those of the whole
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consideration.

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None Genuine without this Trade Mark.

The "Super-Acme" Gas Cooker

is not another ordinary Cooker. It is the highest point yet reached in high-grade Gas-Cooker construction. Where other high-grade Cookers end is the starting point of the "Super-Acme."

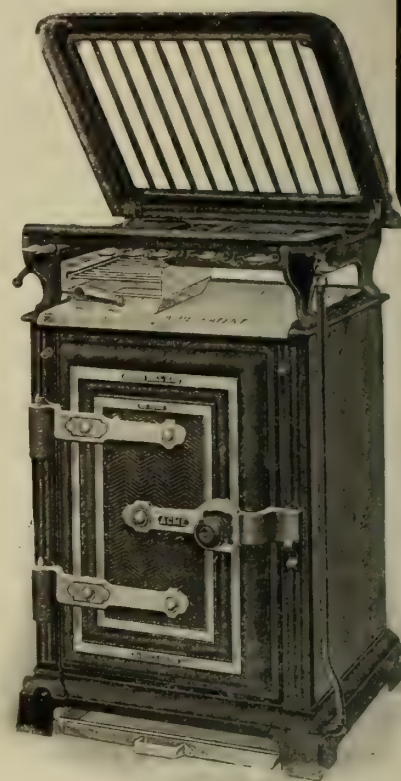
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"Acme"—the highest point attained!

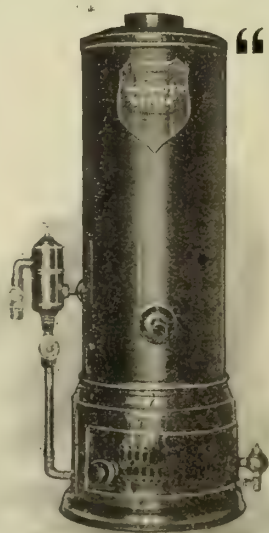
"Super-Acme"—even higher than the highest!

(If you think that an Impossibility—you have not seen the "Super-Acme" !)

ARDEN HILL & CO.,
CME WORKS,
STON, BIRMINGHAM.



247.



THE "INSTANTER" GEYSER

Instantaneous in action.

Water supply controls the gas.

Fitted with Automatic Gas Valve, all parts of which are accessible.

Strong and we'll made.

Economical, Durable, and Up-to-date.

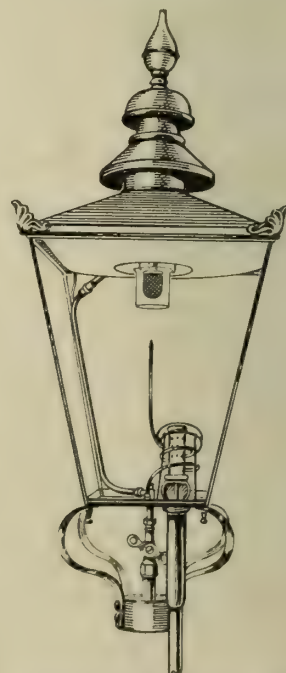
The "Instantanter" stands alone, in that the interior is easily removable in situ.

TRY ONE!

RAPIDLY GAINING PUBLIC FAVOUR.

I can convert your Street Lamps from Upright to Inverted, as illustrated, at a very low cost.

SEND SAMPLE LAMP TO BE CONVERTED.



THE "CAXTON" STREET LANTERN.

Still being turned out in huge quantities, 25,000 fixed in London and Suburbs alone.

I can supply anything you require connected with the Gas Industry.

EDGAR OF HAMMERSMITH,
BLENHEIM WORKS, LOWER MALL.

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Telephone: 14 HAMMERSMITH.

THE CAMBRIDGE SCIENTIFIC INSTRUMENT CO., LD.

CAMBRIDGE, ENGLAND.

HOHMANN & MAURER THERMOMETERS

For Gas Mains, with straight or angle stem, have a clear open scale, and are of robust design.

The H. & M. GAS LEAK INDICATOR

instantly detects and locates gas leaks.



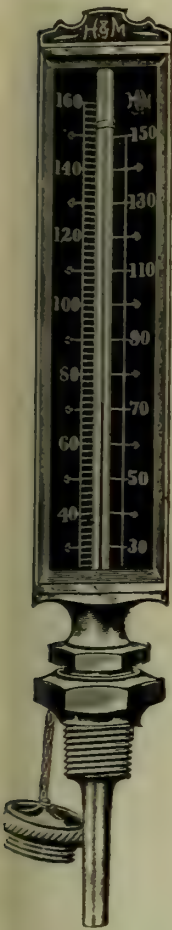
The H. & M. POCKET PRESSURE GAUGE

is accurate and most reliable, and is small enough to be carried in the pocket.

The FÉRY SPIRAL PYROMETER

for taking gas retort temperatures.

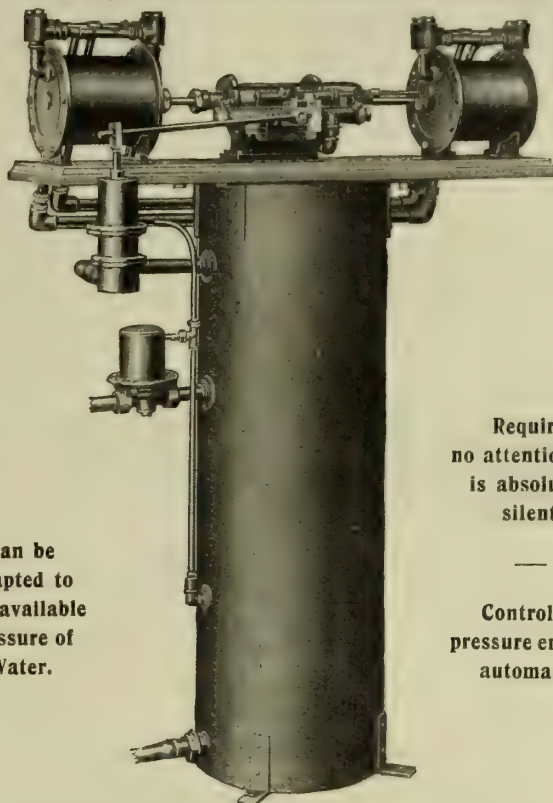
We shall be pleased to send literature describing the above instruments.



TILLEY'S HIGH-PRESSURE GAS LIGHTING & HEATING.

Patent Water-Driven Gas Compressor.

Absolutely the BEST and CHEAPEST on the Market.



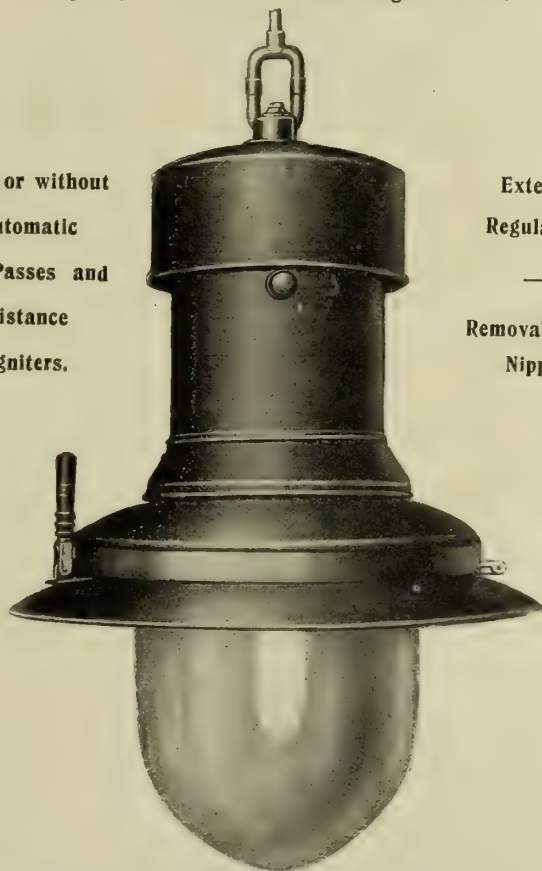
Can be adapted to any available pressure of Water.

Requires no attention and is absolutely silent.

Control of pressure entirely automatic.

Patent Inverted Burner Lamps.

300-1500 Candle Power from Single Burners.



With or without Automatic Bye-Passes and Distance Igniters.

External Regulation.

Removable Gas Nipple.

"COALEXLD"

(PATENTED PROCESS).

The New Smokeless Fuel.

Gas Companies will do well to adopt the making of "Coalexld."

BECAUSE:—

1. No extra Capital is Required.
2. The Cost is repaid by increased Price on Coalexld.
3. Coalexld finds a readier sale than Coke.
4. It can be used in Drawing Rooms or Kitchens.
5. It improves the make of Gas both in quantity and quality, also is a perfect fuel for C.W.G.P.

For further Particulars apply to—

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For Particulars of above and all other Accessories
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Works: 4, Clarence Yard, Manor Place, Walworth, S.E.

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WASHER-SCRUBBER.

"Standard" Specialties.



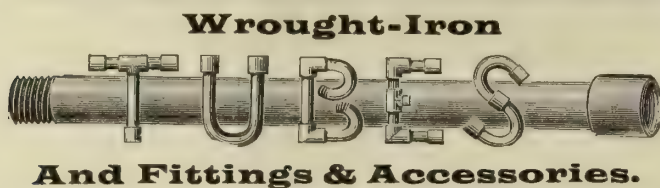
"HURDLE" GRIDS.



"RACK" GRIDS.



TAR & NAPHTHALENE WASHER.



And Fittings & Accessories.

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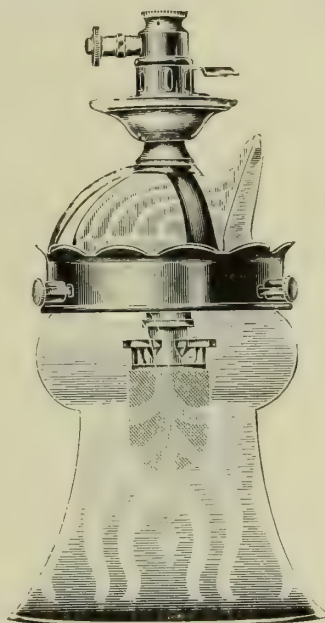
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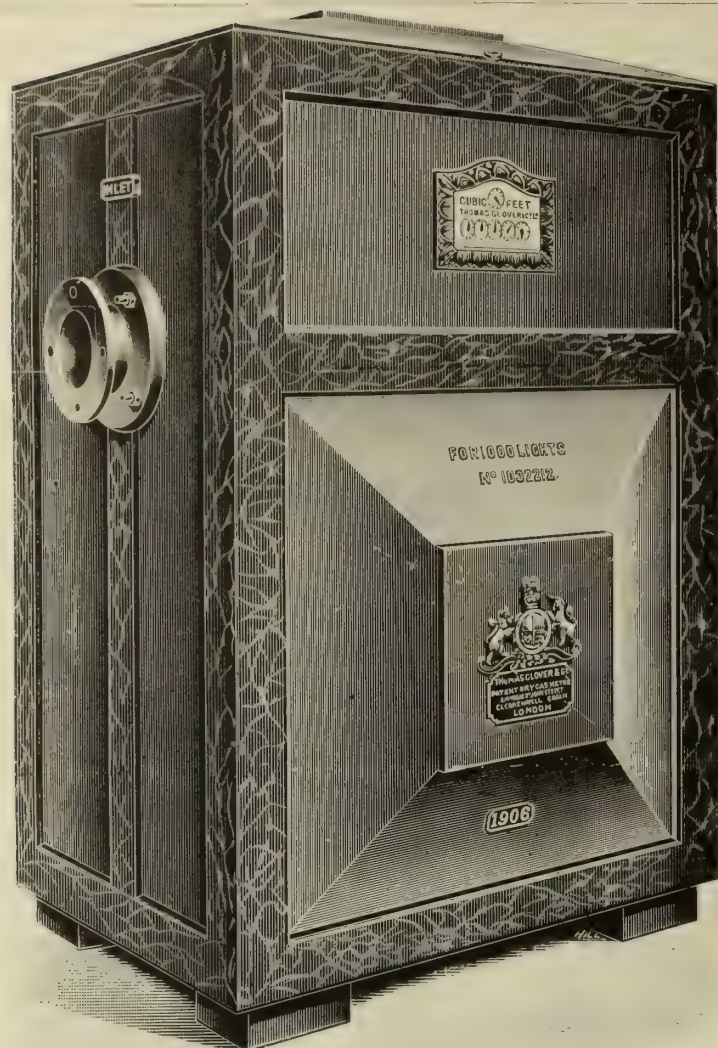
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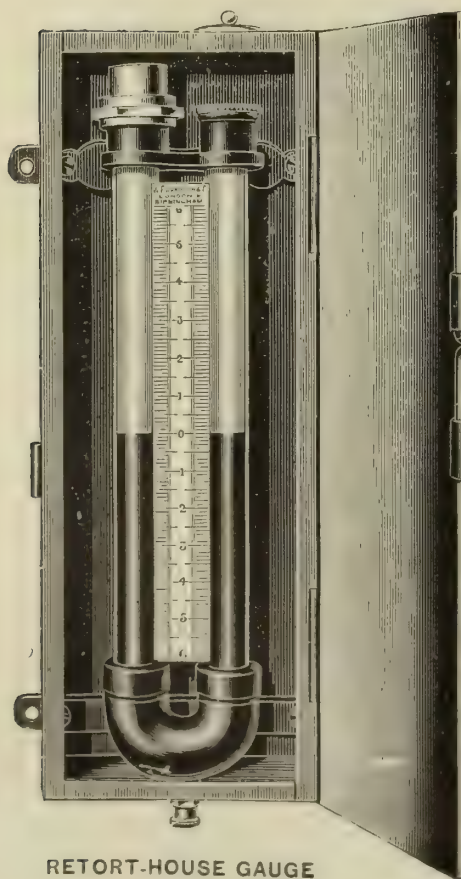
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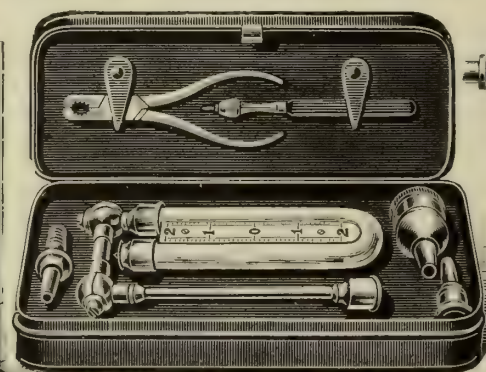
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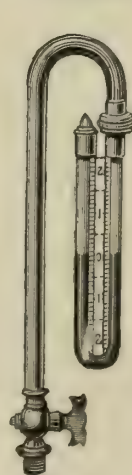
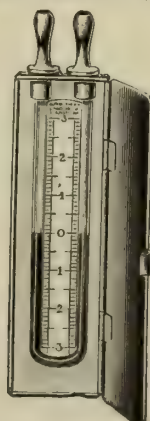


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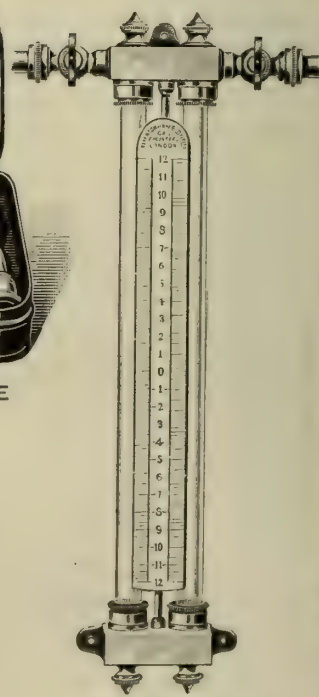
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VOL. CX., No. 2458.—TUESDAY, JUNE 21, 1910.

EDITORIAL NOTES - GAS, &c.

The Institution Meeting.

THE year of the occupancy of the presidential chair of the Institution of Gas Engineers by Mr. James W. Helps has been brought to a close by a meeting that will take position as somewhat extraordinary in regard to the value and the suggestiveness of the material parts—composed of both commercial and technical subjects—of the proceedings. The value of any particular subject in such an industry as ours must be appraised not only in regard to its rank in technical operations and commercial procedure, but in respect of its current importance; and if we reflect on the proceedings of last week, it will be conceded that, from beginning to end, there was an exceptional current pertinence about them all. No such meeting has any value unless it projects some influences into the future; and we do honestly believe that from this meeting in many ways—in connection with manufacturing operations, the gas supplied, commercial methods, co-operation, and the improvement of the means of utilizing gas for heating—there will arise considerable advantage in the future. As we said last year, so we may say again this, a change in tone has come over the meetings of the Institution; and this is to be traced, in our opinion, to the attraction to its platform of men who have the time and ability to pursue investigation under the surfaces where, through the pressure of responsibility, which increases and does not diminish in any direction, the technical officers of the industry have to be largely content to labour. But at the same time, it is palpable that the influence of association, of the infusion of new ideas, and of the practical application of derived knowledge, are in many ways elevating discussion, examination, and deduction.

No small meed of praise for the success of the meeting must also be given to the President. Those well-known traits of his—acumen, courtesy, and business aptitude—did much in carrying through an extensive programme without undue pressure being in any part apparent. The weather, too, was kindly disposed, and played a no small part in the enjoyment of the week. To the Chairman and Directors of the Croydon Gas Company, whose kindness on Friday completely captivated the members and their ladies, the fullest acknowledgment must likewise be expressed. They spared nothing to enforce the pleasure that it gave them to receive those who had raised Mr. Helps to the seat of the greatest honour among them. And the President himself would but desire that, in the distribution of these acknowledgments, sight should not be lost of the loyal assistance rendered him by the Hon. Secretary (Mr. S. Y. Shoubridge), and the Secretary, Mr. Walter T. Dunn.

A new presidential year has commenced its course; and to Mr. Alex. Wilson we express the hope that his year of office may be such that it will give him at its close the liveliest sense of gratification, and the knowledge that the work accomplished has added a chapter of the highest importance to the history of the gas industry. Of this we may be sure, that conscientious effort will not be wanting on his part. The meeting just closed shows much work that is lying at hand, awaiting further attention.

A Message to the Gas Industry—

An Extended Central Organization.

THE year of Mr. Helps's presidency has been made memorable by an address of extraordinary value, treating as it does of matters of immediate and vital moment to the gas-supply industry as a whole. The chief subject in the composition transcends, in current importance, all matters of technical character. He had a message to deliver. He delivered it; and it was evident that, in doing so, he was conscious of the

responsibility. The message was the outcome of a calm and judicial survey of the present position of the industry, and of a perspective scrutiny of its affairs. The address is full of perception, warning, impeachment, and of desire to create an organization concretely representative of the industry for prosecuting work designed, through real and perennial activity, to solidify its defences, and to advance generally its interests. Throughout, the deliverance palpitated with the fervour of one strong in conviction, and in the righteousness and the wisdom of the cause in hand. The President, however, wished what he had to say to be detached from the individual, and from the representative of any particular gas undertaking; and for it to be taken as coming from the, for the time being, titular head, and therefore from the mouth-piece, of the leading executive branch of the gas industry. But the honour must remain largely a personal one. The message, let it be added here, is addressed to a much larger circle than the technical representatives of the industry. If we omit the portion that is interjected—and seems a little out of place through the breaking in upon the continuity of thought—between the statement of the changed conditions of the industry and the case as to the necessity for extension from technical to industrial representation of the constituents of the chief organization of the industry, there is not a line or a word that should not receive careful and thoughtful consideration by all concerned, in any directive or official part, in the fortunes of the business of gas supply.

All around us in the industry changes are taking place; and the President points to some of the leading ones, and to their meaning. The conditions of the past are buried far beneath the circumstances of the present. In the technical methods governing production, there has been change, and change is still proceeding. Important as that is, the President did not—and perhaps advisedly—lay much stress upon it on the present occasion. It is beyond the technical ground that the plea for the necessity for a new order of central representation and organization finds its best foundation, inasmuch as it is the foundation that is most intelligible to those among whom it is essential that the plea shall find favour. We have to get outside the board-room and the gas-works gates, to obtain a proper view of the position. What is seen there? The uses of gas have changed and expanded. More economical methods and more scientific methods of utilization have taken the place of the crude methods of yore. To obtain and retain the satisfaction of the consumers, more expert attention is required by the means of utilization. Men need to be specially trained for this work. The economy, the still advancing economy, of our means of utilization has to be compensated by new business. New business is more difficult to obtain in these days when the fields of opportunity—broad though they be—are occupied by active and strong competitors. It is to the disadvantage of the gas industry, too, that electrical competition is largely directed by municipal agency—an agency that (in electrical departments at any rate) is arbitrary in its methods, and unrestrained by the rule of personal responsibility and self-interest. Briefly put, but not by any means comprehensive of all change, that is the position outside the works, where the methods employed make for prosperity or the reverse.

The old practices and the old methods have been put into the balance, and have been found wanting; but there are still many who try to make them fit the altered circumstances. The act is absurd, and the result is not pleasant; and the day will assuredly come when such administrators will rue their shortsightedness, or whatever else it may be that has caused them to hold back from shaping their modes of operation to the altered needs. Even the best of managements would do well to have a little introspection, and to ask themselves whether what they are doing in their own locality is sufficient for their own undertaking and for the common advancement of the industry. Though we boast in the gas industry of free intercourse, there still exists a goodly amount of exclusivism, which need not continue in

an industry that is, in its prime commodity, internally non-competitive. Therefore what the President asks is (and it is a question that has been put before in these pages), Is enough being done in the industry in co-operative work for the general good? We cannot imagine anyone coming to any other finding than the negative. That must be changed; and to effect it there has to be inculcated in the ranks of the administrative portion of the industry a sense of community of interest. If this can be accomplished, the rest should be plain sailing. If, however, we cannot bring this about from within, then sooner or later, the pressure of a callous competition will certainly effect the same end. Accepting the doctrine of community of interest, it will be readily seen, in all places in the industry, how much there is to be done that can only be effected by co-operation. The free discussion of methods and practices, and persevering and continuous work in many ways for common defence and progress—in connection, for instance, with competition, by free advertising in the daily papers, by popular articles that will be both instructive and corrective of misstatements from other quarters, and by systematic watching and activity—will be, and cannot fail to be, mutually advantageous. Some of these were questions that were discussed at the meeting held under the auspices of the Commercial Sections of the District Associations on Tuesday afternoon; but they are matters that, while temporarily dealt with in some way, should be considered in relation with the larger scheme propounded by the President.

To carry out all such work, and much other both definite and casual (such as has marked the history of the industry during recent years), there must be a proper, effective, and strongly-supported central organization. Is the Institution of Gas Engineers such an organization? Is it representative of the whole of the interests of the gas-supply industry? The President, and all who consider the subject in a broad-minded and judicial spirit, can only, unfortunately, answer "No." We ask every reader to consider the matter for himself. The address contains much apothegm and suggestive thought that will contribute to serious reflection and determination on the question. The Institution, as an effective organization representative of the gas-supply industry as a whole, stands condemned by the smallness of its yield; and by the substantial proof of its circumscribed activity. The President submits that the cure for this is an extended constitution of the Institution. He commits himself to nothing as to exactly what should be done; but he takes his stand firmly on his personal convictions as to present needs and present woful inadequacy of both method and organization. What he says beyond is purely suggestive, and subject to revision upon judgment from collective deliberation and wisdom. He offers alternative proposals as the first steps to the end in view: (1) The alteration of the Articles of Association of the Institution, so as to allow of the admission of officials who are now strictly ineligible (the chiefs of secretarial and distribution departments), and to keep to the present title of the Institution, which would be a misnomer; or (2) to revert to the title of "The Gas Institute," and to divide the work into sections, in much the same way as is done by the British Association. The latter is the course favoured by the President; and with him we think the gas industry will generally agree. It is a broadening of the basis of the central organization that is first required; and the broader it is made (subject to regulation in order to avoid indiscriminate election) so as to give future liberty, in place of the present crippling restriction, the better. With sectional work, any feared unwieldiness would not be felt.

As a matter of fact, the want, in the President's opinion, is a numerically strong body, thoroughly representative of the various interests concerned, and therefore particularly well calculated to secure the co-operation of the various officials of gas undertakings, and the confidence and financial support of the companies and local authorities they serve. But regarding the limitation that the President sets on the directions in which the numerically strong body representative of all interests is to be obtained, there may be some divergence of view. He confines himself to the naming of the heads of the secretarial and distribution departments. In our opinion, that is where he errs. By such restriction, the financial interests of the gas-supply industry are not secured an adequate direct representation. That apart, too, the greatest curb upon its movements in effective and more extensive work the Institution has had, has been its comparatively penurious condition. A much stronger financial

position must be secured. That stronger position is wanted more than ever; and the subscriptions of an increased number of members from the ranks of gas officials will not alone produce this. And where gas engineers have failed to produce an adequate financing of the work of the central organization, the heads of the secretarial and the distribution departments cannot surely be expected to do better. The President admits that boards of directors and committees of gas undertakings must have the assurance that the body or Institution which sets itself the task of carrying on any organized work is thoroughly representative of the various interests of their several concerns. Only in this way, he adds, will they gain sufficient belief and confidence in the work being done on their behalf, and induce them to give to it not only their moral but their financial support.

If this is so, would not a more direct method of obtaining that confidence and moral and financial support be by inviting representation of gas undertaking administrations in both membership and direction of the central organization? It is a composite organization for the gas-supply industry that is now proposed; and confidence and other necessary things are not to be gained by keeping the real representatives of the financial interests of the industry outside the pale of the organization. The President would invite them to a conference on the subject of the need for combined action and for an extended constitution of the Institution. That is good; it is necessary. But there he stops short in his suggestion. Directors and committeemen have not only to realize and appreciate to-day, but their realization and appreciation have to be kept alive to-morrow. Their interest has to be sustained, and so has that of their successors. We know of no way in which this is to be done, except by permanent participation and identification with the work—anyway of one of the sections—of the central organization, and by representation on the central council. Confessedly, it is a difficult work that has to be tackled in this direction. Custom, prejudices, inanity, parochial tendencies, parsimony (for the development of which the long unchallenged security enjoyed by the industry is responsible) are obstacles that have to be removed; and until they are, the officials of the industry will never be accompanied by united lines of administrators on to the path of practical wisdom to which direction is given by the changed conditions.

This matter must not remain where the President has left it. His address must be the turning-point to the construction of stronger defences, and to the broadening of activities in the common interest. Acting on the suggestion made, the Council have received an instruction to appoint a Special Committee to consider the whole matter and to report. We hope that the Committee appointed will be a composite one representing not only the engineering side of gas-supply industry, but the administrative, the secretarial, and the distribution sections. But this work should be pushed forward, independent of the annual meetings. It is indeed a work—a great work—worthy of the utmost despatch and effort. The truth has been plainly written by the President. Appreciation of it not only by officials but by directors and committeemen, and the realization of a strong centre—a veritable centre of co-operative activity—should be easy of attainment.

Fresh Starting-Points for Research and Application of Knowledge.

JUDGMENT before the event is never wise or safe. When the programme for the annual meeting was first issued, there were freely expressed views that there would be comparatively little in the papers that would evoke discussion; but now that the meeting is over, the universal judgment is that the prepared contributions have elicited much that is of immense value to the gas industry, and that new starting-points for research and action have been marked. Take as a group first the statement on heavy-charge working by Mr. J. Ferguson Bell in connection with the Carbonization Committee's report, Dr. Davidson's paper on the Birmingham coal-testing plant, the report submitted by Mr. F. W. Bywater on behalf of the Refractory Materials Committee, Mr. J. B. Klumpp's paper on calorimetry, and Mr. S. Y. Shoubridge's contribution on coke-conveying; and from all these, including the discussions, there are new starting-points presented for research or for extended application of knowledge already derived from experience.

The fact is irresistible nowadays that the heavy or full

charge is a right and most productive practice in carbonization. There are a few who still endeavour to persuade themselves to the contrary; but they are one by one coming into line, and must do so if they do not wish their old reputations for good working to sink under the results achieved by others. With heavy charges, it is proved extensively—the South Metropolitan Gas Company's experience covering a million tons of coal (referred to in the carbonizing discussion by Mr. Charles Carpenter), may be taken as an example—that high yields of gas are not incompatible with good candle and calorific power. Some few have wondered, but even that few have not stopped to seriously inquire, how this is, or whence comes the increased yield without any very great depreciation of qualities. The point has been raised at this meeting; but even among those experts who have given thought to the matter, there is no settled view. There is one opinion in one place; and another in another. Both may be correct; and the increased product from the ton of coal may be due to the combination of the suggested causes. There is here a starting-point for research. We have Dr. Colman expressing the view that the steam formed from the coal in carbonization is decomposed to a greater extent with the full charge than when a large free space is left in the retort. The theory on first blush seems feasible; until Mr. Charles Hunt points out that, with a full retort, a larger quantity of virgin liquor is obtained than with a partially filled one. Under this circumstance, what becomes of Dr. Colman's theory? Mr. Hunt rather thinks the increased yield of good calorific power gas and gas without its illuminating power seriously (if at all) degraded, is due to the fact that the bulk of the gas—through the reduction of temperature in the retorts brought about by heavy or full charges, and the considerable, or entire, elimination of the free space—meets with a lower temperature, and so is not decomposed. The reduced carbon deposit on the retorts in which heavy charges are used indicates to Mr. Samuel Glover, Mr. J. P. Leather, and Mr. Bell that Mr. Hunt is on the right track in this matter. Weight of opinion is, therefore, rather against Dr. Colman, though no one, except Mr. Hunt, ventured to deny the accuracy of his deduction from mental consideration rather than from actual working.

High temperatures and a large free space have no doubt made between them a heavy claim both upon the gas product and the retorts themselves. They have been responsible for a considerable inequality in the matter of the strains to which the retorts are subjected; for while the temperature of the floor of a retort with a light charge has been diminished considerably on the introduction of the latter, there has been little change, comparatively speaking, in the temperature of the upper part of the retort. The heavy or full charge diminishes the great synchronous temperature inequality. Some indication as to what this inequality must have been is found in the report of the Refractory Materials Committee, where it mentions that, in the investigations, the maximum temperature pyrometrically registered in retorts was 1909° Fahr., and the minimum 1558° Fahr. But in testing the minimum temperature on the bottoms of the retorts immediately after charging, records as low as 800° Fahr. have been obtained. This being so, it may be that we shall find that the heavier charge may not only result in increased production, but by eliminating the great inequality of temperature, and consequently of strain, between the bottom and top parts of the retorts on each re-charge, there may be advantage accrue in respect of the life of the retort. The Dessau vertical retorts, in which full charges are employed, are giving an excellent account of themselves in Berlin in the matter of longevity; and we are hoping for more helpful records in this particular matter. There is a starting-point for investigation in regard to this question of the effect of large simultaneous inequalities of temperature in retorts, and the lessening of those inequalities by heavy or full charges.

Bearing upon this question of full charges, is that of calorific power. Dr. Davidson shows that it may be taken, in ordinary working, as a rough rule that a 2 per cent. reduction of illuminating power only represents 1 per cent. reduction of calorific power. But this does not apply to vertical retort and full charge working; for the calorific power under these conditions is shown to be higher than in ordinary working, though the illuminating power may be lower. It was rather noticeable, in the Presidential Address, in the discussion on Mr. Klumpp's paper, and during the discussions on carbonization, the freedom with which the setting

up of a calorific power standard (appropriate to local conditions) was advocated to supersede the illuminating power ones. The matter was also introduced in connection with Mr. F. J. Ward's paper on the management of small gas undertakings; for in carrying on successfully the affairs of a small non-statutory company, the only consideration he gives to illuminating power is through the jet photometer and his optic organs, and, so long as the calorific power is satisfactory, he does not concern himself about much else. Here, again, is a starting-point. Those best competent to give a judgment as to calorific power, under the new conditions of gas use, and under the new conditions of gas production, pronounce it to be altogether a more favourable standard in the interests of consumers, and yet a more stable property of gas than illuminating power, and therefore a standard more appropriate for gas makers to which to work. The suggestion fell from Mr. Arthur Valon that the big corporations supplying gas could help enormously the gas industry by being the first to apply for the substitution of a calorific power standard for the existing illuminating power one. But care must be taken to have full regard to both general and local conditions in deciding what the standard should be. On all hands, the advocacy is that the gross, not the net, value should be adopted as the standard (for reasons set out in our "Review of the Proceedings" at the meeting, and more extensively in the full report), and that the standard itself should be fixed in each case with reference to the carbonizing system in vogue and the character of the coals generally used. These points have been made frequently in our columns; and Mr. W. J. A. Butterfield, Dr. Colman, Mr. Jacques Abady, Mr. Holgate, Mr. Klumpp, and many others who have specially studied this matter have all so advised.

There is no occasion to look far into the other papers to see where there is necessity for fresh starting-points, owing to new conditions, and the leaving behind of old practices. The fine coal-testing plant at Birmingham, and the valuable collection of results from it, that Dr. Davidson introduced to notice, lacks one provision for making tests that are of real value, through the inability to do so in conformity with the modern practice in relation to heavy charges and the rapid discharging and recharging of the retorts. Hand labour, as Mr. Carpenter pointed out, and as Dr. Davidson acknowledged, is a failing point in the plant; and this means that a complete testing plant in the future, should have, if full reliance and value are to be secured, its carbonizing portion situated in a retort-house where the operations are subject to proper mechanical control. We turn to the report presented by Mr. Bywater on behalf of the Refractory Materials Committee; and to the valuable work that it incorporates—more especially in regard to temperatures. The report opens one's eyes; and it presents a starting-point for united work on the part of makers and users. Makers of the refractory materials used in gas-works deserve in a measure pity, as well as the censure they have received. They have, as it were, been working in the dark as to requirement. This report, however, throws a considerable amount of light in that direction. It gives the makers of fire-clay goods information that they have not had before in respect of temperatures; and it shows that there must not again be the absence of co-operation there has been in the past, which has to an extent kept the practical experience of use from guiding in the production of the goods. The manufacturers have expressed, through representatives of their section of the Society of British Gas Industries, a desire to co-operate in future. One of the lessons of the inquiry has been that retorts must be made to stand not only high temperatures, but frequent and considerable variations of temperature while (as pointed out earlier in the article) in use.

Then there is the paper—the only engineering one contributed to the proceedings—by Mr. Shoubridge, and the discussion upon it. From these are gathered information as to the economy of coke-conveyors, and as to their necessity, in working of any magnitude, under the new retort-house practices. There is abundant testimony now that, if properly designed, wear and tear has been considerably modified; and that there need not be any inordinate amount of breeze produced as the result of their use. The main part of Mr. Shoubridge's paper was hardly touched upon in the discussion, and that has reference to the travelling and rising and falling transverse conveyors in conjunction with the main yard conveyor. There is a starting-point in new practice here. The transverse conveyors will really provide largely

increased storage on a given space; result in a diminution of breeze; and facilitate the loading of trucks and carts at any part of the storage ground, and on either side of the conveyor. There is no fixed point for loading as in the case of storage hoppers.

Though mentioned last here, the paper by Mr. Jacques Abady occupied (as will be seen elsewhere) first place after the Presidential Address at the meeting. It deserved it. It deals with much neglected questions; and is a studious and critical examination of public lighting contracts. Throughout it is composed of matter that is original, that stirs up thought, and that will be of immense value to all who have to deal with public lighting questions. It and the Westminster lighting contract will, we believe, together form the point at which the old ways in this matter will be left behind, and the new way advocated be adopted. The plan of purchasing illumination under photometrical protection, ignoring quality, pressure, consumption, and all such matters to which attention has hitherto been paid, appeals as a scientific one, and one that will be pushed to the front by the inexorable force of competition. But in connection with it, cost should not be the only factor for consideration; reliability and efficiency in the worst of atmospherical conditions should not be lost sight of in dealing with the question of illumination for our public streets.

Gas-Heating Research.

THE second report of the Gas-Heating Research Committee appointed by the Institution of Gas Engineers in conjunction with the University of Leeds constitutes one of the most valuable items in the technical programme of this year's meeting. It is a production which is highly creditable both to the Committee and to Mr. E. W. Smith, M.Sc., who has carried out, for the Committee, the investigations the results of which it records and discusses. These investigations have covered a great deal of ground; but from the standpoint of the practical gas man, they may conveniently be grouped under three headings—viz., (1) A comparison of the efficiencies of various makes and types of gas-stoves, and of the effect thereon of varying the gas consumption; (2) A study of the radiation from gas-flames, and from "fuels" of varying composition; and (3) An investigation of condensing gas-stoves. Incidental to the research work, it was found desirable to devise a simplification of the former mode of mounting the thermopile with a view to facilitate its transference from one position to another of the surface of the hemisphere over which the radiant heat from the stoves was determined. The simplified method of mounting effected a considerable reduction in the time occupied in the determinations, and rendered the latter more reliable than those made in connection with the first series of researches, the report of the Committee on which was presented at the previous meeting of the Institution.

In our comments on that report, we said that it was eminently desirable that researches should be pursued with the object of determining the relative radiating efficiency of the different types of gas-stove. We are glad to observe that the Committee have taken this view, and have had comparative investigations made of a number of gas-fires of different types and makes. The conclusion to which these investigations lead is that no one make of gas-stove stands out above all others as a type of what should be. "Where one stove has an advantage in one respect, it falls short in another." Had the conclusion been otherwise, and the Committee had reported that one make of stove was pre-eminently superior, the big commercial interests represented in the other makes would have been seriously damaged, and embittered comments on the Committee's work would almost certainly have ensued. Fortunately, the discovery that the various makes and types attained a uniformly high efficiency, though the advantageous points of each were different, will ensure a more peaceful reception being accorded to the report, and a greater measure of benefit from its conclusions accruing to the general body of makers of gas-fires, and to the gas industry at large. Disregarding the reflector type of stove, it appears that, of the total heat of the gas consumed, the proportion which is radiated varies from 35 to 43 per cent. when the various gas-fires examined are used in normal conditions. By modification of the form or composition of the "fuels," it was found possible to raise this proportion to as much as, in one case, 48.5 per cent. The Committee apparently consider that the maximum figure attainable for radiant heat efficiency with the present type of open gas-

fire will be a little more than 50 per cent.—that is to say, it should be possible for the makers of gas-fires to improve them to such an extent that an average radiation at the present time of (say) 40 per cent. of the heat of the gas consumed will be raised to about 50 per cent. in the near future. This points to a substantial gain in the practical efficiency of gas-fires being realized at an early date—in fact, we believe great progress in this direction has already been made by manufacturers of gas-fires (certain claims to this effect were made during the discussion of the report at the meeting) while the Committee's investigations have been in progress.

Another interesting matter looked into by the Committee was the effect on the radiation efficiency of a gas-fire of varying the gas consumption. The result may be said to have been a foregone conclusion, since the duplex type of gas-fire owes its origin to previous recognition of the facts disclosed. With "fuel" of a particular form and dimensions, the highest radiant efficiency is secured when the gas-flame has a certain shape and size. If the consumption of gas is altered from that which affords this normal flame for the "fuel" in question, the flame is altered in size and probably in form also, and no longer fits the "fuel" well. The radiant efficiency falls as a consequence of bad fit between the flame and "fuel." But since the amount of radiated heat required in a room varies from day to day, and even from hour to hour, the gas consumption of the fire has to be varied accordingly. If all the burners are turned up or down, the gas is not burned in the altered conditions to the best advantage. In one experiment made by the Committee, a reduction of the gas rate to about one-half, effected by turning down seven burners, reduced the radiant efficiency from 37.7 to 30.7 per cent., whereas a similar reduction of the gas rate effected by turning out four of the seven burners (the remaining ones being full on) left the radiant efficiency at 36.9 per cent. This experiment demonstrates anew the well-recognized advantage in respect of efficiency and convenience that may be secured by the use of the duplex type of gas-fire.

The study of the radiation from gas-flames and from "fuels" of varying composition which has been made by the Committee has disclosed many interesting, highly suggestive, and valuable points. It was found that a gas-fire with the old type of vertical iron-frets had only about the same radiant efficiency as one of the best of the fire-clay "fuel" fires. But the iron-fret fire examined had no gas or air adjustments; and had it been the equal in this respect of the other fires, it is possible that it would have shown a higher radiant efficiency. Be this as it may, the results of the comparison show that a fire of very old design fitted with iron-frets is little, if at all, inferior in respect of radiant efficiency to the most modern pattern of fire-clay "fuel" fire. The upshot of this comparison has fully justified us in drawing attention last year to the claims of the old iron-fret fire to a high radiant efficiency. Even now, we think the iron-frets may repay further investigation, firstly, by fitting them in stoves with modern gas and air adjustments; and, secondly, by varying, in the light of modern knowledge of alloys, the composition of the "iron" from which they are cast, in order to diminish, if possible, the tendency to oxidation and increase the radiation. The radiation from bunsen and luminous flames was studied by the Committee; and a test of the radiant efficiency of a reflector stove with luminous flames was made. The result was low—only 26 per cent.; but this must not be forthwith taken to represent the efficiency of those reflector stoves which are in very general use in many Continental countries. The stove examined by the Committee was clearly not of the regenerative type; and it is to the heated air-supply and the consequent high temperature of the flames that the Continental reflector stove owes its efficiency. We are inclined to think that the latter has been over-rated, and that it is in any case discounted by serious disadvantages of the type of stove; but the test made by the Committee throws no light on these points, since the stove tested was not of the Continental regenerative class.

The experiments on the effect of variations in the composition of fire-clay "fuels" have led to some remarkable discoveries; and doubtless the lines of research which they suggest will be vigorously pursued by the makers of gas-fires. At present, it appears to be established from the investigations made that treatment of the "fuel," which provides a deposit of copper oxide in its outer layer, raises the radiant efficiency of the stove from 42.8 to 48.5 per cent.

Other treatments or variations in the composition of the "fuel" produced less substantial gains; but there can be no question that it is by the use of improved "fuels" that the next considerable advance in the efficiency of gas-fires will be achieved.

The work done by the Committee included also an investigation of the action of a condensing gas-stove. This stove contained an open gas-fire of fire-clay "fuel" heated by six bunsen flames; and the products of combustion were passed through eight vertical tubes to the shallow reservoir provided for the condensed water. It is satisfactory to learn that no trace of carbon monoxide was ever found in the products of combustion. The use of the stove caused a slight drying of the atmosphere of the room, though, of course, at the higher temperature due to the heating effect of the stove, the actual amount of moisture in the air was largely increased. The proportion of the sulphur in the gas consumed which was found as sulphur acids in the condensed water was determined in varying conditions: and it was found to vary inversely with the temperature of the room. At about 60° Fahr., the sulphur acids in the condensation product represented about 30 per cent. of the sulphur in the gas; so that 70 per cent. of the latter passed at that temperature into the air of the room. We are not sure, however, that this conclusion should be accepted as generally applicable, because the gas upon which the investigations were made contained only the abnormally low amount of 10 to 13 grains of sulphur per 100 cubic feet. Since the general abolition of sulphur restrictions, there is little gas supplied in this country containing less than 30 to 40 grains of sulphur per 100 cubic feet; and it is not unlikely that the proportion of sulphur acids extracted in a condensing-stove will vary to some extent with the degree of their concentration in the products of combustion. A similar comment may be made regarding the amount of iron dissolved from the inner surface of the "radiator" tubes, which was found to vary from 5.33 to 7.47 grains per 100 cubic feet of gas burnt. It would be interesting to know that this quantity would not have been sensibly greater had the amount of sulphur in the gas been more nearly normal.

Reviewing the whole of the research work now reported by the Committee, we have no hesitation in saying that it constitutes a most valuable accession to our knowledge of the principles underlying the more usual methods of heating by gas, and that all sections of the gas industry and the makers of gas-fires in particular, will reap very considerable benefit from it. Ultimately, the gas-consuming public will gain great advantages, as a result of the investigation. In a word, the small expenditure involved in the carrying out of these researches will be repaid a thousandfold to the commercial interests directly concerned. The Committee have been singularly fortunate in having secured the services of so diligent and able an investigator as Mr. E. W. Smith; and no small meed of praise and thanks should be accorded to him for his labours.

The Disposal of Profits.

It is easy to understand the demand of the Devonport Town Councillors that a portion of the profits realized by the municipal undertakings should be appropriated to the relief of the rates—all town councils have this experience. When rates are continually advancing, it is perhaps no more than natural that the men who are responsible should look for salvation to the business ventures which are so frequently heralded as sources of profit and contributors to the relief of the rates. Sometimes, as in the case at Devonport, they look in vain. Both the gas and the electricity businesses of the Corporation have had a good year; and in each case there is a substantial sum to place to the reserve fund. The Electricity Committee decided to give out of their balance a slight concession to consumers. Less fortunate, the Gas Committee found themselves unable to make an allowance to anybody—chiefly, it would seem, because of certain special charges which have taken from the reserve fund a rather larger amount than the net profit of the year. In these circumstances, neither the consumers nor the ratepayers get anything. We are not greatly impressed with the claims of the latter, as such, to consideration. In spite of the vicissitudes through which the undertaking has gone, no one can pretend that the ratepayers of Devonport have ever been in the least danger of incurring a loss over the gas-works such as would necessitate an appeal to the rates. If any concession was to be made, it should be to the consumers who

have come forward in such numbers as to more than neutralize the loss of the supply of gas to the Dockyard. The Devonport Corporation have now owned the gas-works for nine or ten years; and so far there has been no reduction of price. The Town Clerk hinted at private reasons why contributions to rates or reductions of price are not easy to make in the case of municipal undertakings. These reasons must be substantial indeed if they are to outweigh what we think must be allowed to be the just claims of the gas consumers of Devonport.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 891.)

BUSINESS on the Stock Exchange last week grew quieter and quieter. Outside distractions in the world of sport (it was Ascot week) had something to do with this, but not enough to account for the extreme inanition—approaching somnolence at times—which benumbed the markets. Prices inevitably continued to give way; but before the close the tone brightened up, and promised some recovery. On the opening day, the indications were adverse. A failure, though of inconsiderable magnitude, was reported. The gilt-edged group were dull. But Consols stood still unchanged; and Railways were languid. The depressed Americans almost alone looked better. Tuesday was rather weak at first, but stiffened somewhat later on. On Wednesday, there was no strength anywhere, almost all departments drooping for lack of a little support. Business on Thursday was, if anything, even quieter still, and the dullness inseparable from inaction brooded over the markets. Consols shrank at the intrusion of the big Indian Railway loan—a cheap offer. On Friday, there was no abatement of the ruling inactivity, but there was a slight recovery in tone. Government issues were stronger; Consols had a small rise; Railways stiffened a little; and movements elsewhere were more cheerful. This tendency was maintained on Saturday. There was not much actual change for lack of motive power, but the better feeling was of happy augury. In the Money Market, a good steady demand found employment for a liberal supply; but discount rates ruled easier. Business in the Gas Market resumed its normal proportions; there being a good aggregate of transactions. Primitivas were even more conspicuous than ever, and there were more dealings in the preference shares last week than in Gaslight and Coke ordinary. There were few changes in quotation; and the general tendency was firm, though one or two minor issues were put down slightly. Transactions in Gaslight and Coke ordinary were at the same figures as the week before—103½ to 104½. In the secured issues, the maximum was dealt in at 88½ and 89½, the preference at from 104½ to 105½, and the debenture at 82. South Metropolitan was also quite unchanged; all transactions being within the limits of 121 to 122. The debenture changed hands two or three times at 82. In Commercial, there was one deal in the 4 per cent. at 108, and one in the 3½ per cent. at 105. Among the Suburban and Provincial group, Alliance and Dublin marked 82½ and 83½, Bournemouth "B" 16½, Brentford old 254, ditto new 188, Brighton original 215 and 216 (a rise of 1), British from 44 to 44½, Ilford "A" 145½, ditto "B" 109, South Suburban debenture 122½ special, Southampton 110½, and Wandsworth "B" from 140½ to 141. On the local Exchange, Liverpool "B" was done at 164½. In the Continental companies, Imperial marked 178 and 179, Union 95 and 97 (a fall of 1), European 24½ and 24½, and ditto part-paid 18½. Among the undertakings of the remoter world, Monte Video changed hands at 12½ special, Primitiva at from 7¼ to 7½, ditto preference at from 5½ to 5½ (a rise of ½), and ditto debenture at 98½.

Visit of the Société Technique to Brussels.

As mentioned in the "JOURNAL" some weeks ago, the members of the Société Technique du Gaz en France, who are now holding their congress in Paris, intend at its close to have an excursion to Brussels. They will leave Paris by midday train on Thursday, and reach the Belgian capital in the afternoon. In the evening there will be a reception by their colleagues of the Belgian Association. On Friday morning, the party will be conveyed to the Forest works of the Imperial Continental Gas Association, where, under the guidance of Mr. Salomons, they will have an opportunity of seeing the vertical retorts installed there, and of witnessing their discharge. In the afternoon, they will visit the Jette-St.-Pierre and Schaerbeek works of the St. Josse-ten-Noode Gas Company, who at the latter works have inclined retorts in operation. In the evening, they will inspect, under the conductorship of members of the Belgian Gas Association, the various systems of lighting at the Exhibition. Saturday will be devoted to the Exhibition—the morning being spent in the Belgian Section (particularly in the pavilions of the above-named Association); and the afternoon in the Lighting and Heating Divisions of the French Section. An invitation was extended to the President and Council of the Institution of Gas Engineers to join the party; and we understand that several of the members have accepted it.

OBITUARY.

CHARLES HANSON GREVILLE WILLIAMS.

WE regret to record the death on the 15th inst., at his residence, Bay Cottage, Smallfield, near Horley, of Mr. Charles Hanson Greville Williams, F.R.S., who for many years held the position of Chemist to the Gaslight and Coke Company, and whose name, some years ago, was frequently before the members of the gas industry from his contributions to the literature bearing upon chemical questions connected with it, most of which appeared in our columns. His contributions dealt with the following subjects: "Determination of Boiling-Points in Tar Distillation" and "Production of Liquid Hydrocarbons from Waste Gases" (1879); "Determination of Sulphur in Coal" (1882, in conjunction with Mr. Hamilton Dove); "The Action of Some Heated Substances on the Organic Sulphides in Coal Gas" and "The Antiseptic Alkaloids contained in Creosote Oils" (1883); "The Referees' Ammonia Test" (1884); "The Occlusion of Hydrogen by Zinc Dust and the Meteoric Iron of Lenarto" and "Source of the Hydrogen Occluded by Zinc Dust" (1885). Mr. Greville Williams did not confine himself to the investigation of subjects such as those mentioned; for in the summer of 1890 we described briefly a method he had devised for producing artificial emeralds from the refuse of gas-retorts. In the domain of gas-works chemistry, he gave special attention to the subject of the distillation of tar. As some of our readers may remember, he was the writer of the article on "Tar and Tar Products" in "King's Treatise on Coal Gas;" and at the meeting of the British Association of Gas Managers in London in 1880, he delivered a lecture on "The Past, Present, and Future of Coal Tar." Two years later, he contributed to the Gas Institute a paper on "The Determination of the Specific Gravity of Gas." He had of late lived somewhat in retirement; and was consequently unknown, except by repute, to the rising generation of gas engineers and managers. He was a Fellow of the Royal Society; and apart from his scientific attainments, he possessed considerable knowledge of Egyptology, the study of which was the recreation of the later period of his life. He was in his 81st year.

Last Wednesday morning, the Stretford Gas Company were deprived of the services of an old employee by the rather sudden death of Mr. BENJAMIN HAYNES, who had been with them for nearly fifty years, for about the last thirty of which he had filled the position of Secretary. In his long connection with the Company, he had seen the district develop from a comparatively quiet village to the important industrial centre it is to-day, with its gas consumption of 327 million cubic feet compared with 50 millions half-a-century ago. Deceased was in his 69th year.

The death took place, on Monday of last week, of Mr. CHARLES CROWTHER SMITH, who for about thirty years occupied the position of Secretary of the Southampton Gas Company. Some years ago, however, he retired on superannuation, and was elected to a seat on the Board. Deceased, who was eighty years of age, was one of the best known public men in Southampton, to which town he went in 1847, on receiving an appointment at the local County Court, which he held for thirteen years. He was appointed Clerk to the Southampton Board of Guardians in 1860, and continued in the office till 1896, when he retired on a superannuation allowance. Five years after his appointment as Clerk to the Guardians, he became Secretary to the Gas Company. As Clerk to the Guardians, Mr. Crowther Smith became an authority upon rating questions, and was personally concerned in at least two important cases. He individually conducted and won an action against the New Forest Guardians (which went right through the Courts to the Court of Appeal), against the payment of poor-rates on unoccupied land; while in another case he appealed against a rate made by the Corporation of Southampton, and the rate was quashed. He twice gave evidence before Royal Commissions—those on Poor Law Removals and Local Taxation; and in recent times played an important part in the local disputes which resulted finally in the inclusion of the parishes of Shirley and Portswood in the area of the Borough of Southampton for municipal and poor law purposes. The gas world similarly, it is pointed out in an appreciative notice which appears in the columns of a local paper, looked upon Mr. Smith as an authority upon various phases of the lighting industry; and he played a foremost part in making the arrangements for the annual conference of the Gas Institute at Southampton in 1902, when Mr. S. W. Durkin, the Manager of the Southampton Gas Company, presided. The funeral was on Thursday afternoon in Southampton Cemetery; there being a large attendance, which included Captain A. J. Corse-Scott, J.P., the Chairman of the Gas Company, and many of the Directors and officials. One of the floral tributes was inscribed: "With deep regret, from the officers and staff of the Southampton Gaslight and Coke Company."

The marriage is announced, as having taken place at Cork on the 11th inst., of Mr. Frederick William Taylor (Secretary and Manager of the Harpenden District Gas Company), son of Mr. Frank C. Taylor, of Shanklin, to Kathleen Sheelah Mary, youngest daughter of the late Mr. George R. Pemberton, of Dublin, and granddaughter of the late Sir Benjamin J. Pemberton.

GAS ENGINEERING AND SUPPLY EXAMINATIONS.

Some of the Successful Students.

WE are, unfortunately, unable this year (as has been our custom) to publish the complete pass list of the City and Guilds of London Institute Examinations in "Gas Engineering" and "Gas Supply," owing to an intimation from Sir Philip Magnus, the Superintendent of the Department of Technology, that, "owing to the extreme pressure of work at this office, and for other reasons, it has been decided that the pass lists shall not be supplied to the Press." Without stating what the "other reasons" are, Sir Philip Magnus hopes we shall "understand that it has been found impossible to arrive at any other conclusion." However this may be, perhaps the successful candidates themselves will feel disappointed at the innovation; and therefore it is that we offer this explanation of the reason for the omission of the complete list. But even on this occasion it is possible to do something in the matter; for, by the courtesy of Mr. R. H. Collins, we are able to publish a list of the Polytechnic students who passed this year's examinations.

REGENT STREET POLYTECHNIC.

City and Guilds Examinations, 1910.

GAS ENGINEERING.

Honours, First Class Pass.

| | |
|---------------------|------------------|
| Ashmole, Gordon | Mann, Harold C. |
| Barclay, Warren | Webb, Francis S. |
| Broadberry, Leonard | Winslow, George |
| Cross, Douglas C. | Willsmer, Norrie |

Honours, Second Class Pass.

| | |
|----------------------|------------------|
| Waterfield, Edwin W. | Wellard, Leonard |
|----------------------|------------------|

Ordinary, First Class Pass.

| | |
|----------------------|--------------------|
| Allen, Henry J. | Hole, George |
| Brown, William | Jeffreys, J. S. |
| Carpenter, George E. | Page, James L. |
| Croxford, Leslie J. | Partridge, Henry |
| Donaldson, John H. | Priest, Francis R. |
| England, Albert A. | Winslow, Alfred D. |
| Hilson, John G. | |

Ordinary, Second Class Pass.

| | |
|--------------------|--------------------|
| Alford, Arthur N. | Larkin, Leslie |
| Caudwell, Frank | Parsons, Edward |
| Clark, William H. | Prentis, Arthur E. |
| Howard, William C. | Snook, Walter |

GAS SUPPLY.

Honours, First Class Pass.

| | |
|-------------------|----------------------|
| Cardwell, Frank | Rosevear, Charles E. |
| Cross, Douglas C. | Winslow, George |

Ordinary, First Class Pass.

| |
|------------------|
| Webb, Francis S. |
|------------------|

Ordinary, Second Class Pass.

| |
|-------------------|
| Sumner, Horace R. |
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Coalite.

In a recent issue, the "Journal of the Society of Arts" wrote Two or three years ago a good deal was heard about a new process of manufacture which produced what was called "coalite." A Company was formed with a capital of £2,000,000 to work the process; and prospectus estimates showed an annual profit of over £500,000. The Company has now been in existence for nearly three years. It has spent about £600,000; and it is in immediate want of more capital, which it is obtaining by means of an issue of £300,000 in 5 per cent. debenture bonds—part of an authorized issue of £500,000. Meantime, far from having earned the promised half-million sterling in the way of annual net profits, it has paid no dividend; and the question for the public is whether the new capital asked for is likely to enable it to do so. The Directors are very confident that it will. But it is not reassuring to know that three of the original Directors, including Sir Arthur Cory-Wright, have retired from the Board; and that some months ago another patent for the manufacture of coalite was granted, which at least shows that the patents held by the Coalite Company do not prevent other processes making coalite being put upon the market. Again, the Company has been unfortunate with its plants. It is said by those who should know, that at the present time the Company has not a plant at any one of its stations which can produce good coalite at a profit; and at Hythe the Company is said to have now reverted to the high-temperature retorts which were working before the coalite process was adopted, and gas and tar are being produced by the ordinary gas-works methods. It is said, too, that at Wednesfield two gas-engines of 300-H.P. each were erected more than a year ago for the manufacture of ferro-silicious and chloride of soda; but neither of these products has been made, and the expensive plant remains idle. It may be that success will attend the future efforts of the Company. Coalite is itself a good thing; and its present apparent failure as a commercial product may be due to preventable causes. But on the face of it, it seems one of those processes which look very inviting in the experimental stage, but fail to justify themselves from the commercial stand point.

THE INSTITUTION OF GAS ENGINEERS.

PROCEEDINGS AT THE EIGHTH ANNUAL GENERAL MEETING,

HELD AT THE

INSTITUTION OF MECHANICAL ENGINEERS, STOREY'S GATE, LONDON,

JUNE 14, 15, and 16, 1910.

MR. JAMES W. HELPS, OF CROYDON, IN THE CHAIR.

REVIEW OF PROCEEDINGS.

For Full Report see page 791.)

"TIME rolls its ceaseless course." Once more we found ourselves, on Tuesday morning, at the steps of the Institution of Mechanical Engineers, surrounded by gas engineering friends from all parts of the country, with genial greeting on every lip, and with further expression in the heartiness of the grip of the hand. In the vestibule, the same; and on to those with whom one came in contact in the well-known lecture-hall. The brightness of the morning was reflected all around. The benches in the lecture-hall were filling well before the appointed time for the beginning of the proceedings. As one looked about him and in the distance, the eye alighted on representatives of the gas industry from distant climes. There was Mr. J. C. Watson, relieved for the time being of his official work in Calcutta, and Mr. P. Holmes Hunt, from his duties in Australia. Mr. Chas. H. Nettleton and Mr. Burghi were present from America; and there may have been still more who are daily engaged in the work of gas supply in other countries. The front row of the gallery was filled with ladies (among them Mrs. Helps and the elder daughter of the President); and they were interested spectators of the animated scene below. The clock pointed to 10.30. The President (Mr. James W. Helps) appeared, accompanied by the Hon. Secretary (Mr. S. Y. Shoubridge), a long line of councillors, including the elected of the District Associations, and the Secretary (Mr. Walter T. Dunn). When the President took his seat, it was seen that the University of Leeds was represented on his right-hand side by Professor Arthur Smithells; and on his left were the Vice-Presidents of the Institution, Mr. Alex. Wilson and Mr. R. G. Shadbolt.

The room was well filled. Intuition gave the premonition. There was silence. "The memory of the great loss we have sustained would not allow us to open our meeting without referring to it." Those were the President's introductory words. Brief though the sentences were that followed, they were to the point; and by noiseless rising from their seats, the members endorsed a resolution, which is to be engrossed and forwarded to the Home Secretary, expressing the profound sorrow of those present, and recognizing the practical interest of our late Sovereign in the progress of engineering science, and particularly in those branches relating to the industry represented by the Institution. The solemn duty performed, formal business succeeded. Minutes were read, and the report of the Council adopted, without comment. Then, with suitable recognition individually of their contributions to last year's proceedings, the President called to the platform singly Mr. J. Ferguson Bell, to receive the London Gold Medal; Dr. Rudolph Lessing, to take possession of the Institution Silver Medal; and Mr. Robert Watson, of the Institution Bronze Medal. The three recipients obtained and merited the applause of those present. Hearty welcome was next accorded by the President to the several visitors present; and then there was a settling down to listen to a Presidential deliverance that, in its effect, it is hoped, will be a memorable one in the annals of the Institution, and mark the preliminary stage in a career of expanded usefulness on the part of the central organization.

Greater Co-Operative Work.

At first the President's voice hardly penetrated to the remote portions of the hall; but it gathered strength as he

proceeded. Again were expressed the feelings of sorrow of all who are loyal to country and constitution at the passing of King Edward the Peacemaker, for so in history he will be known. The more immediate loss to the gas profession and the industry in the death of Mr. Alfred Colson received words of regret and sympathy and of appreciation of a life well spent. Concurrence, on these occasions, expressed by silence where a number of men are gathered together is always impressive. It was so at this point. Then we passed on to matters from which, there is hope, there will be much material result. The addresses of a long line of predecessors in the chair have been good in material; but this one had a definite object appealing to the whole industry, and designed for the whole industry's good. The address was published last week, and comment is made upon its principal theme elsewhere in this issue. It first refers to the great changes that have occurred in the gas industry, during the progress of which changes, through the expansion of the uses of gas, there is no depreciation of, but much gain in, prosperity. The several fresh needs call for the application of changes in the conduct of the industry's business. The methods and practices of the shopkeeper have to be adopted—and more. Officers and workmen in the distribution department have to be specially trained for their work, and the qualifications of the gas-fitter have to be diverse. Then there is discussed the question of the quality of gas the consumer requires to-day; and there was general approval—not one voice was heard in dissent—when the President said: "I look forward to the time when Parliament will recognize the fact that, for all purposes to which gas is at present applied, its illuminating power is a factor of the most trivial importance, and will, in consequence, eventually decide to abolish the illuminating power standard in favour of one indicative of its heating value." The President has found—especially with vertical retorts and horizontal retorts fully charged—that it is possible to decrease the illuminating power of gas while actually increasing its calorific value. And regarding the allegation of opponents that the introduction of the No. 2 test-burner will result in consumers having to use a larger quantity of gas in order to get the results previously obtained, figures supplied to him by companies who have been using the burner for some time proves the contrary. While on the question of quality, an instructive account is incorporated of work done at Croydon (suggestion in regard to which is freely credited to Dr. H. G. Colman) that has given relief from the nuisance of naphthalene deposits.

The great feature of the address lay in the end. The time has come, in both the technical and the commercial work of the industry, when it is necessary that there should be more co-operation; and for the work to be done, and actually waiting attention, there must be given both the moral and the pecuniary support of the whole of the gas undertakings of the country. To instance one commercial question only—that of national advertising. The activity of the electrical industry must be met with activity that is commensurate in scope, and that will appeal to the public. It is imperative, and an indispensable condition, that the interest of Boards of Directors and Committees should be secured to gain the end. But as present constituted, and in its character of a purely technical organization, the President does not consider the Institution equal to the work or possessing sufficient commanding power to attain the

necessary support. Prominent though he personally was in bringing about the amalgamation of the old Institute and Institution, he now confesses that the end that he and others had in view has not been accomplished in the matter of full representation. But there is really no ground for regrets. The years since have produced such a unity in the professional organizations of the industry, that we see in this an excellent preparation of the way to the still more substantial representation of the industry. The President favours the continued separate existence of the Society of British Gas Industries, as he sees in it the capacity for excellent work on lines essentially appertaining to its members, and a great usefulness in co-operative work with the central organization of the gas-supply industry. But the necessities of the industry demand a central organization with a constitution embracing the heads of the secretarial and distribution departments. To gain extended support for the work lying around, greater interest of the gas undertakings has to be attached. The President suggests—but it is only a suggestion—that two courses are open to this end—either to alter the present Articles, so as to allow of the admission of the officials to whom he has referred, or to change the name of the body to the “Gas Institute,” and to divide the work up into sections, as is done by the British Association. Personally, he favours the latter, as he believes it would result in the formation of a powerful and numerically strong body, thoroughly representative of the various interests concerned, and therefore particularly well calculated to secure the co-operation of the various officials and the consequent confidence and financial support of the undertakings they serve. Among concluding suggestions were these, that the matter should be referred to either the Council, or a specially appointed Sub-Committee, for consideration and report; and further that representatives of Boards of Directors and Committeemen should be brought together to consider the subject. Such a meeting of Directors and Committeemen was again suggested by Mr. S. Y. Shoubridge during the discussion on national advertising at the meeting convened by the Commercial Sections in the afternoon. What has to be done is to get face to face with them, explain the position, and solicit and endeavour to secure their adhesion to a scheme of larger co-operation.

A Resolution.

There was much applause at the close of the well-reasoned address, which was continued when it was seen that Mr. Corbet Woodall was on his feet to express the sentiments of the members as to the character of the address, and of its worthiness to a place in their thoughts and in the Institution's “Transactions.” Mr. Woodall did not share in any inference that might be drawn from the address that the men who carried on the work of the industry had not proved equal to the changes of the past score years. The address itself is a refutation of any such deduction. There seemed to be the trace of an indictment in Mr. Woodall's words as to the Institution not having done sufficient to secure the confidence of gas undertakings when he said: “I feel quite sure that if the Institution is able to show by the work it does that it is worthy of carrying on the widely extended usefulness to which the President has referred, there will be no considerable difficulty about finding funds.” He quoted the German and French Gas Associations in support. The conditions are quite different there. The Institution cannot—they have tried again and again—obtain sufficient support as they are at present constituted. Mr. Woodall has not had to canvass for money for the industry's purposes; and his influence on the Boards with which he is associated goes a long way to a ready acquiescence in his proposals regarding subscriptions. That experience cannot be commonly applied. However he is with Mr. Helps; and he hopes that the propositions of the address will be thoroughly weighed. To that end, combined with the vote of thanks, he proposed a resolution authorizing the Council to appoint a Committee to consider the suggestions, and to report. A hearty seconder was Mr. John West, who tersely stated the position, when he said that a great deal had been done by the Institution, but there remains a very great deal that might be done by a central organization. Mr. E. A. Harman seemed to think the resolution a little premature. But there is nothing committal about it beyond inquiry; and so it was passed without a dissident. In his acknowledgment, the President said the whole object behind his suggestions was to get the support and the means to carry on thoroughly the work of a central organization; and support and means should be

contributed by every undertaking. There the matter is left for the present—to bear, it is hoped, good fruit.

Buying Illumination for Street Purposes.

Of the appropriateness for a meeting of the Institution of the paper by Mr. Jacques Abady (which was the first to be presented and discussed) on the subject of “Public Lighting from the Municipal Point of View,” there can be no question; and, from the critical standpoint, no one could be better qualified to examine the subject of the relationship between the suppliers of public lighting and the public lighting authority. A barrister, there is the question of lighting contracts. A photometrician, there is the matter of lighting efficiency. A municipal councillor, there are the aspects of the matter from the local authorities' point of view. A manufacturer of gas and electricity testing appliances, and so in close touch with the suppliers of those commodities, there are the considerations affecting the question from the point of view of the latter. And further interest is added to his appearance as the author of this paper, in that he is the Chairman of the Committee of the Westminster City Council upon whose recommendation a contract has been entered into that has arrested the attention of the whole lighting world. With the manner in which Mr. Abady deals with the subject, not even the most captious electrical critic can fairly find fault; and it has been his aim, throughout this business, to keep himself aloof from even the semblance of partisanship.

To satisfy all the interests involved in public lighting is a difficult matter; and the difficulty has not been lessened by competition. But the author submits that, given a light of a certain value, distributed in a certain manner, it does not seem of importance to the public whether that light is produced by gas or by electricity—the sole consideration should be the question of relative cost. There will be some disposition to dispute this. He lays it down as an axiom that the terms of any contract should establish a mutuality or community of interest. But he finds that the general forms of public lighting contracts are, in some way or other, defective, and disadvantageous to one or other or both the parties, and exercise an adverse influence in some one or more directions. He makes out an excellent case. The ordinary forms of contract are: (1) For the supply of energy, with maintenance; and (2) For the supply of energy only—maintenance being undertaken by a contractor acting for the municipality, or by the municipal lighting department itself. Under the first form of contract, there would be considerable difficulty, in the case of a careless gas or electricity management, in ensuring that the condition of the public lights should always be satisfactory. Under it, too, there is a stop or no encouragement to progress. Under the second form of contract, a gas company's interests may be seriously jeopardized by an indifferent maintenance contractor, or an indifferent public lighting department. The defects of such contracts fall thick and fast in the paper. There is a good deal of a commendatory nature in it as to the Calcutta public lighting contract, under the conditions applying to Calcutta. In close conjunction is found this deliberate expression of opinion: “It seems to me that a direction in which future improvements in the efficiency of gas lighting are to be found will be in the reduction of the quality of the gas and an increase in the pressure at which it is supplied; so that, by reducing on the one hand the amount of air theoretically required for perfect combustion, and increasing on the other hand the mechanical means by which that theoretical amount of air is obtained in practice, we shall be enabled to burn the right quality of gas under conditions of absolute maximum efficiency.”

The greatest interest in the paper concentrates about the new form of contract entered into by the Westminster City Council with the Gaslight and Coke Company for the supply of light, payment to be made for so much light irrespective of the energy required to produce it, and irrespective of consumption, quality, and pressure. The salient clauses of the contract are appended to the paper; and they will be diligently studied. There is a heavy penalty attached to deficiency of illuminating power; and the details of the testing clause are given. A portable photometer is to be employed; and one set of tests is to be made at an angle of 20° to the horizontal, and a second set at 50°. The chief terms are subject to various conditions. The tedious mean hemispherical candle-power test would have been impracticable for this particular purpose; and it may be taken that, in the majority of cases, the mean of the light given at 20° and 50°

practically coincides with the mean hemispherical intensity, and therefore fairly represents the value as candle power. What this form of contract has reduced the whole question to, is one of price against price for the supply of the same light; and the lowest tenderer succeeds. If, under these circumstances, the photometrical instrument and method of testing are the subject of agreement, then the gas or the electricity suppliers know precisely to what they have to work—provision, of course, being made for no tests during rain, mist, or fog. These are safeguards. It transpires that the Gaslight and Coke Company have already had five years' experience in the City of Westminster of a contract on a photometer basis; so that they know what they are about. In the author's opinion, buying and selling street illumination by light value is the most direct, simple, and generally advantageous course. The final part of the paper discusses many pertinent points bearing upon the photometrical aspect of the question; and statistics and curves are given in the supplement. The paper, novel and informative in many ways, is one that no one connected with public lighting, technically or commercially, can afford to be without, and to thoroughly digest; for nothing like it has ever been attempted, or, if attempted, has been published.

Mr. Abady has the faculty, which few possess, but many envy, for verbal condensation of an extensive subject. He did not read his paper, but gave a *précis* that put the members in possession of points and argument. Among his asides, he spoke highly of the distribution power of the vertical form of burner for street illumination; but inverted burners, on the other hand, save a lot in mantles and consequently in trouble, and for street illumination they should be fitted with proper reflectors. Another point is one of nomenclature. He suggests the coining of a term which includes both the pressure at which the gas is delivered and the volume supplied. A better idea in the designation of the value of what is being sold and what is being bought is required than mere "cubic feet." For instance, 3 cubic feet at 12 inches pressure is not the same thing as 3 cubic feet at 60 inches pressure. He placed much emphasis on his preference for a lower grade gas at high pressure than for a rich gas at low pressure.

Sundry Views.

Many good things were said in the discussion about the paper. Its extreme value was recognized; and the tables and other matters, it was agreed, would be very useful in getting out a lighting scheme. Mr. Abady must have been happy with so many panegyrics flying from different quarters of the room. The speakers were: Mr. C. E. Botley, Mr. F. W. Goodenough, Mr. George Helps, Mr. C. E. Jones, Mr. R. G. Shadbolt, Mr. H. E. Copp, Mr. Thomas Canning, and Alderman Griffiths (Southport). So far as there were expressions of opinion, it was agreed that the principle enunciated, of contracts being founded on an illumination basis, is the correct one. It was regarded as the most scientific; and it does leave everything under the control of the gas suppliers. Hard knocks were applied to municipal owners of electricity undertakings, who will not treat public lighting on its merits. The principles put forward by Mr. Abady are shunned by them, though, of course, if they can supply (without financial loss, or direct or indirect injury to ratepayers or electricity consumers) a better light for less cost than can be obtained by gas, they are justified in doing so. Mr. Canning questions whether it is not illegal for such municipalities to enter into contracts with the electricity departments without submitting the matter to tender. As to a photometrical contract being any block to progress in the adoption of means of securing higher illumination efficiency, it is thought that it would be rather the reverse, as during the remainder of a contract (if the remainder were sufficiently long) it would be to the benefit of the company to make the change, and to the municipality on a new contract being entered into. A wise gas company, with an eye to future favours, Mr. Abady thinks, would offer to share the savings immediately with the municipality. More than one speaker regarded high-power lights as being an uneconomical form of lighting in relation to illuminating efficiency, preferring small units placed fairly close together. But there was agreement as to the advertising value of the former. As to the advertising usefulness of the public lighting to gas suppliers, this is rather difficult to estimate; but Mr. Shadbolt points out that public lighting may be done at such a low figure as to be a tax on the ordinary consumer.

On the point as to the relative efficiency of the vertical and the inverted types of burner for street lighting, the high efficiency, reduced consumption, low mantle costs, and good distribution (when fitted with proper reflectors) were pointed to as being unanswerable advantages on the side of the latter. The submission that, on the illumination basis of contract, cost is the only arbiter, Mr. Canning seemed inclined to dispute, as there is the practical question of the relative diffusiveness of electric and incandescent gas lamps. He finds this difference in his tests; and Mr. Abady gives the only explanation of which he is aware, that the source of illumination in electric lamps is very small and of high intrinsic intensity, whereas the source of illumination with incandescent mantles is much larger. Concerning distribution pressures, all who referred to the subject see advantage in raising them.

Publicity for the Gas Industry.

In the afternoon, there was a joint meeting of the Commercial Sections, to which members of the Institution who are not associated with the Sections were invited. The chief topic of discussion was the question of national advertising, and the important one in association with it of ways and means. The proceedings were in the nature of a preliminary conference; but it may be stated that a report proposing the formation of a Gas Publicity Committee, to be composed of members of the Commercial Sections and co-opted members, was adopted—the resolution including an instruction for a conference with the Council of the Institution. More is to be heard of the matter when the proposition has been brought to more definite shape. The question of financing is an important one; and it seems to hang very much on the bringing into closer contact with a central organization of those who can provide the money.

A Generous Offer.

On the last day of the meeting of the Institution, it was announced by the President that the Directors of the Tottenham and Edmonton Gas Company had resolved, in connection with the joint advertising scheme, to undertake to contribute to a fund for the purpose at the rate of 2s. 6d. per million cubic feet of gas sold, provided fifty other gas undertakings will enter into the same arrangement. The Board of the Company are prepared to guarantee this for three years. This paves the way for starting a good scheme.

Benevolent Fund Work and Apathy.

The first item on the *agenda* for Wednesday morning is the one most neglected by members of the Institution. Comparatively few of the members were present to hear of the requirements of this fund, and of its potentiality for good among the dependents on the benevolence of the industry. The amount of the subscriptions from members of the Institution bears a very poor relation to its numerical strength. The President has made an appeal by letter for further assistance. The District Associations are responding; but beyond them there is not any great amount of encouragement. A further appeal was now made by him; and this was supported by Mr. J. Ferguson Bell, Mr. Kendrick, and Mr. George Helps, the last-named of whom offered that he would make himself responsible for collecting £10 from among his friends if so desired. Why not appoint collectors in this way from among the members? There are many probably who would like to subscribe through a private individual—anonymously if not by name. It was mentioned by the President that, though the Benevolent Fund Committee do not canvass for outside subscriptions, they are quite prepared to accept offers of subscriptions from anyone not directly represented by membership of the Institution. There are many readers of the "JOURNAL" who might like to take note of this.

Gas-Heating Research.

The report of the Gas-Heating Research Committee was then introduced. It is a voluminous document, and indicates that Mr. E. W. Smith, the Research Chemist, has been diligent and eager over his work at the Leeds University. The main directions in which he has been occupied during the year are in making experiments upon the relation of gas consumption to radiation efficiency; upon the relation of the composition of fuels to radiation efficiency; upon the radiating power of naked flames; and upon condensing-stoves.

It seems from the early part of the report that we have to discount somewhat the radiant heat tests quoted last year. Modification has since been made in the mechanical arrangement of the method for determining radiant heat, as it was found too cumbersome. The result is rather better radiant heat readings. Quite a large number of different makers' fires have been up for testing in connection with the inquiry as to the relation of gas consumption to radiation efficiency. In testing, they were varied until the greatest efficiency was attained. In one or two instances, it was found that the stoves, after being adjusted to suit the conditions under which they were tested, gave 4 or 5 per cent. better efficiency than when used as they were forwarded from the makers. The expectation of the makers that their fires will be adjusted when fixed, is not always the subject of realization, though they at their works cannot adjust to the local conditions under which the fires are to be used. So much the worse for the makers' reputations. To them, a careful study of the report will supply many hints.

There are certain conditions that will give the highest radiation efficiency within the range of present knowledge; but these conditions do not appear to be compacted in the whole into any one maker's fire. There is the necessity for having fuel that will fit the flames, or flames that will fit the fuel. The fuel must stand well over the flames; otherwise there will be reduced radiation efficiency. The fuel should be regular in length, and should not be irregular on the inside. Flames should be even in length; and good and convenient gas and air adjustment should be provided. These are matters that receive variable attention in the stoves submitted to test. Then, again, there is great divergence in practice respecting the provision at the top of the fires to capture as much of the waste heat as possible without diverting it down the back of the stove. Some fires are so arranged and constructed as to effect this, and so to obviate a high flue loss. This is commended. Attention is urged to the firebrick back—on account of its radiating power, its usefulness in keeping fuel in a vertical position, and so forth. The claim as to the radiating superiority of the iron-fret stove gets a little knock in this report—determinations showing that, although the iron-fret stove is equal to the fire-clay type, yet it is not better; and the advantages of the latter, from the points of view of cleanliness and appearance, make it much to be desired. There is, too, rather more chance on first lighting of carbon monoxide being liberated from the iron-fret stove. An incandescent mantle stove is referred to; but being in the experimental stage, not much is said about it yet. But generally, in this section of the report, it is found that the radiant heat efficiencies of the various stoves tested range from 37 to 43 per cent. Change in the testing apparatus and better attention to testing details may account for the increase upon the figures in the first report; but perhaps the makers will claim that their own work has not been altogether without effect. Mr. Smith puts it forward as probable that the highest radiant efficiency attainable with the present type of open fire where the air of the room has free access to the front of the hot fuel, will be little more than 50 per cent. Although this may be so, there is no reason why the heat that has been allowed to pass up the flue should not be utilized more than has been the case hitherto.

Of course, the point of most importance in the study of the principles underlying the working of a gas-fire of the radiating type is the convenient and economical generation of the requisite amount of heat, and the transference of the heat of combustion to the radiating material employed. In this connection, the amount of heat the flame itself radiates is worthy of consideration. Mr. Smith's tests generally confirm the findings of Professor Callendar, that variations in the size or volume of flame, vary considerably the radiation efficiency, as does also the amount of the aëration of the flame—the less the aëration, the greater the efficiency. Closing his information regarding this particular line of research, Mr. Smith remarks that, when the flames are surrounded with fire-clay fuel, the heat is being conserved to the flame, and, in all likelihood, the flames themselves in a gas-fire are radiating more than without the fire-clay fuels. It is probably safe to suppose that these flames radiate at least 16 per cent. of their total energy. References to experiments on the radiation from luminous flames follow; and then there is a discussion as to the extent that radiating efficiency of an open gas-fire is affected by variations in gas consumption. There is an example of a fire stated by the maker to be for a consumption of about 27 cubic feet per

hour. But in the experiments the maximum radiation was reached when the gas consumption was 31 cubic feet per hour; and by increasing or decreasing this rate of consumption, the radiant efficiency is decreased. Trials with the duplex form of burner show that leaving three burners (out of seven) full on, gives a better radiating efficiency than turning down the whole seven.

Dealing with the subject of fuels, it is suggested that there are two main courses of investigation open to those desiring to increase the radiant efficiency of a stove by modifications in the composition of the fuels. In one, determination might be made of the effect of colour on the amount of heat radiated from the fuel; and, in the other, the effect of varying constituents in the composition of the fuels bringing about a selective radiation for heat in somewhat the same way as the thoria-ceria mixture causes selective radiation for light. Mr. Smith's experiments with specified clay have carried him to the point where he is led to suppose that (for this clay) there is a maximum porosity which is useful as an aid to radiation. The value of the degree of porosity in the fire-clay lies in the fact that the porous clay requires less heat to get it to the same temperature as the less porous clay. The porous fuel also has a rough surface which appears to take up the heat from the flames better than a smooth surface. In regard to the question of half fuels, the experiments result in the finding that, without special adaptation, an equal efficiency may be obtained without the front portion of the fuel. Succeeding is much information or experiments regarding fuels of varying composition; the figures indicating that the radiant efficiency of a fire can be increased to an appreciable extent by such means.

The last part of the report deals with condensing-stoves the conclusions being summarized as follows: The amount of the sulphur acids condensed in the type of "radiator" under examination varies with the temperature of the room. At normal temperatures (60° Fahr.), this amounts to about 30 per cent.; leaving 70 per cent. to pass into the atmosphere. There is a slight drying of the atmosphere, though the actual amount of water vapour present is largely increased. No trace of carbon monoxide was ever found in the products of combustion. The room was well ventilated and under these conditions no ill-effects were experienced by those present, except during the first three experiments when the smallest amount of ventilation was maintained. The amount of iron dissolved from the inner surface of the "radiator" tubes varied from 7.47 to 5.33 grains per 100 cubic feet of gas burnt.

Trials with Non-Illuminating Gas.

The contents of the report were supplemented by Mr. Smith stating that a method, is now being devised for estimating the radiant heat in a much shorter time, and in a simpler way, than at present. The existing method is accurate, but it takes a long time, and an experienced individual, to deal with it. By the new method, only about ten minutes will be required to obtain a test. Arrangements are also being made to test gas-fires with producer gas, Mond gas, and water gas. This investigation will be rather important in connection with the question of calorific and illuminating values. Mr. Smith is of opinion that the efficiency of gas-fires will be quite maintained by the use of water gas. The reason is that a great cooling effect results by passing through the fuel the quantity of air required for the combustion of the ordinary town gas; with the poorer gases, the amount of air needed will be less. The air, gas, and flame can be better adjusted to the fuel.

The Makers' and Other Views.

A number of the members of the Gas-Stove Section of the Society of British Gas Industries were present; and they added much of practical value to the discussion. The speakers were Mr. Samuel Glover, Mr. H. J. Yates, Mr. W. H. Y. Webber, Mr. H. M. Thornton, Mr. W. J. Liberty, Mr. A. P. Main, Mr. J. H. Brearley, Mr. H. Kendrick, Mr. F. W. Goodenough, and Professor Smithells (Chairman of the Gas-Heating Research Committee). Mr. Wilson and Mr. Davis had intended to speak; but time would not allow. It will be gathered from this list of speakers that the discussion was of considerable length. The praise for the work done by Mr. Smith was universal; and those who could more especially appreciate the amount and value of the work done—the gas-stove makers—were the heartiest in their encomiums. In this connection, Mr. A. P. Main made confession that the enthusiasm of the gas-stove makers

sometimes carries them beyond the limits of truth; and he thinks these independent impartial scientific investigations will act as a continuous check on the manufacturers.

Glancing at some of the subjects raised rather than taking the order of speakers, gratification was expressed by Mr. Thornton on behalf of the makers that the instruments used in testing gas-fires, through the work at Leeds, are now so accurate as to form veritable standards. There was much said on the subject of "fuels." Mr. Glover seems to have an objection to the term "fuel" as applied to the incandescing material of gas-fires; but the term has been adopted advisedly in the report in order to escape the charge of pedantry. "Radiants" is an appellation suggested by Mr. Yates; but it would not be at all a popular one. The composition and conformation of the fuel are directions in which the makers have worked assiduously; and there is regret that they have not yet been altogether successful. Mr. Yates points out that cost is a commercial factor of which sight must not be lost. Mr. Main hopes the inquiry will continue into these matters at Leeds. The proper length of the fuel is also still a disputed question. The report suggests that the longer fuel gives greater radiating efficiency, though full incandescence does not continue to the top. Mr. Thornton, however, is dubious as to whether appearance should be sacrificed to a little increase in radiant efficiency. Better results are obtained by Mr. Kendrick by displacing the longer fuel, and using short fuel with cross pieces on the top. The makers are all pleased to find that Mr. Smith has realized higher radiation values in the past year than in the previous one; and it was satisfactory to hear from both Mr. Yates and Mr. Thornton that higher values even than those quoted in the report are now being realized by them. Upon the wide fire, Mr. Yates places his faith in respect of the improvement of radiant efficiency. A cognate point, in reference to efficiency, is that the flame must fit the fuel, upon which Mr. Thornton directs attention to the fact that if there is a drop in pressure there is a drop in efficiency, as the fire is adjusted at a certain pressure, and a pressure decline must alter the shape of the flame. Mr. Yates laid it down as axiomatic that, provided the envelope of the flame is kept in contact with the fuel, the greater the aëration the greater the radiation. Speaking of the adjustment of gas-fires, it was properly insisted that this must be done *in situ* to suit local conditions; and herein is, as Mr. Goodenough remarked, an argument for the trained gas-fitter.

A Question of Pressures.

There is curiosity on the part of Mr. Webber as to the effect on radiating efficiency of increasing the pressure of the gas; and this he suggests as a line of work for the research chemist. The higher the pressure (he was speaking of the pressure behind the nipple) the more efficient the burner, is a safe generalization. The point was one of the interesting features of the discussion; and it disclosed a variation of views. It was fancied by Mr. Liberty that Mr. Webber had overlooked the effect of higher pressures on the gas-fire user; but Mr. Liberty had apparently himself overlooked the fact that pressures are adjustable at the nipple, as mentioned by Mr. Kendrick. Admitting that it is an interesting problem, and that wonderful results can be obtained with high pressures in gas-fires, Mr. Main pointed out that the discomfort occasioned by the noise makes the use of higher pressures at present out of the question. Rather sceptical is Mr. Brearley as to going to higher pressures than 2 inches for gas-fires. Commenting on the matter, Mr. Smith said the effect of high pressures was to take in more air, and to get concentration of heat at a given point. If this is done, there may be too great a concentration. He maintains that there is no necessity to have higher pressures to get more air. At Leeds they have succeeded in drawing in more air with quite low gas pressures.

Hygienic Investigation.

As Chairman of the Committee, Professor Smithells received quite an ovation when he spoke just before the conclusion of the discussion. He explained that the object of the inquiry is to improve the gas-fire, and to make it a more efficient means of consuming gas. The object, in short, is entirely and exclusively practical. It is for the makers of gas-fires to take advantage of the lessons of the research. The most important work in connection with the gas-fire awaits investigation, and that is its hygienic aspects. This he feels inclined to personally undertake single-handed. On

hearing this, the members applauded; and in that perhaps Professor Smithells will find encouragement.

Throughout the report made by Mr. Smith and the discussion, the hall was well filled, which evinces the importance that the gas industry attaches to the work that is being conducted at the Leeds University in this connection. The number of members remaining showed considerable diminution, and the benches were somewhat sparsely occupied, during the reading and discussion of the next two papers. The one on the *agenda* by Mr. H. L. Doherty, of New York, on "Gas as a Universal Fuel," had not been received; so attention was next turned to

Gas Calorimetry in the United States.

The paper was full of information, and was by Mr. John B. Klumpp, of Philadelphia. In his absence the principal parts were read by Dr. Harold G. Colman. No one can be in a better position to tell us about this matter from the American standpoint than Mr. Klumpp, seeing that he is Chairman of the Committee on Gas Calorimetry of the American Gas Institute, whose first report was published in our columns on Dec. 29, 1908, p. 904 (a comment appearing in the same number, p. 888); while the second report was given in these columns as recently as Feb. 1 of this year. The subject as applied to America is a large one, and assumes various phases in different States, partly owing to the widely diverging character of the gas supplied—straight coal gas, varying percentages of water gas, and carburetted water gas unmixed with coal gas. Gas technicians and others in the United States have been giving as much attention to the question as we have been doing here; and calorific power regulation has actually now got a larger hold there than here.

The value of the paper lies not so much in the material of which it is composed, as in that it brings together the whole history of what has been done in America in applying a calorific test, and in investigation. But under the system of control by Public Service Commissions in America, there is just the danger that there will be striking discordancy in enactment, if great care is not exercised—they have a way of striking out on to lines of their own selection. The State of Wisconsin has adopted heating value in place of illuminating value as the standard; and within a mile from each distribution centre, it is ordained that the gas shall have a total heating value of not less than 600 B.Th.U., with a minimum that is never to be below 550 B.Th.U. In the State of Indiana, it has also been decreed that the supply of gas in cities of the first class shall not be less than 600 B.Th.U. No city can, of course, afford to be in any other category. These standards, however, are much too high for economical manufacture; and Mr. Klumpp is as strongly unfavourable to any haphazard enactment as we are on this side in the matter of fixing calorific standards. In his opinion, investigation should precede any decision as to the standard for any locality. Just as rigid is he against a dual standard of quality. He turns our attention to the State of New York, where there appears to have been some attempt to get near a uniform heating value by a variable illuminating power specification—viz., 16 candles for coal gas, 18 candles for mixed coal gas and carburetted water gas, and 20 candles for pure carburetted water gas. This has been the rule for some years past; but the Commission are now considering whether it would not be advisable to adopt some other standard of quality than illuminating power.

It is satisfactory to learn that the tests of the Calorimetry Committee of the American Gas Institute show that the efficiency of several types of calorimeter is at least 99.5 per cent.; and the Committee in arriving at this view no doubt carried out their tests with that precision as to detail that they lay down as necessary in their report, and as reproduced in the paper. The author takes the opportunity of discussing four sources of error referred to in Mr. J. H. Coste's paper before the Society of Chemical Industry, and reported in our columns; and he also turns an amount of comment on Mr. Holgate's recent articles in our pages. It is clear that there is a tendency in America to reduce the illuminating power; but that tendency has been so slow as to be almost imperceptible. This statement arrests attention: "The heating value of carburetted water-gas plants on the average has been as high as, if not higher than, the coal-gas plants; and consequently the mixed-gas plants have been manufacturing gas of a higher heating value." There is warning given against placing too much value on

calculations of heating power from gas analyses; and, in stating necessary conditions to accuracy, the author lays stress on (in calorimeters of the water-heater type) the inlet water being at the room temperature. There will be a large agreement with him as to the values being expressed as "gross" and not "net"—in fact, he regards the gross as the only proper and scientific method. The paper concludes with a specification of a calorimeter outfit and with full operating directions.

Gross v. Net Values.

Few took part in the discussion. As a matter of fact, there was little in the contribution that was open to dispute. Mr. Jacques Abady, Mr. Thomas Holgate, Dr. Davidson, and Dr. Colman were the speakers. Many of their remarks are not of the nature that one can indicate shortly. The matter of most general interest referred to gross and net values; and there was absolute accord on the part of all the speakers that the gross is to be preferred to the net. We have Mr. Abady pointing to the errors that arise in making a reduction from gross to net; but he holds that for experimental purposes the net cannot be neglected. But there is warning in his observation that, in the case of official tests, it would be a dangerous thing to be content to abide by the net result arrived at by the observer. Dr. Colman agrees; and it is a matter of regret to him that the net value has been adopted in the only statutory provision dealing with the subject in this country. On the whole, the errors of gross determinations are fewer than the errors of the net values. Further endorsement came from Mr. Holgate, who, however, pointed out that Mr. Coste, in his paper before the Society of Chemical Industry, referred to the fact that there are frequently errors of observation present in the gross figure, which are corrected when the condensation figure is deducted therefrom—thus leaving the net figure more accurate than the gross.

Regarding other matters, the speakers generally saw no reason, in measurement, for abandoning Centigrade for Fahrenheit thermometers. A practical point was raised by Mr. Holgate, with reference to the inlet water being at the same temperature as the atmosphere of the room, in reminding that there are occasions of rapid transition of temperature in a room when the temperature of the water in a tank in the room would not change with the same speed. He also thinks that, whenever possible, the analysis of the gas should be given, so that calorific power readings may be checked. It is interesting to learn that Dr. Davidson, comparing different calorimeters, finds the errors very slight between them; but all calorimeters require careful supervision so as not to allow sources of error to go undetected.

An Expert View and a Valuable Table.

Some illuminating views were contributed by Dr. Colman; and they are worthy of extended reference. He warmly supports Mr. Klumpp's contention that, in stating the calorific power of gases for purposes of definition, the gross value should be adopted, as this represents the total potential energy of the gas. The determination of the gross calorific power is, on the whole, subject to less experimental error than that of the net; in addition, two different net values are sometimes employed. Usually the practice is to find the net value by deducting from the gross figure the latent heat evolved from the steam produced in condensing to water at the boiling-point, together with the sensible heat due to the cooling of the condensed water from the boiling-point at the ordinary temperature. But in certain cases only the latent heat is deducted; and the figures obtained by the two methods would differ by about 1 per cent. with coal gas. The real use of the net value is chiefly in connection with thermodynamic investigation, where it is desired to know what amount of the total energy of the gas is evolved in the flame itself and was really available for production of flame temperature or for the development of pressure in a gas-engine cylinder. For such "thermodynamic" net values, only the latent heat of the condensed steam ought to be deducted, as the sensible heat given off from the condensed water in cooling to atmospheric temperature is not latent, but is really originally present in the flame as sensible heat, and is available for increasing flame temperature or development of pressure. The ordinary method of ascertaining the net value therefore gives results below the true "thermodynamic" net value; and this difference might give rise to trouble if the net value were adopted as the statutory one. The

supposition often met with, that the net figure represented the amount of heat which can actually be obtained from a gas in practice, is quite untenable; for if the products of combustion pass away at such a temperature that the steam does not condense and evolve its latent heat, large quantities of sensible heat are inevitably lost at the same time, as the gaseous products of combustion and the excess of air also pass away at temperatures above that of the atmosphere—the loss in this respect being often greater than that represented by the latent heat of the steam. Dr. Colman also gave a table of the calorific powers of the various combustible gases present in coal gas, showing the gross, the ordinary net, and the "thermodynamic" net values of 1 cubic foot of each gas, measured moist at 60° Fahr. and 30 in. bar, by the use of which the calorific power of a gas can be calculated from its analysis in terms corresponding to those obtained by the calorimeter. He also agrees that in this country the calorific power should be recorded in the "all-British" units of B.Th.U. per cubic foot, and not in the hybrid units of calories per cubic foot, although he himself (as he does not forget) has been guilty in past years of using the latter.

Small Works Management.

It is not often at the meetings of the Institution that the managers of the smaller works have an opportunity of discussing matters that appertain more particularly to themselves and their duties, and of hearing the views on those questions of the managers of larger works. Such an opportunity was given in the paper by Mr. Fred. J. Ward, of Knowle, where he has been Engineer, Manager, and Secretary of the gas-works for a dozen years, and can now claim a make of just under 10 millions per annum. The paper was the last to be taken on Wednesday.

There is no doubt about it that Mr. Ward entertains some very advanced notions as to what should be the accomplishments of the chief official of an undertaking of the kind; and we are not disposed to dispute in any way his inferred contention that the nearer a man can approach to any high standard that he personally sets up, the better. But many a small undertaking with an output of 10 millions would have to go begging a long while for a manager, at the salary that could be afforded, if the directors or the committee insisted on only having a man reaching the capacity of the manager portrayed in the paper. In Mr. Ward's view, the offices of secretary and manager should be combined. The man appointed as manager should be an able accountant, and versed in company law and procedure. He should also be able to perform all the duties of engineer in the designing and preparation of drawings, &c., relating to extensions and reconstruction of works and plant. He should be able and willing to perform any hard practical duties, be expert in the use of tools and appliances, love work, be always in a condition to meet consumers and directors, always be a gentleman, and have a natural aptitude for steady, plodding, and unwearying work. A good knowledge of chemistry and physics is desirable. And with all must be combined sound common sense. These are the requirements picked out from various parts of the paper; and such a man, we say it with all respect to Mr. Ward, has all the qualities and qualifications required by the Chief Engineer and General Manager rolled into one of the Gaslight and Coke Company.

Mr. Ward is strongly in favour of the amalgamation of small undertakings, finding in such combinations economy in material purchasing and selling; and for the work of reconstructing, repairing, fitting, &c., such a combination can afford to keep a staff of specially qualified workmen. But the success of the scheme would rest largely in constant supervision; and, of course, the salary of the manager should be ample, and, if possible, be partly fixed by results. The qualifications such as Mr. Ward outlines should enable the manager to give thorough supervision; and he states a few of those points in the technical class to which special attention should be paid to ensure good manufacturing results. This must be said. Mr. Ward has done well for the little Knowle Company, as evidenced by a make of 12,307 cubic feet (with 11,855 cubic feet accounted for), without anti-dips, tar columns, retort-house governors, &c., and using South Yorkshire coal and one-third North Staffordshire. The cost into the holders is 13.29d. per 1000 cubic feet; and the charge to the consumers during his management has been reduced from 5s. to 3s. 6d. and 3s. 4d. The capital, too, has been brought down to £819 per million cubic feet, which, for such a small concern, is not by any means outrageous. What the

author has done, amid his limitations at Knowle, shows that it is a good thing for any gas manager, wherever situated, to set for himself a high standard, and to use his best endeavours and abilities to reach it.

One Objector, but General Approval.

From Ireland there came terrible denunciation of the paper—Mr. T. J. Reid, of Ballina (who was the first speaker), not finding anything in it helpful to the manager of the small gas-works, nor had he a good word for the Council for accepting it. The paper lacks reference to commercial matters. Some of the small gas-works in Ireland he claims have been far in advance of England in the matter of commercial method. Before free maintenance was thought of here, Mr. Reid was doing it in Ballina, and charging only for materials; and in some cases these even are not charged for. There was a little rub from the same quarter for the President, who, in his address, said "it is no use disguising the fact that gas companies have now more than ever become shopkeepers." Mr. Reid (turning to the President) remarked that gas men do not want to disguise the fact; it is their duty to advertise that they are out for business. Mr. T. Berridge, Mr. C. Stafford Ellery, Mr. R. W. Edwards, and Mr. S. O. Stephenson, were other speakers; and their congratulations to the author were of the most cordial kind regarding the results achieved by him. Mr. Berridge bore testimony to the quality—both illuminating and calorific power—of the gas being right. A little advice was given on the commercial part of the fittings and slot-meter business at Knowle. There was some inquisitiveness as to the character of the carbonizing plant used by the author; and amalgamation of small concerns (unless quite close together) was not altogether approved by certain of the speakers—Mr. Berridge, for instance, pointing out that the advantages of amalgamation are secured in the case of certain small undertakings for which he acts, by the purchase of material passing through his hands. Mr. Edwards, too, failed to see where the benefits of amalgamation are to come from in the case of Knowle, with such a working showing as is made in the paper. On the question of qualifications, Mr. Stephenson considers it more important for the manager of a small gas-works to devote himself to developing the business than to having any great engineering ability. It transpired that the Knowle Company, being a non-statutory one, do not pay much attention to illuminating power, but the calorific power of the gas they supply is about 530 B.Th.U. net. Knowle suffers the disadvantage, in one respect, of being close to Birmingham; the people, being mostly engaged in the city, purchasing there the gas-fittings they require. The secret of Mr. Ward's high makes, he thinks, is the method of working. He puts in a full charge; and at first has the pull rather heavy—decreasing it through the whole period of carbonization. By this means, a level retort-gauge and an even pull on the hydraulic are maintained. He has five retorts in a setting; but he would be better pleased if he had only four, and had them somewhat higher. Regarding the complaint of Mr. Reid that there was not more of the commercial element in the paper, the author pointed out that it was due to its curtailment at the request of the Council.

Save for the formal business towards the close of the sitting on Thursday, the whole morning was devoted to carbonization and kindred matters; and right away from ten o'clock until lunch time tempted, the attendance was good. The reports, papers, and discussions were excellent, and therefore attractive.

Carbonization Committee's "Report."

The proceedings opened with the presentation of the report of the Carbonizing Committee; and it was read by Mr. J. Ferguson Bell. To call what was submitted, as was done, the report of the Committee was in itself a misstatement; for a dozen opening lines constitute the whole of the report the Committee had to make; and this, if we may take the statement as representing the sum and substance of their work, is the confession of a single aim during the twelve months, and in that they have been disappointed. That is to say, they endeavoured to institute tests of the three best known systems of vertical retorts; but, through no fault of their own, they were unable to carry out the trial. Mr. Bell, however, saved the Committee from the odium of having no material to submit. He recounted the results of further investigations with respect to carbonizing with heavy and long-hour charges in horizontal retorts. But this is not a

collective report by the Committee—it is a one-man investigation, and a one-man statement of the results.

Nevertheless this does not disparage in any way the value of Mr. Bell's work. His paper of last year (which obtained the distinction of the London Gold Medal), there is no gain-saying, gave a fillip to investigation wherever possible into the productive worth of changing working method in the retort-house; and the general confirmation that he now presents will be equally useful. There is one thing Mr. Bell is able to do that all gas engineers cannot accomplish through their works' limitations, and that is make trials of different weights of charge and hours of carbonizing, and register the results, under otherwise comparable conditions. Two retort-houses at the Litchurch works at Derby enable this to be done; and in these a week's run was made with Derbyshire coal of an average quality—the fine slack only being removed. In No. 1 house 12 cwt. charges were employed, with a carbonizing period of twelve hours; while in No. 2 house, charges of 8.21 cwt. were used, and the carbonizing period was eight hours. It was a substantial test; and Table II. gives the results at a glance. The production of gas per ton with the heavy charge working was (corrected) 12,091 cubic feet of 15.56-candle power; while the relative figures for the lighter charge were 11,820 cubic feet of 16.29-candle power—the respective sperm values being 645 lbs. and 660 lbs. The net calorific power, however, was respectively 554.6 B.Th.U. and 530.4 B.Th.U. The coke produced was of better quality on the large charge working; and the quantity used as fuel was slightly less—by 0.05 cwt. per ton of coal carbonized. The quantity of tar made per ton of coal was greater by 1.64 gallons. Rather more ammoniacal liquor and sulphate resulted. Mr. Bell describes the conditions under which the tests were carried out, and comments on the results. There is all the evidence required that the residual products—coke, tar, and sulphate—are improved by the heavier charge. As to the tar, we shall look with much interest for the results of the distillation tests. The ammonia shows an increase with the heavier charge of 1.39 lbs. per ton of coal carbonized—the total per ton being 29.89 lbs. It is somewhat curious that the sulphuretted hydrogen and the carbon bisulphide are somewhat higher in the heavy charges, as it is opposed to experience in other quarters, and likewise to expectation.

Coal Testing on the Large Scale.

The coal-testing plant, on the working scale at the Saltley works of the Birmingham Corporation, has been in operation now (as the "JOURNAL" records show) some five years; and through it excellent work has been done for the Gas Department, and valuable experiences have been gathered. The paper which immediately succeeded Mr. Bell's statement was composed of the fruits of the work on this plant; and it was presented by Dr. W. B. Davidson, upon whom falls the chief responsibility of the chemical work of the Gas Department. The paper was one of the finest technical contributions to the proceedings. The coal-testing plant is a complete gas-works in every detail; the carbonizing portion consisting of no less than four settings of six 20-feet retorts, 21 inch by 15 inch. Three beds are kept simultaneously at work; and the coal carbonized per day approximates 24 tons. The author discusses the comparative advantages and disadvantages of large and small test plants. Prior to this installation of large plant at Saltley, two small plants existed in the department; and the difficulty was to get any uniform records. In consequence, coal agents were often taken to task for inferior quality when no such deterioration existed. The results of carbonizing tests on the large scale are shown to greatly exceed those made with the small test plants—using, of course the same coal. Results of tests of a certain coal quoted in a text-book compared with results from the large test plant indicate the discrepancy and unreliability of laboratory carbonization of gas coal. Reasons for this are given in the paper.

The large test plant was adopted at Birmingham for certain purposes—to obtain information as to the true value of different coals that were offered, to carry out carbonizing experiments, and to check coal consignments. While the large test plant is superior to the small one, even under the best conditions the testing of gas coal does not admit of a high degree of accuracy. In the main, this is due to differences in the nature of the coal, and partly to inaccuracies of measurement and testing. Thus it is advisable to use the law of averages to eliminate errors of this kind by repetition of the tests from time to time. Regarding the valuation of

gas coals, the author gives a sketch of the basis of testing and valuation. This is where we get into a mass of detail that defies mere indication by a few words. Passing over it, a section of the paper is arrived at dealing with the standard of the quality of the gas; and Dr. Davidson is seen there as a progressive, with scientific and practical support for this particular feature of his creed. He shows that calorific power is a more dependable standard than illuminating power. When the legal standard of candle power of town gas is reduced to 12 or 14 candles with the No. 2 burner, coal may be valued, so far as the yield of gas is concerned, on a basis of calorific value with (say) 500 B.Th.U. net as the standard. From two years' tests of coals, and taking the results ranging between 16.5 and 17.5 candles and between 14.5 and 15.5 candles, together with their respective calorific values, he finds a decrease of 1 per cent. in calorific value corresponds to a decrease of practically 2 per cent. in illuminating power.

The paper is packed with information of this kind. We are told the effect of variations of 1 per cent. of different constituents on the calorific value and illuminating power of gas; and there is a comparison of gas manufactured with vertical retorts at high temperature with the product of horizontals. The illuminating power (No. 2 burner) of the gas from the verticals is given at 15.7 candles, and from the horizontals it is 0.2 candle higher; but the calorific value is respectively 524 and 506 B.Th.U. From complete gas analyses, the temperature of a bunsen flame is calculated with vertical retort gas at 2185° C., and with horizontal retort gas at 2095° C. Worth study, too, are the tabulated effects of altering the pressure in the retorts, and of other cognate investigation. The advantages of high temperatures are discussed, and with increases in the temperature, improvements in results have been realized. With the refractory material at present in use, it is not advisable to exceed an average retort temperature of 2100° Fahr., or a combustion chamber temperature of 2600°. Much depends as to what can be done in this direction on the use of better refractory material. And so we go on in this didactic paper, gaining information from every new section, till at the end there is hearty endorsement of the author's desire to thank the Birmingham Gas Committee for the permission they gave to the publication of the paper.

A closing remark of the author, apart from the paper, was that he does not know why it is that many of the advocates of the systems of carbonization keep back the figures as to their working. It would be a good thing if reliable figures could be obtained. It is proposed to instal a unit of one of the modern systems at Birmingham, in order to make comparisons.

Heavy Charges, and Source of Increased Yield.

It was a valuable discussion that took place on the report and paper; those participating in it being Mr. S. Y. Shoubridge, Mr. Charles Carpenter (Chairman of the Carbonizing Committee), Mr. John West, Mr. George Helps, Mr. Arthur Valon, Mr. W. B. Randall, Dr. Colman, Mr. Charles Hunt, Mr. S. Glover, Mr. J. P. Leather, and Mr. P. Holmes Hunt (Melbourne). Congratulations to Mr. Bell and Dr. Davidson were many. The discussion mainly turned on the experiences with heavy charges in the test plant at Birmingham and elsewhere. The President appeared a little envious of this plant, and wished it belonged to the gas industry. But the Birmingham Gas Committee, he acknowledges, deserve the gratitude of the industry for placing the results of the work upon it at the disposal of the industry. In Mr. Shoubridge's belief, it is the largest test plant in the world. He is not sure, however, that it is not too large for merely the analysis of gas coals; but for research work, it is admirable. Then we soon fell on to the question of heavy charges—Mr. Carpenter introducing it by expressing his opinion that Dr. Davidson has not been able to carry out his tests in regard to them under the best conditions, owing to hand labour; and Dr. Davidson later on admitted this. The results, as Mr. Carpenter pointed out, do not agree with the large-scale working of the South Metropolitan Gas Company, at whose works a million tons of coal have been carbonized now in full retorts; and there is no doubt about the increased yield. Mr. George Helps gave confirmation by reference to the working results achieved in numerous works. There is Mr. Randall, too, who claims a make (through reading Mr. Bell's paper last year) of 13,000 cubic feet per ton, with a sale of about 12,500 cubic feet, with

fewer complaints from his consumers, and relief from the bugbear of naphthalene.

Where does the largely increased yield of gas come from, reflectively asks Dr. Colman? Either there must be a less weight of coke produced, or less water formed and condensed from the coal. He is convinced that the steam formed from the coal is decomposed to a greater extent with the full charge than when there is a large free space in the retort. The increased yield of gas, in his opinion, is more due to that source than to the one Dr. Davidson mentioned. Then that old carbonizer, Mr. Charles Hunt, rather controverted Dr. Colman's views. It seems to him that the increased yield from the heavy charge, or full retorts, is due not to the rise of temperature in the retorts, but to the reverse. Filling the retorts with coal, the bulk of the gas meets with a lower temperature, and is not decomposed as when there is a large free space for the gas to go through. Dr. Colman seems to think a great deal depends upon the decomposition of the steam; but, with a filled-up retort, a larger quantity of virgin liquor is obtained than with a partially filled one. This, in Mr. Hunt's judgment, disposes of Dr. Colman's theory. Following up the point, Mr. Samuel Glover thinks the improvement due to the fact that there is less loss of the hydrocarbons originally contained in the coal—in the way, for instance, of carbon deposit on the retorts. That there is something in this, is believed by Mr. Leather. What was formerly lost in the way of carbon on the retorts is largely gained in the newer practices. The extent of the real loss, he submits, cannot be judged by the weight of the carbon on the retorts. Mr. Bell also deposed to there being less carbon on the retorts, and less sulphur compounds and naphthalene produced, by the fuller charges. Bearing on the heavy charge, some interesting experiences came from Mr. P. Holmes Hunt. In Australia, the coal used for gas making varies considerably; some of it swells very much. He finds that he gets an undue pressure in his retorts if he packs them; and he has come to the conclusion that it is advisable to leave a little passage at the top of the charges.

Fuel and Calorific Power.

There were naturally many points raised on the fertile report and paper which cannot be noticed in this reference to salient features of the discussion. But two subjects more. As to the question of fuel consumption in retort-settings, Mr. Carpenter has discovered that jacketing the latter has a great beneficial bearing upon this. The calorific power question also cropped up again. Mr. Shoubridge introduced it by objecting to the sentences in Dr. Davidson's paper, suggesting that, when the standard of candle power of town gas is reduced to (say) 12 or 14 candles with the No. 2 burner, coal, so far as the yield of gas is concerned, might be valued on a calorific basis—say, 500 B.Th.U. net. Mr. Shoubridge was rightly opposed to it being understood outside that this was a fair calorific value to take for gas of a 12 to 14 candle power standard, tested by the No. 2 burner. As the result of a long record of tests at the South Suburban Company's works on gas made to a 14-candle standard, he regards 450 B.Th.U. as quite high enough to which to work. Mr. John West urges that test-burners and photometers should be done away with; and calorific power standards be adopted. Such a change would be a great advantage in technical work. Mr. Valon suggests that it would be a good thing for the gas industry if big corporations like Birmingham would take the lead in adopting a calorific standard, in lieu of the illuminating power one. Dr. Davidson disclaimed any intention of suggesting that 500 B.Th.U. net should be regarded as proper for a legal standard; it was only a suggested basis for the valuation of coal.

De Brouwer Plant at Sydenham.

"The Latest Installation of De Brouwer Stoking Machinery and Coke-Handling Plant" was the title given to the succeeding paper. It was by Mr. S. Y. Shoubridge, the Hon. Secretary of the Institution. The title of the paper might well have been "Economy of Modern Practices and Plant." Since Mr. Shoubridge's advent at the South Suburban Gas Company's works, they have been the scene of much progressive engineering work. Change has succeeded change; and at the back of it all, there has been one object, and that economy. And nothing in this way has been done at Sydenham during his tenure of office that has not had financial justification in the accounts. As to the change

that Mr. Shoubridge modestly describes in the paper, the economy of it is already fully assured. At Sydenham there has been a large experience with the De Brouwer stoking machinery and coke-conveying plant; and in the largest of all the houses (containing 26 beds of tens) the cost, from the unloading of the coal to the delivery of the coke on to the heap, has amounted to 8½d. per ton of coal carbonized. Comparing this with 18½d. in the case of another house, containing eighteen beds of sevens and six beds of tens (all will ultimately be converted to tens), and with an arrangement of coal and coke handling and transmission that was responsible for heavy costs and the making of an undue proportion of coke breeze, it was clear that there was room for improvement and economy; and improvement there has been which will produce economy.

The framework of the compressed-air stoking-machines that were formerly in use has been utilized for accommodating De Brouwer machinery, worked by the compressed-air plant. But special interest centres in the coke-conveying plant, and Mr. Shoubridge's scheme for utilizing this in a manner that will facilitate coke stacking, and reduce the making of breeze to a minimum. There is novelty here. A De Brouwer conveyor has been adopted which, after it leaves the house, rises at an angle of 30° to a height of 27 feet, where it delivers the coke, over a screen, into the trough of the yard conveyor, which is 205 feet long. On each side of this yard conveyor is the feature of largest interest. This consists of a travelling and lowering conveyor for stacking the coke in the yard without breaking it, and for loading it direct into railway trucks. These lateral conveyors are each composed of a trough and De Brouwer chain, carried on a steel gantry, fitted with travelling wheels running on rails. One end of the conveyor is suspended on chains, and the other is hinged so that it can be raised and lowered, and thus avoid dropping the coke from a height. The coke can now be stacked in a large and almost level heap (except for the small peaks just where the coke is deposited) over a large area; and not as of old in a heap, triangular in section, with steep sides down which the coke was wont to slide, producing by the friction of its travel a plentiful supply of breeze. These transverse yard-conveyors are electrically driven; while the retort-house and the yard-conveyors are driven by the gas-engine that is used for the old conveyor.

We will not in this sketch describe the installation, in the old frameworks of their predecessors, of the De Brouwer projector and De-Brouwer-Jenkins discharging ram. But it may be mentioned in regard to the hopper feeding the projector, that a double rotary feeder has, in this instance, been adopted in order to avoid the irregularity occasionally experienced under former conditions, with the De Brouwer projector, when the coal happened to be fine and damp. Details regarding the whole of the work (which has just been finished) are given in the paper; and the estimate is that the over-all cost of carbonizing will be, from coal handling to coke heap, not more than 10½d. per ton—representing a saving of about 8d. on the superseded plant and methods. Figures as to costs (including the maintenance of the coke-conveyors) are supplied in the paper. Savings are shown in all directions other than in maintenance, the increase in which, however, is submerged by the large final economy, added to which some credit must be taken for the smaller quantity of breeze made. This was really the only engineering contribution to the proceedings.

Coke Conveying Justified.

Details were numerous in the discussion; and for them reference must be made by those interested to the full report. Just as in the former discussion, this one was pointed with interest, to which contribution was made by Mr. J. Ferguson Bell, Mr. Edward Allen, Mr. D. Irving, Mr. A. C. Hovey, Mr. Edward Harman, and the President. The hot-coke conveyor had many good things said about it. With the heavier charges of to-day, it is an indispensable adjunct in works of any magnitude; and it has become, with time, a more economical means of doing the work. It is generally agreed, too, that the cost of maintenance has become less with the growth of experience. Mr. Hovey regards the chain conveyor an improvement over the old plate conveyor, which he thinks is becoming extinct. He also raised the question of friction and breeze; but, in respect of this, Mr. Shoubridge says his faith in the De Brouwer conveyor has increased with experience. By it the coke is carried forward, and does not roll about, and

cause breeze by the pieces rubbing together. And the improvement described in the paper deals with one seat of an excess of breeze production. Mr. Irving had some critical remarks to make as to the power needed to drive conveyors at Bristol. The excellent work of the Temperley and the Telpher systems of conveying was referred to; but Mr. Shoubridge points out that such systems cannot be applied to the taking of coke direct from retorts under modern methods of working. They would only add to costs by delaying retort-house operations. There was congratulation to Mr. Shoubridge on his over-all working cost of 8½d. per ton in the largest of his retort-houses. Some interesting figures were produced both from Bristol and Liverpool. Mr. Harman, however, thinks that the costs in different parts of the country cannot be properly compared on account of the variations in the wages paid. A better system of quenching coke than by water is desired by Mr. Allen. There was some talk of the system of coke smothering; but the time and the expense involved are against it, though the product is good.

Refractory Materials Inquiry.

We come to the final technical matter on the agenda. Quality and not quantity must be taken as the basis of judgment of the Refractory Committee's report which was presented by the able Hon. Secretary, Mr. F. W. Bywater. The Committee have been active, and have done useful work. Many inquiries and many pyrometrical tests have been made by them; and now, in this report, the fireclay, brick, and retort manufacturers have presented to them fairly representative maximum and minimum temperatures that their wares have to submit to in different parts of retort-settings and water-gas plants. If the works at which inquiry was made may be taken as representative of the whole, there is no question about there being a very fair amount of dissatisfaction abroad concerning the quality of the material supplied. A small proportion of the technical chiefs of the works state that they are satisfied with the materials supplied; only "fairly" satisfied is a slightly larger proportion; but the greatest number vote for dissatisfaction, or say there is room for improvement. An interesting point is the sizes of horizontal retorts used; and there is quite a considerable use made of 22 in. by 16 in. section. A goodly number of works employ irregular sizes. With so many using the 22 in. by 16 in. retort, and variations in the cross section being so small, the Committee are looking into the question of standardizing this size of retort. But there appears to be a very widespread objection to the standardization of retort patterns; and few would promise to adopt a standard pattern in the case of new work only. Still there is a preponderance of replies in favour of the preparation of standard specifications. We are to have these published in due course; and it is hoped engineers will make use of them next contract season. The establishment of an independent testing-station for gas-works refractory materials seems to be an idea that would meet with large acceptance. The Committee have had a conference with the representatives of the manufacturers, through the Society of British Gas Industries; and the manufacturers have signified their willingness to make the quality of their material equal to the required standards.

The discussion on the report was brief; and there is really not much to say about it here, as any little criticism was disposed of completely by Mr. Bywater. It may, however, be stated that Mr. J. W. Morrison thinks the specification proposed will be of much value in strengthening the hands of corporation engineers, who are handicapped by the craze for the acceptance of the lowest tender. It was pointed out by Mr. Bywater that the specification would not be directed exactly to defining what is a good material, but to showing what is not required, and therefore what is a bad one. The immense value of the report to makers was acknowledged by Mr. W. P. Gibbons, the Chairman of the Fire-Brick Section of the Society of British Gas Industries, and his remarks were endorsed by a fellow-member of the section—Mr. C. W. Thomas. The report, as Mr. Gibbons says, gives the makers information that they have been wanting for years; and he pledges the makers to further to the best of their ability the objects this inquiry has had in view. *Inter alia*, Mr. Samuel Glover spoke of the value of the temperatures collected by the Committee.

Next Institution Year.

The scrutiny of the balloting-papers revealed the expected. Immediately after this meeting, accession to the

presidency is made by Mr. Alexander Wilson, of Glasgow; Mr. R. G. Shadbolt follows him in the Senior Vice-Presidency; and Mr. J. Ferguson Bell takes office as Junior Vice-President. It was quite an interesting episode when that veteran Gas Engineer and Administrator, Mr. Robert Morton, rose and congratulated Mr. Wilson on the dignified position to which he has attained. Mr. Morton has known the new President all his life, during which Mr. Wilson has had to work very hard. But this is the "capping" of the whole. There was tremendous applause when Mr. Wilson rose to acknowledge his election, which was repeated when he invited the Institution to visit Glasgow for their next annual meeting. There was no refusing this, more especially when Sub-Convener Bailie Paxton (who will probably be Convener of the Glasgow Corporation Gas Committee next year), with great cordiality, added, on behalf of the Committee, his support to the invitation.

Honorary Members.

The Presidents of the French and German Gas Associations and Mr. R. Forbes Carpenter were elected honorary members of the Institution. The mention of the nomination of Mr. Forbes Carpenter (whose great interest in the gas industry is recognized and appreciated in the whole of its professional ranks) was loudly cheered; and only as a mere formality was it necessary to put it to the vote.

The technical proceedings concluded with several votes of thanks; but deeply grateful as all are to those who have worked for the Institution, the relief on this occasion from long speeches, which do not add in any way to the feelings of gratitude, was welcome—more particularly as the sitting had extended from 10 a.m. till past 2 o'clock.

SOCIAL EVENTS OF THE WEEK.

Charming was the weather throughout the week; and London looked its best. All the visitors were deeply thankful; for the weather is the one thing that, on these occasions, caps the success of the whole annual meeting. If the weather is (to use a short but comprehensive term) bad, it does not leave its dire impressions and influences outside, but they get indoors, and permeate things all round. The reverse was the case during the past week; and outdoors and indoors brightness and the spirit that it imparts dominated. We did not hear a single regret that fate had decreed the ruling out of that ancient item in the programme—reception, dance, and so forth, that are looked upon by a few conservative ones as an indispensable appendage to the presidential office. It is nice to meet the President and his wife; but it is nice to meet them elsewhere—as on this occasion—than (in June) in the hot galleries of the Royal Institute of Painters in Water Colours. In London there is plenty to do, plenty to be seen, and plenty of amusement, without this old-standing item in the week's programme. Cannot someone, with initiative in these matters, suggest an alternative for immediate future Presidents, when the annual meetings are held in London? From conversation, it was gathered that the new public lighting in London—permanent and trial—engaged a good deal of the attention of the members; and the Japan-British Exhibition was a favourite *rendezvous* in the evening, where Mr. Edward Pilbrow had the pleasure of receiving innumerable visitors, from all parts, at the Exhibition stand of the Joint Gas Companies, in connection with which advertising display it is hoped the Hon. Secretary and Treasurer (Mr. F. W. Goode-nough) will now get that "few hundred pounds" that are required to complete the amount of the estimated expenditure.

Masonic.

Among the engagements usually arranged for Gas Institution week, when the gathering takes place in London, is an "Emergency Meeting" of the Evening Star Lodge, No. 1719. As is customary, this was held on Monday of last week; and there attended more of those who are qualified than has been the case in any previous year. This may be accounted for by the fact that arrangements were made for the lodge to be held in the Grand Temple at Freemasons' Hall—thus giving many of the Provincial brethren an opportunity (which they had not previously had) of seeing the Headquarters of the Craft. Nearly 200 brethren accepted the invitation; and a very enjoyable evening was spent. After the usual formalities connected with the opening of

the Lodge, the W.M. (W. Bro. W. A. Surridge) expressed the extreme pleasure he had in welcoming so large and distinguished a gathering, brought together from all parts of the country in connection with the annual meeting of the Institution; and he hoped the proceedings during the week would pass off to the entire satisfaction of everyone. He had little doubt but that this would be the case, in view of the fact that the President for the year was one so universally esteemed, not only in his professional work, but as a Mason, and one whom every member of the Evening Star Lodge was pleased to welcome. The "business" of the evening consisted of the initiation of the W.M.'s nephew, Mr. Rae Normand. In this, the W.M. was assisted by the other principal officers of the Lodge—S.W., Bro. Cyril G. Davis; J.W., W. Bro. Charles W. Offord; S.D., Bro. W. Edgar; J.D., Bro. E. G. Smithard; I.G., W. Bro. A. E. Croager; and the D.C., W. Bro. Walter T. Dunn. After the initiation, the lecture was delivered to the initiate by W. Bro. A. E. Broadberry, P.M. At the close of the Lodge, a banquet was served in the "Connaught Rooms;" and subsequently the "Variety Entertainment" provided was much appreciated.

At Croydon and the Japan-British Exhibition.

"A glorious day." That was the universal verdict on Friday evening, after some 440 happy beings had been the guests at Croydon of the Chairman (Mr. Charles Hussey, J.P.) and his fellow-Directors of the Gas Company, and at the Japan-British Exhibition of the President and Mrs. Helps, and the favoured ones of Old Sol. Long before the day had far advanced, it was forgotten that when we trooped on to No. 7 platform at Victoria Station of the L. B. & S. C. Railway, the morning was somewhat grey and chilly, so much so that umbrellas, "macks," and coats were well in evidence. Such material precautions were the superfluous luggage of the cautious. Just about eleven o'clock, the long "special," consisting of seventeen coaches—all first-class—steamed out of Victoria with its human freight; and from that time onwards there was not a blank space in the day. A hint might well be taken. This was, in numbers, the record outing of the Institution. Mr. Helps has not often deceived his Directors; but he has to plead guilty on this occasion—not designedly, but evidently through pinning his faith in this matter to precedents. But the Board is a model one; and they made no complaint, but were happy in the knowledge, that so many in excess of the expected in the professional ranks of the industry, and their ladies, desired to visit Croydon, and be the guests of the Company. The record is due to more than the exceptional popularity of Mr. Helps. It proves, we think, that an outing involving only a short railway journey (instead of two or three hours in a close compartment of a railway carriage) and a varied programme is appreciated. There was the short railway journey on this occasion; and there was the varied programme.

When West Croydon station was reached, the ladies alighted from the train; and they made a brave show—being well upwards of 100 in number. They were driven from the station to the centre of the town to inspect the Whitgift Hospital, which was founded by John Whitgift, Archbishop of Canterbury, in 1597. Ever kindly and ever genial Sir Frederick Edridge, who is one of the Governors, acted as cicerone; and Sir Frederick's affability gained for him the immediate regard of his fair charges. "We would not have missed this interesting treat for anything" was a remark that many a man heard when the ladies rejoined the larger party later at the Waddon works of the Croydon Gas Company.

The ladies having parted company from their male friends, the train proceeded to the Waddon Gas-Works, where a temporary platform had been provided by the sidings, but not a platform of sufficient length to accommodate at once seventeen coaches, and so only four or five at a time could be discharged. The first thing that attracted notice was the spacious vacant land, beautifully turfed and kept, on which the Company's employees take their recreation; the General Manager and Engineer holding strong belief in outdoor sport, and the provision of the means for obtaining it, as a cogent way of creating that *esprit de corps* which is such an essential factor in the good conduct of a large manufacturing establishment. Here the visitors were received by the President, the Chairman (Mr. Charles Hussey, J.P.), the Directors, Mr. A. Caddick (Mr. Helps's right-hand man at the works), Mr. W. W. Topley (the Secretary), Mr. W. J. Sandeman (Distributing Superintendent), Mr. Helps, jun.,



A General View of the Present Works at Waddon.

and most of the members of the official staff. We ought to mention here that Mr. Hussey's colleagues are Mr. Thomas Rigby (the Vice-Chairman), Mr. William Cash, F.C.A., Mr. P. H. Hall, Mr. W. J. Russell, Mr. Samuel Spencer, and Mr. Corbet Woodall. Looking round, the faces of most of these gentlemen were seen. After a few words of welcome from the President, the large party was divided into groups of about thirty—the first being headed by the President himself, the others by Mr. Caddick, and other members of the staff—and were conducted through the works; but so extensive are they that not much time could be spared in any one part.

A Glance Round the Works.

The works have been described from time to time in the "JOURNAL;" and the extensions in the order in which they have been made have been duly recorded. One striking thing about the Croydon gas-works is that the normal condition is cleanliness; and there is no doubt about it that the design and disposition of plant have much to do with this. Mr. Helps believes in plenty of elbow room. He believes, too, in buildings having good-looking exteriors and interiors. Refinement in appearance creeps in wherever it can be introduced. It all helps to an end. Thus in most of the buildings other than those immediately devoted to production and purification, a plentiful use is made of glazed faced bricks, which can be kept clean, and always maintain a place in a bright condition.

The works cover about 31 acres of ground, through which the L.B. and S.C. Railway Company's Wimbledon line runs, thus affording good facilities for the importation of coal, &c., and for the export of coke and other products. There are two sets of sidings, one running through the retort-houses at a height of about 14 feet from the ground, the other being on the ground level. These sidings are connected to the main line at both ends of the works. The coal-stores in all are capable of containing, under cover, 12,000 tons of coal. The works comprise two entirely distinct sections, each complete in itself, though at present the old (No. 1) section is in a transition state, and is gradually being converted from the old-fashioned type into a modern works, similar in many respects to the new or No. 2 section lately completed.

The retort-houses were first visited. No. 1 retort-house, built in 1865-6, still remains; and No. 2 house, built in 1875, has been considerably enlarged, and is now 200 ft. long by 72 ft. wide. Nos. 2 and 3 houses, making together the largest of all, will be dealt with presently.

In No. 2 house (which it was an advantage to see before being put to work), fifteen settings of ten retorts in five tiers have been erected by West's Gas Improvement Company, Limited, of Manchester, while stoking machinery, driven by compressed air, and made by the same firm, has been installed. The charging scoop is of the latest type, allowing of a charge of 11 cwt. per retort, while the coke is pushed out from one side by the firm's patent discharger. It was regretted that the makers were unable to complete the new scoop in readiness for the visit of the members.

The whole of the coal-breaking plant and the conveyors for dealing with both coal and coke are driven by electric motors; the electricity being generated by two 60 kilowatt dynamos, supplied by the Lancashire Dynamo Company, Limited, and worked by two 110 B.H.P. gas-engines. The electric plant is in a house erected at the south end of the retort-house, on the site originally occupied by the old sulphate plant, and which will form part of a large block of buildings, intended eventually to include lobbies, the mess-rooms, reading-rooms, lavatories, &c., for the use of the workmen.

The new coke plant was described quite recently in the "JOURNAL" (*ante*, p. 553). But it may be briefly stated that the hot-coke conveyor runs on one side of the retort-house only. It is 33 inches wide, and 12 inches deep, and of the West type. The hot coke is quenched during its passage through the house by water sprayed on it at a pressure of 60 lbs. obtained by an electrically driven two-stage Tan-Gyro pump. On reaching the end of the conveyor, the coke falls into a small hopper having a deflecting valve, which diverts the coke into one of two skips standing ready to receive it. These skips will each contain about 1 ton of coke. When one of them is filled, it is lifted by means of a 2-ton electric crane supplied by Messrs. Stothert and Pitt, Limited. In rising it engages with the deflecting valve, and diverts the coke falling from the conveyor into the empty skip standing ready on the other side. The crane runs on a gantry placed over the coke-hoppers, which are capable of holding about 500 tons of coke. The full skip is either emptied direct into the storage hoppers, into the hoppers of the coke-breakers, or else dropped into the yard should the hoppers be full. The hoppers are provided with two sets of outlets—one allowing the coke to fall on to two Marcus conveyors, by Messrs. Head, Wrightson, and Co., Limited, which carry it at the rate of 30 tons per hour each to trucks placed on a special siding—the breeze, &c., being removed by suitable screens during its passage. The second set of outlets allows the coke to fall over fixed screens into the yard for the purposes of the retail trade. These conveyors are of the jiggling type, with a slow but irregular forward and backward movement. The Croydon installation is the first instance of their use for coke handling.

It is intended that the whole of the condensers, washers, and scrubbers in connection with the old section, shall shortly be removed, and replaced by more modern plant in a more convenient position. It is not necessary, therefore, to publish any description of this part of the plant. There are four exhausters, all by the Bryan Donkin Company, Limited. The two large ones, of 200,000 cubic feet per hour capacity, were erected in 1896. The smaller ones, of 80,000 cubic feet per hour capacity, were supplied in 1876 and 1880 respectively. The engines are of the compound condensing type; an ordinary surface condenser being used. The Lancashire boilers (by Messrs. Taylor, of Marsden) are 27 ft. long by 7 ft. 6 in. diameter, and are fitted with Meldrum's furnaces.

The purifiers are nine in number. The first four are 54 ft. long by 24 ft. wide, with 24-inch connections; the next four 24 ft. square, with 20-inch connections; and the last or catch-box, on Green's principle, 40 ft. long by 30 ft. wide, with 24-inch connections. The first set originally contained eight purifiers, 24 ft. square. But in 1893 they were converted into four of the present size. In 1900, the second set were coupled up by means of a Weck's valve, and now work as two large boxes, instead of four small ones. Oxide of iron is used in all the purifiers.

There are two station meters, one of 50,000 cubic feet per hour capacity, erected in 1875, and the other 100,000 cubic feet per hour capacity, erected in 1891—both being by the Gas-Meter Company, Limited. After leaving the meters, the gas passes to the valve-house, where it is collected in a large cylinder, 48 inches diameter, and thence is distributed to the gasholders. The outlets of the holders are connected up to a second cylinder, which has 30-inch outlets leading to the two governor-houses. By this means the whole of the valves, both inlets and outlets, can be actuated from one centre. An automatic bye-pass governor, by Messrs. W. & B. Cowan, is fixed between the two cylinders.

No. 3 retort-house was built in 1893, and was 196 ft. long by 72 ft. wide, with coal-store at the side, the same length,



View from Top of No. 2 Retort-House Coke Plant, showing Nos. 3 and 4 Retort Houses and Coke Plants, the Water-Gas Plant, the Boiler-House and Compressing Plant, the Booster Plant, and No. 2 Holder.

but 50 ft. wide. In 1904-5, this house was extended, making it altogether about 390 feet long. It contains 29 settings of eights on the regenerative system, with retorts, \square shaped, 22 in. by 16 in. The house was originally worked by West's manual stoking machinery; but, with the erection of additional settings, machinery in which compressed air is the motive power has been substituted, with most satisfactory results. The change has necessitated the provision of apparatus for compressing the air; and this has been installed in a building opposite the water-gas plant, while a large boiler-house has been erected adjoining it, containing five boilers—some fitted with Victoria forced draught furnaces and others with the Varty or Northern fire-bars. Green's economizer is used to heat the feed water.

The coal is brought into the stores on the high-level railway, and is unloaded direct into the breakers beneath, after passing through which it is elevated and dropped into overhead hoppers on either side of the house, from which it is fed into the charging-machines. The house contains four sets of this elevating machinery.

The coke produced in Nos. 3 and 4 houses is either drawn direct into the producers, or is dealt with by De Brouwer conveyors, which carry it

away as drawn from the retorts to cross conveyors and elevators, from which it drops on to jiggling conveying screens, which, after extracting the breeze, divide the coke into two sizes, and drop it into hoppers as broken and large coke. From these hoppers, the breeze and coke can be loaded direct into trucks, which run on rails in a dock placed immediately beneath, or into carts. The plant is driven by gas-engines.

Over the compressor-house is an apartment in which is erected a "Criton" water-softening plant, and over this is placed a large tank capable of holding about 130,000 gallons of water. The whole supply of water is obtained from two artesian wells (one 400 feet, and the other 300 feet deep), and is forced into the overhead tank by compressed air on the air-lift principle.

After leaving the retort-house, the gas passes through a Colman cyclone, which brings about the separation of the heavy tar vapours. It is then (still hot) drawn through a Livesey washer, containing tar oil from the carburetted water-gas plant, which plays an important part in the elimination of naphthalene (as described by the President in his address). It is afterwards cooled in specially designed vertical water-tube condensers made by Messrs. Clapham Bros.

The exhausters and engines are two in number, each of a capacity of 180,000 cubic feet per



View from the Top of No. 2 Retort-House Coke Plant—Showing No. 2. Holder and No. 2 Retort House.



Coal Storage Plant and Electric Crane.

hour. They were supplied by the Bryan Donkin Company, Limited, and are situated in one wing of a block of buildings, the middle portion of which contains two Lancashire boilers, 28 ft. by 8 ft. Space is left for a third. The opposite wing contains the various pumps which deal with the water, ammoniacal liquor, and tar, and also a condensing plant, to which the exhaust-steam pipes from all the engines, pumps, &c., are connected. After leaving the condensers, the gas travels through Livesey washers, where the remaining tar and some ammonia is extracted. It then passes through the Kirkham, Hulett, and Chandler "Standard" washers, where the remaining ammonia is washed out. It is noticed that the condensers, washers, and scrubbers are placed under cover in a lofty and spacious building—an arrangement which is somewhat novel in this country. The purifiers (of the Green type), with patent fasteners, are six in number, each 40 feet square by 6 feet deep, and in all of them oxide of iron is used. They are placed in a large covered shed, nearly 100 yards long.

The gas is afterwards measured in a "Rotary" station meter, made by Messrs. Thorp and Marsh.

The gas passes to the cylinder in the valve-house, which is common to all the gas made on the works, and from which it is distributed to the various holders.

The sulphate of ammonia plant was erected by the Chemical Engineering Company. It comprises the most modern improvements, including centrifugal drying apparatus and conveying machinery for storing. It is capable of making about 45 tons of sulphate per week.

There are three large underground tanks in which the tar

per day. Two of the fans in this plant are driven by steam-engines, and one by a Laval steam turbine. Separate purifiers, five in number (each 30 ft. long by 25 ft. wide), are provided for dealing with the gas produced. This is measured by two station meters (one on the rotary principle) on its way to the inlet cylinder in the valve-house, where its mixture with the coal gas is effected. There are two oil-tanks, each capable of storing 120,000 gallons.

The governor-house in the old section contains three governors, which supply two 24-inch mains and one 12-inch; the other (built in 1906) containing three 24-inch governors, by Messrs. Parkinson and W. & B. Cowan, Limited. From the same cylinder to which these governors are connected runs a main under ungoverned pressure direct to the distribution station at Whyteleafe—a distance of over five miles. It is connected to a 12-inch main through a district governor for the supply of the Coulsdon district at Purley, and it also supplies the Kenley district through a similar governor.

In consequence of the large area (nearly 80 square miles) which has to be supplied, it has been found necessary to increase the pressure available for distribution from the holders. This was done by installing (in duplicate) pressure-raisers on the Sturtevant principle, driven by 60-H.P. steam-turbines on the Laval system. Each is capable of dealing with about 750,000 cubic feet of gas per hour.

The gasholders are four in number. No. 1 (now used as a relief holder in connection with the carburetted water-gas plant) is 100 feet diameter, and will contain 400,000 cubic feet of gas. No. 2 has a capacity of about 900,000 cubic feet of gas; No. 3, of 1 million cubic feet; and No. 4, of 3 million cubic feet.



The Marcus Conveyor—Showing the Outlet Shoots from the Hopper.

and ammoniacal liquor are stored; while a third has been erected in connection with the new section, and is of somewhat novel construction. It is placed above ground, and is of annular type; the tar and liquor being pumped into the centre portion, the liquor eventually overflowing into the outside or annular space. The total capacity of the four tanks is about 650,000 gallons.

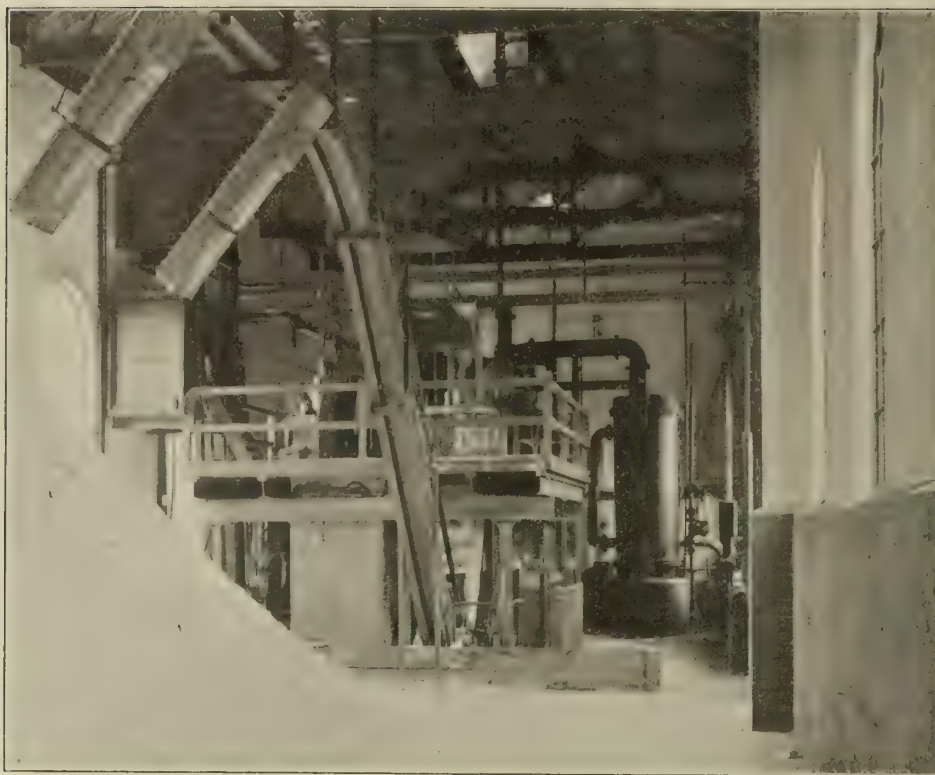
The water-gas plant is by Messrs. Humphreys and Glasgow, and has a total capacity of about 3½ million cubic feet

The Luncheon.

The inspection of the works finished, the visitors proceeded to the recreation ground where they found the ladies had already arrived; among them being Lady Edridge, and Mrs. and the Misses Helps. A move was at once made for the spacious marquee, in which the visitors were to be entertained to luncheon. Mr. Charles Hussey presided;



The Compressor House.



The Sulphate House.

and near to him were noticed Sir Frederick and Lady Edridge, the President and Mrs. Helps, the President-Elect (Mr. Alex. Wilson) the Senior Vice-President (Mr. R. G. Shadbolt) and Mrs. Shadbolt, the Hon. Secretary (Mr. S. Y. Shoubridge), the Mayor of Croydon (Major Fox), Alderman Tetley (the Chairman of the Leeds Corporation Gas Committee, representing the Leeds University), Mr. Corbet Woodall, Mr. W. Cash, Mr. S. Spencer, Mr. P. Hall, and Mr. W. J. Russell (Directors of the Company). The luncheon was a generous one; and appetites were good after the long morning's outing, sightseeing, and inspection.

The toast of "The King" having been honoured,

Sir FREDERICK EDRIDGE said, as an old resident of Croydon, he offered the visitors that day a hearty welcome, and expressed the hope that the ladies had been pleased with their visit to the ancient buildings of the town. With regard to the gentlemen, he could only say that he regretted time did not allow them to see many of the beauty spots in the neighbourhood; but probably they had seen one "beauty spot" in Waddon which had given them all great professional enjoyment. His duty was to propose the "Institution of Gas Engineers." He need not labour the fact that in all trade it had been found necessary to have institutions of this kind. They knew what kindred institutions had done for the trade of the country generally; and it went without saying that the great gas industry, which was a very complex one, having its factories over the whole land, in which some 150 millions of capital were embarked, and which catered for the comfort of a large percentage of the inhabitants of these islands, should have an able Institution to which the industry could look for guidance in the various matters connected with it. It appeared to him that one might also say that it was largely owing to the work of the Institution that the return on the capital which people had invested in the gas industry was so regular and satisfactory. For he was one of those who thought that the great progress that had been made in manufacture, distribution, and utilization was largely due to the interchange of expert opinion and experience that took place at the meetings of Institutions like this one. They had on the rolls of their Institution men whose names and fame were world-known. These were men who were not only eminent as gas engineers, but who intended to see that this particular trade at any rate should always stand in the forefront. They recognized the fact that we live in days of great competition, and therefore that no trade could stand still, but must be progressive. Not only did they understand that further improvements must be made in manufacturing, and further openings be made for their primary and secondary products, but they had taken the wise course of dealing with the education of the rising generation. The Chair of Gas Engineering and Fuel had been started and endowed at the Leeds University for the students of the gas industry. Under such conditions, he felt that the Institution were doing a great work, and that the industry, which had been so successful in the past, would be equally successful in the future. He coupled with the toast the name of the President. [Applause.] He was not surprised the announcement had been received with applause, because he ventured to say that the name of Mr. J. W. Helps in Croydon was a very good name to conjure with. Those of them who were members of the Territorial Army regarded him as one of their best recruiting sergeants; and they all knew that for many years past he had had in his mind the view that the rising generation should be educated so that they might turn out manly men. He had always been to the fore in education in Croydon. When it was suggested that technical education should be started in the borough,

they at once looked to Mr. Helps as their leader, and ever since he had been the indefatigable Chairman of their Technical Education Committee; and he (Sir Frederick) said it, without fear of correction, that it was owing to him that their local secondary schools and polytechnics were, in a very large degree, in so satisfactory a condition as now. Those present knew Mr. Helps in his capacity of engineer much better than he (Sir Frederick) could possibly do. But he did know how his services were appreciated as an engineer of eminence and distinction—a man whose heart was in his work, and a man who had a head to carry it out. He understood that their President had earned, and very properly earned, the distinction he had received at the hands of the members; and during the time he had presided over their deliberations, it had been found that he was the right man in the right place. He hoped that for many years Mr. Helps would be spared to carry on his work in connection with the gas industry.

The PRESIDENT (who was received with loud cheers), in the course of his reply, remarked that he need not say with what pleasure he saw so many friends present on this occasion, and what pleasure it gave him to welcome them to the town in which he had lived for the past 26 years. He thought also it would be agreed by those present that it must have been a great pleasure for him to sit as he had done and listen to such (he thought) flattering words as those that had fallen from the lips of a gentleman whom he might call an old friend, Sir Frederick Edridge. It was a great pleasure for him (the President) to occupy the position he did that day at the head of the great industry like their own. It was a huge industry, employing something like 150 millions of capital, and using in the course of a year something like 16 million tons of coal, from which somewhere about 200,000 million cubic feet of gas were produced. These were certainly very large figures. Sir Frederick had also spoken of the good of competition. He (the President) thoroughly agreed with him. He remembered well the days when he was a young engineer in Leeds when the great electrician Jablockhoff brought out his electric arc lamp; and there was no doubt in his mind that that was what first started the true form of competition between the two lights. It was then only possible to get something like an efficiency of 2 candles for every foot of gas consumed per hour; but now it was possible to get anything up to 45 candles, and even a higher efficiency under some circumstances, per cubic foot. He thought it would be agreed that an industry which could bring that about might still exist, notwithstanding the fact that they could only sell 1 cubic foot to do, under ordinary conditions, what it took 10 cubic feet to do before. That was worthy the praise of the public generally, because it meant economy. He was glad to hear Sir Frederick allude to the efforts that had been made on the part of the Institution in connection with education. It was in order to memorialize the name of their great leader, Sir George Livesey, that they had established at the Leeds University the Professorship in Gas Engineering and Fuel; and he was glad to see present with them that day Mr. Alderman Tetley, who was intimately connected with the work of the Leeds University, as well as Mr. Smith, their Research Chemist, who was working in connection with matters dealing with the hygiene and efficiency of gas in connection with heating. It was absolutely important in these days that those who had to deal with the consumers should be educated, so that they understood not only the practical but the theoretical side of their work. Things were entirely different now from what they were a few years ago. The Institution were endeavouring to do their best, in order to assist in the supply of what the consumers required. He appreciated thoroughly all Sir Frederick had said concerning himself. He (the President) had lived in Croydon 26 years; and he had had the good fortune to work with a broad-minded Board of Directors, always keen, and always anxious, to adopt any methods or improvements that promised to be economical. Those members who had been round the works would acknowledge that the Directors had not spared expense,

while they had not been extravagant, in the effort to get the best that was economical, and a pleasure to those who had to work the plant.

Alderman TETLEY proposed the "Town and Trade of Croydon;" and, among his remarks, were congratulations on the excellent educational opportunities offered by Croydon. While on this topic he referred to the Professorship of Gas Engineering and Fuel; and said the University of Leeds had existed as a College of Science since 1874. During the whole of that time, the object of the Council had been to try to abolish the idea that great industries like this could be worked by mere rule-of-thumb knowledge. While they afforded opportunities for practical work, they had always before them the idea that a sound theoretical, scientific, and complete knowledge was absolutely necessary for ultimate and entire success. He was glad those who had been working in the matter of the Livesey Memorial Fund in the gas industry had been pleased to give to Leeds University this handsome foundation for the advancement of the great industry.

The MAYOR (Major Fox) responded, observing that, for the borough of Croydon, they might claim there was no better, no more cleanly, or more healthy town in the three kingdoms. A great deal of the credit for this result must be given to the Croydon Gas Company. They could at once see why this was so. While the Gas Company gave them the best possible light, they were followed, aided, and spurred on by the Electricity Committee of the Corporation. There was ample room in the town of Croydon for both of these institutions to go on and flourish—each one spurring on the other to gaining something better. Without light, they could not have health; and the Gas Company had done their best to emulate the light of the sun at midday. And they had succeeded very well.

Mr. ALEX. WILSON (President-Elect) said he had a pleasant duty in proposing the toast of "The Chairman and Directors of the Croydon Gas Company," their hosts that day. Their entertainment had been exceptional; and they were all delighted. They would carry away very happy memories of Croydon. The ladies had seen the historic sights of the town, and the members of the Institution had seen what had been very aptly described as a beauty spot in the way of gas-works. This was a point they ought all to keep in remembrance—that a gas-works besides being a place of utility, could also be made (in the way they had seen) a place of beauty. The works showed what could be accomplished by a competent and enterprising engineer; and Mr. Helps was happy in being associated with a Chairman and Board of Directors who were thoroughly alive to the needs of their business. An engineer could not carry on a works such as these without he was ably supported. The prosperity of the Company was well known. In 1851, they only sent out 10,700,000 cubic feet; and in 1909 1257 million cubic feet. A large factor in this rate of progress was seen in the fact that in 1886 the number of stoves on the hire system was 594, and by the end of December last year the figure had increased to 24,321, distributed among 35,644 consumers.

The CHAIRMAN thanked Mr. Wilson for the flattering way in which he had proposed the toast, and their visitors for the way in which they had received it and endorsed the words of the proposer. He voiced his own feelings and those of his brother Directors in saying how pleased they were to see them all, and especially so many ladies. Mr. Wilson had been kind enough to refer to the efforts of the Directors in supporting their Engineer. He (the Chairman) could assure all present that it required no words from any gentleman who had spoken to raise Mr. Helps in the estimation and good fellowship of the Directors of the Gas Company. Their Engineer never put before them anything that he did not thoroughly believe in; and when he could show the Board any way in which, or anything by which, they could reduce the cost of manufacture, they were always ready to adopt it. The Chairman then proceeded to give an historical account of the inception and progress of the Company. Speaking from knowledge during his connection with the Board, it had always been the policy of the Directors to sell gas at the lowest possible price. It was now 2s. 8d. per 1000 cubic feet; and they hoped before long they would be able to reduce it again. He saw by the records that in 1847 the Manager and Collector was paid £120 a year; he was afraid they would have to put another "o" on that to retain their present Engineer. But of this he was confident—the present Board would always make it worth their Engineer's while to stay with them. In 1890, his (the Chairman's) fellow-Directors did him the honour to elect him as their Chairman; and they had done him the honour of keeping him in the position. During that period the output of gas had trebled. This was not due altogether to Mr. Helps or to the Chairman and Directors, but to the fact that the population had increased enormously.

Mr. CORBET WOODALL also responded, on the invitation of the Chairman. He said he valued the opportunity because the other day, when Mr. Helps delivered his admirable presidential address, he (Mr. Woodall) was asked, without notice, to move a resolution expressing the thanks of the members for it. He got up with the most excellent intentions of fulfilling that duty; but he found himself thinking about the address itself, and not about the writer—the result being that he sat down without saying one word with regard to Mr. Helps in his capacity as the author of the address. He did appreciate that deliverance very highly; as he was sure did all the members. It contained material that would be a lasting benefit to the industry. Those who had watched Mr. Helps's work knew how devotedly he had given himself to the service of the Croydon Gas Company; and at the same time they knew how great had been his services to the industry. One of the features in the policy of the Directors of the Company had been to find the best man as their technical head, and having found him to trust him. [Applause.] In regard to the works, they had tried to make them such as the men themselves might be proud of; and he was sure the success and prosperity of the Company had been advanced thereby.

Soon afterwards, the large company assembled on the bank of the railway siding, and were photographed. A few minutes later they were aboard the train, and were speeding their way to the Japan-British Exhibition. There they were entertained to tea by Mr. and Mrs. Helps in the Garden Club. Subsequently, the President-Elect (Mr. Wilson) proposed a vote of thanks to Mr. and Mrs. Helps; and, in

his remarks, spoke of how great a factor the President himself had been in the success of the meeting. The weather had also done its part. He ventured to hope that it would favour them at Glasgow next year. The President, on behalf of Mrs. Helps and himself, thanked Mr. Wilson and the members; and wished them all a hearty "Good-bye." The members and their ladies then roamed about the exhibition, indulging themselves fully in the sights and the music, and not a few found their way to the Gas Exhibition. One thing must be said respecting the arrangements for the day. The President has a reputation for organizing ability; and he was admirably aided by Mr. Dunn. It was in everyone's mouth that the arrangements, to the smallest detail for comfort, were as perfect as it was possible for ingenuity to devise.

Personal adieus were made later in the evening; and then we left the exhibition to enter upon a fresh year's work under the presidency of Mr. Wilson. May that year be, in the largest sense of the term, successful.

GENERAL REPORT.

The Annual General Meeting of the Institution opened last Tuesday, at the Institution of Mechanical Engineers, Storey's Gate, S.W.—Mr. JAMES W. HELPS, M.Inst.C.E., of Croydon, the President, in the chair. There was a good attendance, including many ladies.

The National Loss.

The PRESIDENT said the memory of the great loss which the nation had suffered since the members last met in that room was too fresh to allow him to open the meeting without referring to it. He did not wish to dwell upon the subject, as so much had been said in reference to it. He need only, he thought, read the formal resolution which had been drawn up, and which he would ask the meeting to pass by rising silently. It would then be engrossed and sent to the Home Secretary. It was as follows:—

That the members of the Incorporated Institution of Gas Engineers, in general meeting assembled, desire to place on record the profound sorrow they feel at the death of His Majesty King Edward the Seventh. They recall with gratitude the innumerable instances of the practical interest which their late beloved Sovereign, throughout his beneficent reign, evinced in the progress of engineering science, particularly in many of those branches relating to the industry they represent. To the Queen Mother and the other members of the Royal Family they beg to tender their respectful assurance of deep sympathy in their bereavement, and to His Majesty King George the Fifth their dutiful and loyal congratulations on His Majesty's accession to the Throne; praying that with the blessing of God he may long be spared to graciously rule over the people of this country, and those of the British Dominions beyond the sea.

Mr. ALEX. WILSON (Glasgow) seconded the motion, which was carried unanimously in the manner indicated by the President.

Confirmation of Minutes.

On the motion of the HON. SECRETARY (Mr. S. Y. Shoubridge), the minutes of the last annual meeting were taken as read, and confirmed.

Appointment of Scrutineers.

Mr. Thomas Berridge (Leamington) and Mr. Joseph Davis (Gravesend) were appointed Scrutineers.

The Annual Report

[See "JOURNAL" for May 31, p. 549.]

The PRESIDENT then moved that the annual report of the Council, and the accounts, be received and adopted; remarking that if anyone wished to make any observations upon them, it would be open to him to do so.

Mr. E. ALLEN (Liverpool) seconded the motion; and it was carried unanimously.

Presentation of Awards.

The PRESIDENT said he had now to perform the very pleasant task of presenting the prize medals to gentlemen who read papers at the last meeting, and to whom they had been awarded. The "London" Gold Medal (presented by Mr. H. E. Jones) had been awarded to Mr. J. Ferguson Bell,

for his paper on "Carbonizing." Everyone would agree that the work and investigations of Mr. Bell were no small item in the progress which had been made of late years in carbonizing matters. They would all hope that Mr. Bell would go on to further heights, in appreciation of the honour now conferred upon him.

Mr. BELL (Derby) said that he must cordially thank the President for his very kind and appreciative remarks. It was a great privilege and honour to be allowed to submit a paper to the Institution; but it was a much greater honour to receive this gold medal, which he should treasure and look upon with great gratification. If he could do anything more to further the interests of the Institution, it would be his pleasure, as well as his duty, to do so.

The PRESIDENT next presented the Silver Medal to Dr. Rudolf Lessing, for his paper on "Carbonization in Chamber Settings."

Dr. LESSING said he was much surprised at hearing that the Council had awarded him this medal, which he never expected, especially as his paper was not at all of the character of Mr. Bell's. It was not what he should call an original paper, but was merely intended as a chronicle of events; and what little of his own work was incorporated was only of theoretical nature. He was glad he had included a certain disclaimer, for events had proved that the methods of carbonization he brought forward had not, so far, been adopted in this country, and had not made any really great strides during the past year. On the other hand, he believed the practice of bringing before those interested in the gas industry the improvements which had been made elsewhere had been shown to be justified, for their old friend the horizontal retort had made enormous progress under the influence of imminent competition, and was shown to be quite capable of coping with modern requirements.

The PRESIDENT then presented the Bronze Medal to Mr. Robert Watson, of Doncaster, for his paper on "Some of the Advantages and Disadvantages of a Hot-Coke Conveyor." This was, he said, a particularly practical and useful paper; and Mr. Watson's industry in collecting so much information fully entitled him to the award.

Mr. WATSON, in thanking the Council for the honour that they had conferred upon him, which he thoroughly appreciated, said the object of the paper was to suggest that the mechanical conveyance of coke was applicable to works of small magnitude almost as much as to those of larger size. And in view of the fact that in future heavier charges were likely to be in vogue, with the result that the coke would come out of the retort more in bulk, it did seem as if the day of the barrow was drawing to its close.

Welcome to Friends from a Distance.

The PRESIDENT said he desired to offer a word of welcome to their friends from a distance, whom they were glad to see among them. He would first mention Mr. Holmes Hunt, the President of the Victorian Gas Managers' Association, whose name and work were well known in the gas world. There were also present two gentlemen from the United States—Mr. Nettleton and Mr. Burgi—whom they heartily welcomed. If he did not mention the names of others, it was simply because he did not know them; but he must express his pleasure at seeing among them Professor Smithells, of the Leeds University, whom they might almost reckon as one of themselves.

President's Address.

The PRESIDENT then delivered his Inaugural Address, which was given in the "JOURNAL" last week (p. 682). At its close,

Mr. CORBET WOODALL said he had been asked to move a vote of thanks to the President for his address; and it was also intimated that he should add to it a proposal that the Council be requested to appoint a Committee to consider the suggestions contained in the address, and prepare a report for presentation to the members dealing with the future work of the Institution in general. He regretted not having heard the whole of the address; but he had heard enough to make him, while warmly admiring it, to somewhat question the conclusion arrived at. The President spoke of the great changes which had taken place in the industry, especially during the last twenty years, and drew the conclusion that the Institution and the industry generally had not sufficiently appreciated these changes, and had not risen to the necessity for meeting them. It seemed to him that the address itself

was a satisfactory answer to this charge. As he came to the meeting, he was wondering where Mr. Helps would find subjects for his address; but as the President proceeded, he felt not only how greatly had the industry changed, but how the men who carried it on, with the President at their head, had changed with it and how keenly they were facing the problems which arose in the course of their work. When he looked back, not fifteen or twenty years, but very much farther, it seemed to him that the gas world was a new world altogether. Things went fairly smoothly in the old days; but it was delightful to him to find how, with the immense increase in the difficulty of the problems to be faced, the men entering the profession were proving themselves equal to them, and were facing them in a very successful manner. He wondered at first why he had been asked to move this resolution. But when the President, near the end of his address, spoke of the necessity not merely of dealing with the work in the gas-works but also with the selling of gas, and making known to the general community the advantages of gas and the uses to which it could be applied, he felt that, as he represented a Company who had done their share in this direction, it was perhaps appropriate that he should move the resolution. He could not agree with the President if he meant his observation about dividends being made in the retort-house to be any reflection on the old adage, because he did not think that attention could be better bestowed on any part of their work than the developments and improvements of carbonizing. At the same time, he recognized fully the point that it was in the direction to which a large portion of the address was devoted that they must look for a continued growth of the gas industry. He felt sure that if the Institution was able to show, by the work it did, that it was worthy to carry on the widely extended usefulness to which the President had referred, there would be no considerable difficulty about finding the funds. If it could be shown that the Institution was equal to the duties which had been suggested, he thought that directors and others would appreciate it, and the money would be forthcoming. He should be sorry to think that the gas industry of England fell behind their friends in France and Germany, where the amount of money placed at the disposal of Institutions similar to their own, was vastly greater than it was with us. They had shown a keenness, outside the mere meetings of Gas Associations, which he thought had been lacking here. He hoped that the suggestions now made would not be simply applauded and forgotten, but that in the near future some effect would be given to them in such a manner as had been indicated.

Mr. JOHN WEST, seconding the motion, said that those who knew the President anticipated something good; but he had given them more even than they had expected—something far superior and very far reaching. Therefore it was thought desirable that the Council should consider seriously the suggestions which had been laid before them, and take some action upon them. He would not attempt to go into the suggestions, but they would be very valuable if properly carried out; and a Committee might very properly consider them, and report to the members. In this way he felt sure something might be done to bring the Institution more to the front; for, though a great deal had been done in this way, there was still much which might be done.

The motion was put by Mr. Woodall, and carried by acclamation.

Mr. E. A. HARMAN (Huddersfield) said if it had not been too late he should have suggested an amendment, because while he heartily agreed with the first part of the resolution, he was not sure that the subsequent portion would meet with general acceptance. At any rate, he thought it premature to pass a resolution of this sort in a hurried manner. He should like to have some opportunity of suggesting the division of the resolution.

Mr. WOODALL said he felt no disposition to alter the terms of the resolution; but if there was a general feeling that it should be amended, no doubt there would be an expression to this effect. After a pause, he declared the resolution had been carried without a dissident.

The PRESIDENT thanked the members, and especially Mr. Woodall and Mr. West, for their kind appreciation of his efforts. He had only one object in view in preparing the address, and it was to try and secure for the working of the Institution more support all round than it had hitherto received. He knew Mr. Woodall had in mind the kindly contributions of the directors and committees of gas companies and gas undertakings on various occasions when they had been approached. But he could assure him that where

one met them in this way there were three or four who absolutely refused. He thought it very important that the whole matter should be generally considered, and that every company should take its share in providing the necessary fund for carrying out the work of the Institution. He need not say more now, but would only thank the members for their kindly approval, which he much appreciated.

Reading of Communications.

The reading of papers, &c., was then proceeded with. They were taken in the following order:—

Tuesday.—"Public Lighting from a Municipal Point of View," by Mr. JACQUES ABADY.

Wednesday.—Report of the Gas-Heating Research Committee. "Gas Calorimetry in the United States," by Mr. J. B. KLUMPP. "The Management of Small Gas Undertakings and Works," by Mr. F. J. WARD.

Thursday.—Report of the Carbonization Research Committee. "Experiments in Carbonization on the Birmingham Coal-Test Plant," by Dr. W. B. DAVIDSON. "The Latest Installation of De Brouwer Stoking Machinery and Coke-Handling Plant," by Mr. S. Y. SHOUBRIDGE. Report of the Refractory Materials Research Committee.

The Benevolent Fund.

On Wednesday, the annual meeting of the donors and subscribers to this fund was held. A report of the proceedings will be found on the next page.

The New Officers.

The PRESIDENT announced the result of the election of office-bearers for the current year, as follows:—

President.—Mr. Alexander Wilson, of Glasgow.

Vice-President.—Mr. J. Ferguson Bell, of Derby. [Mr. R. G. Shadbolt, of Grantham, is Senior Vice-President.]

New Ordinary Members of Council.—Mr. F. J. Bywater, of Birmingham; Mr. F. W. Goodenough, of the Gaslight and Coke Company; Mr. W. R. Herring, of Edinburgh; Mr. Herbert Lees, of Hexham.

Auditors.—Mr. J. L. Chapman and Mr. Ernest W. Drew.

Hon. Secretary.—Mr. S. Y. Shoubridge.

The following candidates for membership of the Institution were elected.

MEMBERS.

Armitage, Cecil R., Morecambe.
Armstrong, James, Ilfracombe.
Baillie, William, Keighley.
Brock, William E., Denbigh.
Blakey, Harry, Shipley.
Brooks, Alfred E., Ascot.
Campbell, John M., Margate.
Carpenter, Bertram A., Sheerness.
Clarry, George, Manager and Secretary, Cardiff Gas Company.
Cockey, F. G., Tramway Company, Bahia, Brazil.
Codgbrook, C. A. W., Berkhamsted.
Davidson, William B., Chief Chemist, Birmingham Gas Department.
Davies, D. J., Hirwain, Glamorgan.
Elliott, Arthur H., Engineer-Chemist to the New York Consolidated Gas Company.
Franklin, Thomas E., Barry.
Franks, Ernest A., Ferndale, Glamorgan.
Gaunt, J., Aberystwyth.
Harrison, R., Monaghan.
Kennedy, M. J., Palmerston North, N.Z.
Madden, H. D., Engineer, Cardiff Gas Company.
Mosley, L. D., Seaford.
Murray, S., Pontycymmer.
Nelson, R., East Hull Gas Company.
Robb, James, Beaufort, Breconshire.
Swain, Edward H., Pontypridd.
Taylor, B. L., Colonial Gas Association, Melbourne.
Taylor, J., Mossley.
Tervet, W. P., Devonport.
Towers, Cyril, Brentwood.
Ward, Alfred J., Bute Gas Works, Cardiff.
Watson, C. A., Charters Towers, Queensland.
White, F. C., Treharris.
Wilkins, P. S., Godalming.
Willoughby, John H., Santos, Brazil.
Woodcock, T. H., Stroud, Glos.

ASSOCIATE MEMBERS.

Barber, Leonard G., Assistant-Manager, Oriental Gas Company, Calcutta.
Browning, R. G. S., Assistant-Engineer, Neath.
Chamberlain, Horace, Assistant, British Gas Company, Hull.
Dougall, Percy, Newquay, Cornwall.
Evans, Owen, Assistant-Manager, Wrexham.
Halstead, John W., Assistant-Manager, Walsall.
Helps, Reginald A., Assistant-Engineer, Jersey.
Hogg, Walter T., Assistant-Manager, Mitcham.
Jolliffe, Wilfred E., Assistant, British Gas Company, Hull.
Jones, Charles H., Assistant-Engineer, Gavette Gas-Works, Genoa.
Pearce, Frank J., Assistant, Bath.
Pelley, Charles A., Assistant, Teignmouth.
Port, Horace N., Works Engineer, Woodstock, Cape Town.
Robins, Walter T., Assistant Lighting Engineer to the Great Western Railway.
Sumner, Arthur W., Assistant-Manager, Grays.
Wayte, William H., Distribution Superintendent, British Gas Company, Norwich.

Honorary Members.

The PRESIDENT moved the election as honorary members of the President of the Société Technique de l'Industrie du Gaz en France, the President of the German Association of Gas and Water Engineers, and Mr. R. Forbes Carpenter, the late Chief Inspector under the Alkali Acts.

Mr. S. GLOVER, in seconding the motion, said Mr. Carpenter was a very old friend of his, and it gave him great pleasure to second his nomination, because he had shown throughout his official career very great interest in the gas industry, and in the related industries of sulphate manufacture, &c.

The motion was carried unanimously.

Place of Next Meeting.

Mr. ALEXANDER WILSON said he first desired to thank the members for the honour they had done him in electing him President, which he highly appreciated. He also recognized the responsibilities of the position and the work it entailed. But he would endeavour to maintain the high standard set by Mr. Helps and the other eminent men who had preceded him; and, with the assistance of his colleagues on the Council, he would do his utmost to further the best interests of the Institution. With regard to the meeting-place next year, he cordially invited the members to Glasgow.

Bailie PAXTON said he had great pleasure in seconding the motion. The present was his third appearance at the meetings of the Institution, and his principal mission now had been confided to him by the Corporation of Glasgow, and by the Lord Provost himself, to extend to all the members a very cordial invitation to the city of their adoption—Glasgow—this time next year. They were very interested just now in Glasgow in purifying the air, having succeeded in purifying the Clyde; and, if the Institution met there, they would help forward this crusade. He assured them that in no place would they be more warmly received. Under ordinary circumstances, and if his constituents showed their usual good sense, he would be the Convener of the Gas Committee, and would have charge of the arrangements; and he promised the members personally, on behalf of himself and his colleagues, that nothing should be left undone to make the visit a pleasant one.

The PRESIDENT said the Institution were deeply indebted to Bailie Paxton and the Corporation of Glasgow for their kind invitation. It seemed to him hardly necessary to put the motion; but, as a matter of form, he would do so.

The motion was unanimously carried.

Mr. ROBERT MORTON, as one who had known the new President all his life, expressed the hope that he might be allowed to congratulate him on the position he had attained.

A General Advertising Fund.

The PRESIDENT said he had received a letter from the Secretary of the Tottenham and Edmonton Gas Company, to the effect that the Company approved of a proposal which had been put forward to form a general fund for advertising the advantages of gas for all purposes, and undertook to contribute 2s. 6d. per million cubic feet sold (provided fifty other gas undertakings would enter into the same arrangement), and were prepared to guarantee this subscription for a period of three years. He hoped that this excellent example would be shortly followed, not only

by the fifty undertakings stipulated for, but by practically the whole of the gas-works in the United Kingdom.

Votes of Thanks.

Dr. COLMAN proposed a hearty vote of thanks to the President, not only for his services in the chair, but also for the work he had done for the Institution throughout his year of office. They all knew how the duties of this post were increasing; and, apart from the hard work of the week, there was the constant attendance to the business coming before the Council. Moreover, it was deemed the duty of a President in these days to visit, as far as possible, each of the Affiliated Associations during the year; and Mr. Helps had well carried out this work. Beyond this, they all felt personally indebted to him for the kind assistance he was always ready to give to any member who applied to him. The resolution also included thanks to the Council and the Honorary Secretary (Mr. Shoubridge).

Mr. KENDRICK said his late experience in all three fields in a somewhat similar constituency made him thoroughly appreciate the work which had been carried out; and he heartily seconded the resolution.

The motion was put, and carried unanimously.

The PRESIDENT thanked the members and Dr. Colman, not only for the kindness they had all shown, but for the attention paid to the business, and the very satisfactory way in which they had come to listen to the papers. He should always look back on the week of the meeting as one of the most pleasant he had ever spent. He also returned thanks on behalf of Mr. Shoubridge and the Council.

Mr. E. ALLEN (Liverpool) proposed a vote of thanks to the Chairman and Directors of the Croydon Gas Company, for their invitation to inspect the works, and for the hospitable arrangements they had kindly made for the reception of ladies and members; also to the Council of the Institution of Mechanical Engineers, for their kindness in granting the use of the room for the meetings.

Mr. T. GLOVER (Norwich) seconded the motion; and it was carried unanimously.

Mr. D. H. HELPS (Reading) proposed a hearty vote of thanks to the authors of the papers, to the Research Committees on Gas Heating, on Carbonization, and on Refractory Materials, to the Scrutineers, and to the Auditors. He said the members would all agree that the papers they had heard had not only been most interesting, but would be of very great value to the industry. The large and continuous attendance at the meetings showed how much their efforts had been appreciated.

Mr. B. W. SMITH (Walsall) seconded the motion, which was carried unanimously.

This concluded the business.

THE BENEVOLENT FUND.

The Annual Meeting of Donors and Subscribers to the Benevolent Fund was held on Wednesday morning—the chair being occupied by the President.

The minutes of the last annual meeting were taken as read. The minutes of a special meeting which confirmed an alteration of rules were read.

The PRESIDENT, in moving the adoption of the report of the Committee of Management (which was taken as read), said it was his own feeling, and that of the Committee generally, that it was unsatisfactory to find that less than 25 per cent. of the members were subscribers to the fund; the result being that they were unable to consider favourably the whole of the applications received. They had either to cut down considerably the benefits given to deserving cases, or to refuse them altogether. In such an Institution as this, with nearly 900 members, it was an unfortunate circumstance that comparatively so few should subscribe to the fund. He should like to acknowledge the way in which the Affiliated Associations had taken the letter which he had personally addressed to them some time ago, drawing attention to the importance of their assistance in getting members to subscribe. As a consequence of the appeal, the Manchester District Institution gave £10 10s., and did what they could to obtain individual subscriptions; the Eastern Counties Association of Gas Managers had obtained subscriptions to the amount of £3 or £4; the Isle of Wight Association gave a donation of £3 3s.; and the Wales and Monmouth-

shire Association obtained a considerable number of new subscribers. In this way, their wants for the present were perhaps met; but only for the present. They were able to deal with the cases they had in hand; but they wanted to feel that they had funds enough to enable them to deal fairly and generously with all the cases which came before them. He hoped those present would do what they could, by speaking to their friends, to get them to subscribe, if they did not already do so. He might also mention that, although they did not appeal for subscriptions to anyone outside the Institution, the Committee did not refuse offers of help from any quarter. He had a letter the other day from the proprietors of the "Gas World," asking whether any outsiders would be allowed to subscribe; and the reply to this was that they would be glad to receive a subscription. Consequently, the proprietors of the paper subscribed £2 2s. to the fund.

Mr. J. F. BELL (Derby), in seconding the motion, pointed out that the amount received in subscriptions during the past year was only £143, and the assistance granted amounted to £255; so that, if it had not been for the interest on investments, there would have been a deficiency of over £100. He believed it only required to be known personally to members that they were in need of further funds, and they would be forthcoming. It was a great pity that there were only about 200 subscribers out of 900 members of the Institution; and he appealed, especially to the younger members, to do all they could to increase the number of subscribers.

Mr. H. KENDRICK (Stretford) asked if the list of local Associations mentioned by the President who had assisted during the year was complete. He had been present recently at two District Association meetings—viz., the North of England and the Midland—where the matter had been brought forward.

The PRESIDENT said the explanation was simply that he had given the names of those District Associations who had communicated directly with the Secretary. He knew that other Associations were considering the matter, but had not yet sent in the result.

Mr. KENDRICK further suggested that a reminder should be sent out to the members every year. He thought some dropped their subscriptions simply from forgetfulness.

The PRESIDENT said the Secretary was in the habit of sending out reminders. He feared it was not forgetfulness only which led to dropped subscriptions.

Mr. GEORGE HELPS (Nuneaton) said he was very sorry to find that the Committee were really unable to meet the demands made upon them; but this being the case, he had scrutinized the list of subscribers, and found that there were some 65 subscribers of £1 and over, and 139 of 10s. 6d. and under. It was a good adage to "Look at home;" and it occurred to him to put the question, Were the present subscribers doing all they could to set an example to those who at present stood aloof? They were most of them proud of their positions, proud of their works, and proud of many other things; but he thought there was room for those who were receiving large salaries to show a little more pride in the matter of the Benevolent Fund. If they increased their own subscriptions, they could appeal more effectively to those who did not subscribe. To show that he was in earnest, he was prepared to give £10 at any time when the funds were deficient—not that he could afford it, but he would take the responsibility of collecting it from his friends, who, he had no doubt, would subscribe in that way, if in no other.

The PRESIDENT said that they were much obliged to Mr. Helps for his remarks; but, personally, he felt that it would be far better to get an increase in regular subscriptions from all the members than to get large subscriptions from those who were able to afford it. Still, if anyone else would be good enough to do something on the lines that Mr. Helps suggested, and work among those who had not subscribed hitherto, and get them to do so, it would be a very good thing. It was much better to get a great number of small subscriptions than a few large ones; and if they could only secure an average subscription of 10s. 6d. from all the members, instead of having a total of £140, they would have between £400 and £500, which would probably be sufficient to meet all demands.

The resolution was put and carried unanimously.

The PRESIDENT then announced that the Scrutineers reported that Messrs. Thomas Berridge and Henry Woodall, jun., had been elected to serve on the Committee.

This concluded the business.

COMMUNICATIONS READ.

PUBLIC LIGHTING FROM A MUNICIPAL POINT OF VIEW.

By JACQUES ABADY, M.I.Mech.E., of London.

To the casual observer the question of public lighting appears to be, no doubt, a simple and straightforward matter, involving no more difficulty than placing lamps on columns, lighting them when dusk approaches, and extinguishing them at break of day. As a matter of fact, however, the problem is one of very considerable difficulty because it concerns so many diverging interests. The public, for instance, as it becomes more and more used to improved lighting in dwellings and shops, expects that the lighting of highways will keep pace with such improvements, but does not of course expect to pay more for it. The municipality has to consider the question of cost, and its relation to rateable value; while those supplying the light regard public lighting as something of an advertisement, and naturally enough desire to introduce whatever improvements may be forthcoming from time to time, so that the lighting of the streets may represent the last word in the form of illuminant installed therein. It will, therefore, be seen that there are several separate interests requiring to be reconciled; and I think consideration as to how this can best be done is worth the attention of the Institution of Gas Engineers.

Although from a municipal point of view, the form of illumination would appear to be of secondary importance compared with the volume and distribution of the light itself, yet there is no doubt that the severe competition between gas and electricity almost invariably comes into fierce play when lighting schemes are under consideration. And the relative positions of gas and electricity might perhaps form part of a discussion upon the subject of public lighting. I am, however, free to admit that, given a light of a certain value, distributed in a certain manner, it does not seem of importance to the public whether that light is produced by gas or by electricity; the sole consideration should be the question of relative cost.

It will, therefore, be more profitable to examine the following different forms of street-lighting contracts which are in vogue, and to which members have all at some time or another had their attention very forcibly directed:—

- (A). The contract for supply of energy with maintenance, payment being made for so much energy and not for so much light.
- (B). The contract for supply of energy only, maintenance being undertaken by a contractor acting for the municipality or the municipal public lighting department itself.
- (C). The contract for supply of light, payment being made for so much light irrespective of the energy required to produce it.

What are the relative merits of these forms of contracts (which will be termed Contracts A, B, and C) always assuming them to be equally well drafted in the legal sense, and how do they assure what I venture to point out as desiderata? (which will be termed Points 1, 2, and 3) viz.,

- (1). The due observance of the terms of the contract entered into.
- (2). The efficient maintenance of the standard of lighting contemplated by both parties when the contract was entered into.
- (3). The facility or encouragement for either party to take advantage, during the contract period, of the introduction of improved methods, to either reduce the cost of producing the light, or obtain a greater light for the same cost.

Let me say at once that I look upon a contract as something very difficult to draw up, but comparatively easy to break, in spirit at least; and that it should be borne in mind that it is of the utmost importance that the terms of any contract should establish a mutuality or community of interest—that is to say, it should be to the advantage of both parties to keep to the terms agreed upon. It is one thing for a lawyer to present in triumph to his client a draft contract with a verbal handcuff in every line; but it is quite another matter to look at a question from the point of view of both the contracting parties, and draft an agreement which it is to the personal or pecuniary advantage of both signatories to keep.

Bearing this in mind, and also the desiderata already set out, we may proceed to examine the alternative forms of contract stated under A, B, and C.

CONTRACT A.—For the supply of and payment by energy—maintenance being undertaken by the contractor for energy.

Point 1.—The due observance of the terms of this contract naturally hinges upon the facility for measuring the energy supplied. This may be gas or it may be electric current. If the former, it may be agreed to supply through burners with nipples which, tested in the laboratory at a certain pressure, will pass so much gas. To make such a test involves the removal of the burner from the post; and the removal and test of one or a few burners is no guarantee that the bulk are under the same conditions, nor that the pressure under which the burners are tested in the laboratory will be maintained in every street and at every lamp. This can only be ensured by a liberal and constant use of pressure recorders; and the presence of these might easily stop progress in the direction of improved means of gas distribution. If however the contract stipulates a certain consumption by the nipple test, and the maintenance of a certain pressure all over the district, with damages for failure in pressure, it will be seen that by this method a general penalty would be inflicted in respect to many lamps when a failure in pressure is found.

Alternatively, the agreement may involve the use of a governor at each burner; and assuming for a moment the invariability of governors, their introduction is also unsatisfactory because the efficiency of incandescent gas lighting is hampered by limitation of pressure, and therefore the use of increased pressure should be encouraged and not discouraged, as it is by the use of governors. In fact, it is now recognized that just as with an electric lamp the energy is measured by the product of current (amperes) and pressure (volts), so with an incandescent burner the energy is properly measured by the product of current (cubic feet) and pressure (in terms of atmospheric pressure). These two methods of fixing the basis of payment, therefore, seem to fall short of efficiency, and are not to be recommended on this account. The further method of fixing the basis of payment is either by an average-meter system or by tests of consumption *in situ*; and as to these I think the former is unsatisfactory because it naturally induces a tendency to excessive consumption of gas, and does not ensure a community of interest, while the latter, the "*in situ*" method, is one which presents considerable difficulty in carrying it out. When we examine the method of measuring energy as applied to electric current, we find the same unsatisfactory state of affairs. If a lamp is removed and tested in the laboratory, there is firstly no guarantee that the pressure or voltage in the district will be the same as in the laboratory, and there is further in the case of arc lighting no guarantee that the pressure is being effectively applied at the arc itself, or whether, instead, it is being reduced by the lamp mechanism. These remarks dispose, I think, of the first point—viz., the observance of the terms of the contract.

Point 2.—The second point is the efficient maintenance of the standard of lighting under the contract. In the case of a gas-lighting contract, the gas company, be it remembered, is maintaining; and it therefore rests with the company to see that glasses and lanterns are kept clean, that burners are free from dust, and that mantles are replaced when required. So that, assuming *bona fides* and willingness on the part of the company, there is nothing in this form of contract to prevent the standard of lighting being maintained. But looked at from the municipal side of the table, there would be considerable difficulty, in the case of a careless or unwilling gas management, in ensuring that the condition of the public lights shall always be satisfactory. New mantles might be fitted when required; but the quality of the mantles might be poor, and a poor illumination obtained, notwithstanding that the maintenance terms may be adhered to literally. Similarly with an electricity contract. Filament lamps giving a high efficiency, and good carbons might be used if the electricity company so wished. But if not, then inefficient lamps and poor carbons (selected on account of low price) might very conceivably be the cause of a poor illuminating effect, notwithstanding a literal adherence to the terms of the contract.

Point 3.—The third point is an exceedingly important one—viz., what facility or encouragement does this form of contract give to either party to introduce improvements which would reduce the cost of lighting or increase the

light without increase in cost. In this respect I think this form of contract is particularly weak, and will bear a brief examination.

A gas company enters into a contract for a term of years, to supply so many lamps with so much gas per lamp, and maintains the burners. When the contract was entered into, they agreed upon (say) 4 cubic feet per hour, probably at a certain pressure, and contemplated producing thereby a light of (say) 60 candles. All the municipality can demand is the 4 cubic feet per hour. An improved burner is placed upon the market consuming (say) 3 cubic feet of gas, at probably an increased pressure, and yielding (say) 75 candles. Now if the gas company approached the municipality with a proposal to be allowed to substitute the improved burner and pay for the capital cost by the saving in gas to be effected, what is the probable reply of the municipality? Surely in nine cases out of ten it would be that 4 cubic feet is the contract, and that if 3 cubic feet are to be used, a proportionate reduction must be made in the lighting bill. In other words, the municipality would no doubt overlook the fact that improvements in light will probably be effected in the future by a decreased consumption and an increased pressure. Where, therefore, is the incentive to any gas company to reduce its revenue from consumption, and bear the additional capital cost for new burners?

If it is an electricity contract, and we therefore substitute "carbon filament lamps" for "4 feet per hour" and "metallic filament lamps" for "3 feet per hour," is there not a very similar situation created, and would not the same causes operate to prevent improvement, through replacing carbon lamps by metal lamps or carbon arcs by flame arcs? It will be seen that this form of contract is, therefore, against the interests of the public and does not commend itself to the municipal point of view. An example of the stop to progress and improved lighting which follows on this form of contract is to be found in an agreement entered into by the City of Westminster with the Westminster Electric Supply Corporation. It is for supply and maintenance of arc lamps and filament lamps all to consume specified energy at a specified pressure at an inclusive charge per lamp per annum. This contract is, I admit, for a very long period; but this does not affect the point. Open arc lamps, with ordinary carbons and carbon filament lamps, are used; and the consequence is that there is an enormous consumption of current for a poor lighting effect, whereas the substitution of more modern lamps would either enable the same light to be produced for very much less cost or else a vastly improved light to be obtained for the same consumption of current. This example shows clearly how the public interests suffer from a contract of this nature.

CONTRACT B.—*For the supply of and payment by energy, maintenance being undertaken by a separate contractor acting for the municipality, or by the municipal public lighting department itself.*

Point 1.—This form of contract is to a great extent similar to the first form already discussed; and the preceding remarks with regard to the due observance of its terms apply to it.

Point 2.—With regard, however, to the efficient maintenance of the standard of lighting contemplated by the contract, it is on a different footing, for while it is obvious that the municipality (whether it maintains by itself or through a separate contractor) has greater control over efficiency in this respect, yet it will be equally obvious that the interests of the contractor for the energy are very much at the mercy of the municipality. Thus if the maintenance contractor neglects the maintenance, the energy contractor suffers; while if the municipal lighting department (taking as it often does the energy from another municipal department which is in competition with a competitive form of lighting) is interested in doing what it can for its sister department, it is plain that the competitive form of lighting suffers, and real competition is at an end.

It would be affectation to deny that there are many corporations with a municipal gas (or electric) service, a lighting department, and an electricity (or gas) company in competition; and that the outside competitor is denied a fair chance, and on this account the public interest is sacrificed. From my municipal point of view, I hold this to be an unsound position, and I am trying to make clear how this sort of position can arise under the form of

contract now being discussed. Where an outside contractor carries out the maintenance, the situation is almost as bad from the energy contractor's point of view, and certainly as bad from the public point of view. An instance of this is Marylebone. Here the gas company undertook to supply gas at so much per thousand. The borough employed a contractor to maintain. Tests which came under my immediate notice showed the efficiency of the gas lighting to be bad—due merely to insufficient attention to burners and lamps. The Council which owns an electricity service was able to put forward a scheme of electric lighting which was obviously better than the results being obtained from the gas lighting; and so the gas company, whose position was prejudiced and whose hands were tied by the state of the gas lighting over which it had no control, lost the public lighting. This is put forward as an example of the weakness to the contractor of this form of contract.

Point 3.—Now when we consider this form with reference to the third point—viz., the facility or encouragement to either party to introduce improvements which would reduce cost or increase the lighting without increase in cost—there is a position strikingly different to that under the first form of contract. Provided the contract does not limit the pressure of the gas supply, the municipality can obviously, if it chooses to pay for them, instal improved burners and give its public a better light, without affecting the contractor's position in the least. What it cannot do, however, is to give the same light by the introduction of improved burners, and reduce the cost of gas or electricity, and so reduce the cost to the public of its lighting bill. Of course, if there were simply an agreement to pay for what total energy is consumed without specifying so much energy per lamp, then such reduction can be made, and the municipality has an absolutely free hand. But then the difficulties of measuring the total energy are very great, and I know of no instance (although there may possibly be some) in which the payment for total energy is made in this way.

An interesting example of the contract in which the company supplies energy, and the municipality maintains, is to be found in the recently executed Calcutta Corporation contract drawn up by my friend, Mr. Alfred Mansfield, as technical adviser to the Corporation, and entered into by that body and the Oriental Gas Company. In the appendix to the present paper are set out the salient clauses in this contract; and those who read them will agree they are drawn in a way which does Mr. Mansfield's thoroughness great credit. I am informed that the contract which this replaces was one for so much light per burner at so much per burner per annum, that this was found to be inelastic because, being for a long period, it set up a standard long since past and at prices now capable of considerable reduction, and that this example shows the weakness of a contract for a certain light at a certain price, which will be dealt with presently.

However that may be, it will be noted that, in order to carry out thoroughly the "B" form of contract, it has been necessary to specify tests of burner nipples, minimum pressure involving forfeiture for default, precautions and safeguards to prevent the Corporation being bound to buy gas at a pressure which may later on be below the generally prevailing minimum which improvements may necessitate, and finally tests of the constituents and quality of gas and its freedom from impurity. It must be pointed out that the Calcutta Corporation are in a position with respect to the Gas Company somewhat analogous to a local authority under the Gas-Works Clauses Act; and on this account the testing clauses are very complete and detailed. But I suggest that even if this were not the position of the Corporation, there is very little which Mr. Mansfield could have omitted if he desired to protect the Municipality as buyers of gas for public lighting from the Gas Company. In other words, it seems that this Calcutta contract carries to its logical extreme the testing arrangements necessary for the public protection if an "A" or "B" contract is entered into with a gas company by a local authority.

There is one matter—purely a statement of my own opinion—which both the "A" and "B" contracts seem not to provide for—that is the question of the decreased quality of gas and increased pressure. "B" contract (as exemplified by the Calcutta agreement) and "A" contract (if it is drafted properly) must specify pressure and quality of gas. Now it seems to me a direction in which future improvements in the efficiency of gas lighting may be found will be in a reduction of the quality of the gas, and an

increase in the pressure at which it is supplied, so that by reducing on the one hand the amount of air theoretically required for perfect combustion, and increasing on the other hand the mechanical means by which that theoretical amount of air is obtained in practice, we shall be enabled to burn the right quality of gas under conditions of absolute maximum efficiency. It will be clearly seen that contracts "A" and "B" specifying as they do either (or both) consumption, pressure, and quality, prevent improvements in the direction suggested.

In connection with contract "B," there is a point of very vital interest to the public which should not be overlooked—that of expense. It is obvious that there are limitations, both by statute and commercial expediency, which govern the price at which it is possible or lawful for electric or gaseous energy to be supplied. At or above this limit, therefore, must such energy be sold to a corporation. There is, however, no limit to what a company (gas or electric) may do in the way of cheap maintenance; and so it will be found, I think, that "Energy + Cost of Maintenance by a Corporation Lighting Department" is, or may be, considerably more expensive than "Energy + Maintenance by the Energy Supplier." On the question of expense, again, where there is a contract "B," there is the possibility of a cheese-paring policy of maintenance being adopted by the municipality, so that for a more or less unimportant annual saving (too often a paper one), the efficiency of the lighting is sacrificed, and the odium falls upon the contractor for energy. The tendency to show savings on estimates is one which the average councillor finds almost irresistible. It would appear to be an ineradicable human weakness.

CONTRACT C.—*For supply of light, payment being made for so much light irrespective of the energy required to produce it.*

Point 1.—The question as to control over the proper fulfilment of this class of contract is one about which there is undoubtedly considerable difference of opinion, and plenty of room for discussion; and, in order that there may be something concrete to discuss, in an appendix are set out the salient clauses of the contract for lighting entered into by the Westminster City Council. The testing clause is one to which attention is particularly directed, because this is the centre of gravity, as it were, of a contract which is for the supply of so much light. I am not personally responsible for the drafting of the clause, and frankly admit there are many alternative methods of framing a clause to a similar effect. I append one hereto as follows:—

Each lamp is to be fitted with burners, mantles, globes, and fittings, as the case may be, giving a minimum of ——— standard candle power, respectively, as directly measured by the Council's portable photometric apparatus placed at an agreed distance above ground level, and is to burn ——— hours per annum in accordance with a daily schedule to be hereafter supplied by the Council. The fittings and lamp must be in every respect to the satisfaction of the city engineer; and in particular the reflectors above are not to be shaped so as to concentrate the illumination at the foot of the lamps, but horizontally flat or slightly convex or otherwise as may be approved by the city engineer, so as to disperse the rays. The tests will be taken in such a manner as to ensure that the glazing bars shall not interfere with the results obtained.

The candle power shall be arrived at by taking the average of two sets of readings in any position with regard to the light under test—one set at an angle of 20° and a second set at an angle of 50° to the horizontal. The photometer used shall be one working on the law of inverse squares, and so constructed as to read accurately whatever the respective colours of the light under test and standard light.

Not less than three and not more than six readings, at regular intervals of not less than 30 or more than 60 seconds, shall be made at each angle; and the average of the readings shall be termed the reading or illuminating power at that angle. If, upon a test being made, the illuminating power of any lamp falls below the prescribed standard and is not more than 10 per cent. below it, a test may be made of each of the two nearest lights; and if the aggregate of the light from the three lamps equals the aggregate required by the contract, no damages shall be recoverable. The tests only to be made in reasonably clear weather—not during rain, mist, or fog—and in the presence of a representative of the contractor should be so desire.

The intention of this contract is that the contractor shall assure himself, by continued test and inspection, that the lamps he provides are, during lighting hours, fulfilling in all respects the requirements of this contract; and he shall not claim relief from the conditions of this contract on the grounds of non-notification on the part of the Council of any failure to comply with the terms of this specification.

The light given shall be of a steady, invariable character, of a white or yellowish-white colour.

Now the questions that arise on this clause are two. Firstly, does the manner of applying the photometer test ensure an adequate fulfilment of the lighting contract; and,

secondly, is the method of making the test itself such as to remove all ambiguity and ground for dispute with respect to any test—in other words, is a photometer test sufficiently definite and certain? On the first of these points it should be observed that the light is determined "as the average of two readings in any position with regard to the light under test, one reading at an angle of 20° and a second reading at an angle of 50° to the horizontal." It will be seen from this that no question of gas or electricity consumption or pressure is involved, but merely a direct photometrical comparison at two definite angles; and the following is the reason why the two angles of 20° and 50° were selected.

It must be recognized that to select any particular angles favouring one form of light would be most unfair. It will also be recognized that to take the mean hemispherical candle power is not practicable, as the comparison involves readings at each angle from 90° to 0° , which is impossible with a test *in situ*, besides being a tedious matter. It will further be recognized by those who have studied street-lighting problems that to include in such a photometrical test either of the angles of 80° , 70° , or 60° would be highly undesirable, because it is at these angles (*i.e.*, in the vicinity of the lamp-post) that one usually gets an excess of light to the detriment of the rays thrown upon the area more distant from the lamp, and their inclusion would encourage, instead of discourage, the distribution of a large volume of light near the post. Now it so happens that if the lighting curves of all types of lamp are examined—electric and gas, arcs, filament, upright and inverted mantles (high and low pressure)—it will be found that in the majority of cases the mean of the light given at 20° and 50° practically coincides with the mean hemispherical intensity, and therefore represents the value as candle power. Of course, it might be possible for an enterprising individual to make a lamp giving (say) 180 candles at 50° and none elsewhere; and this would be a 90-candle lamp. But a lamp such as this would not comply with the general specification of the Westminster testing clause; and the example is here sited simply as a *reductio ad absurdum*.

I emphasize the fact, before leaving this point, that there is no question of the light being defined by a foot-candle test; for one must admit that, had this been done, there would have been introduced all kinds of difficulties and problems (as to the behaviour of light rays with respect to surfaces and view point), about which photometrists themselves are not agreed. The test specified involves simply the light of the lamp itself and the photometer. There is moreover no ground for ambiguity as to the meaning of the contract, because certain candle powers on columns of certain heights are specified throughout. Thus, in the competitive sense, it is a question of price against price for the supply of the same light without any quibble whatever.

The remaining question, then, is whether it is possible to test in such a manner as to remove all grounds for ambiguity and dispute. As a photometrist, I naturally see no difficulty at all in the matter. But it is possible that those who are not photometrists will look upon a photometer as a very indefinite and indifferent foot-rule indeed; and, of course, it must be admitted that it is necessary to define the kind of instrument and the way it shall be used, in the clearest possible manner. It appears to be quite satisfactory to take an instrument based upon the law of inverse squares, and in which such means of obviating reading errors—due to either colour difficulty or stray light—are provided, as may be agreed upon between the parties entering into the contract. It is also quite simple to agree upon a definite primary standard of light; and it is equally simple to agree upon the secondary standard. This being the case, and it seems that these are all points which are demonstrable, What safeguards against error or chances of dispute should be provided?

I think that these are three—viz., (1) A definition of the weather in which official tests are permissible; (2) absence of infliction of damages if the two lamps nearest to a defective lamp are giving such light as will bring the average of the three up to standard; and (3) the presence of a contractor's representative should be permitted during any test. If one admits the physical possibility of making accurate tests, then what one has to guard against is *mala fides* on the part of the tester, and tests being made under conditions which are beyond the control of the contractor and which might affect the accuracy of the test or the apparent power of the light tested. Surely, if analogy is needed, we only have to turn to the candle power or calorific power or any of the

penal tests now in vogue, and upon which a contractor can be penalized; and we find that just the same conditions will apply. I consider that there is less liability to error in a street test at different angles, because one measurement is involved—viz., a photometer reading; whereas in a quality test, there is liability to error in measurement of the gas, through error in the meter, in the clock, and what not. It must be admitted as a weak point in this form of contract that, because one or a dozen or twenty lamps are tested and found to be giving the specified light, this is no guarantee that several hundred or thousand of lamps will be doing the same thing. On the other hand, there is no limit to the number of lamps which the corporation can test daily if they wish; and further than this a contractor would never know where tests would be made on any night.

Upon the question of the practicability, in working, of such a test clause, it might be pointed out that in Westminster we have already had five years' experience with a gas and electric light contract; and I am not aware of a single dispute, though defects have been found, charged, and paid for. Further, as members will know, invitations were recently issued by the Westminster Council to the Gaslight and Coke Company and to several Electricity Companies, to tender for lighting on this basis, and several offers were received. So certain, apparently, were the Gaslight and Coke Company of the soundness of the basis of the contract and their ability to comply with its terms, that they quoted such prices as have not only ensured to them a continuance of the present gas lighting, but the transfer of several west-end thoroughfares which have been lighted by electricity for some years. And this is after they have had five years' experience of a contract on a photometer basis, made with a Corporation which is most stringent in the carrying out of all its agreements.

If, then, we assume the practicability of the photometrical valuation, how does this contract "C" affect the points 2 and 3?

Point 2.—It is unnecessary to labour the point that this contract ensures—so far as any contract can—"the efficient maintenance of the standard of lighting contemplated by both parties when the contract was entered into." "A" undertakes to supply so much light. "B" undertakes to pay for it if he gets it. He determines whether he gets it by measuring it in a previously agreed manner. It is not necessary to say more as to this. Of course it is obvious that in a contract of this nature, maintenance by the contractor is implied. Otherwise he could not be responsible for the light.

Point 3.—Does this contract facilitate or encourage the adoption by either party of improved methods? It seems to me that it does, because if the contractor finds that he can produce the same light at a cheaper cost, or a better light for the same cost, he would surely approach the corporation and offer to share the benefit of such improvement; and it would be imagined that there are very few municipalities in which the officials or elected members are so neglectful of the public interest as not to take advantage of such an opportunity. As an example of this, an incident occurred only last year when the St. James's and Pall Mall Electric Lighting Company approached the Westminster Corporation with an offer of this kind, which was accepted, and we have been obtaining two or three times the light originally contracted for, without any increase in annual cost. On the other hand, if the municipality wished to adopt (say) a new burner or lamp, consuming the same or less gas or electricity, and costing no more for maintenance, there would surely be no contractor so dead to his own interests (which as was premised are to a great extent publicity or advertising through street lighting) as to refuse such a proposal. A clause to cover such contingencies should properly be inserted in the agreement; and under these circumstances it seems to me that contract "C" is best from a municipal point of view, and best for the contractor as well.

A great deal of the matter put forward does not apply with equal force to cases of a municipal light supply and municipal lighting department; but I suggest that if, as I think has been shown, it is practicable to buy and sell street lighting by light value, then that is the most direct, simple, and generally advantageous course.

Whatever arrangement, however, may exist in a town between suppliers of light and the local authority as to the contractual basis of the public lighting, it is plain that, from a municipal point of view, the selection of suitable units,

the proper arrangement of them, and the general distribution of light, are also questions of the utmost importance. And yet, if one may judge from specimens of street lighting, it is evident that these questions are very imperfectly understood; and in place of scientific arrangement of lamps of candle powers suited to the financial ability of a town, one often sees a motley and haphazard positioning of lamps, of all descriptions—exhibiting the crudest and most harmful contrasts of strong glaring light on one spot and next to none on another.

It is unnecessary to dwell upon the fact that what one town can afford in the way of lighting another town cannot. Thus Westminster's lighting bill is £40,000 per annum, and more; but then Westminster has a rateable value of about £6,500,000. If this is contrasted with the rateable value of various towns in England, it will be seen that there are not more than three with over £2,000,000, nor more than twenty over £1,000,000. That is, however, no reason why adequate and scientific light distribution should not be urged upon those responsible for the government of towns, large and small; and therefore a subject well worth discussion is comprised in the question, "What is adequate lighting?"

I am well aware that in many instances—too many instances—the suppliers of light have little or no voice in the selection of positions for lamps or the general drafting of lighting schemes. And it seems to me that this fact makes it all the more important that, by a clear grasp of the principles underlying the scientific arrangement of street-lighting units, they should be in a position to offer criticism to lighting schemes which are open to criticism, and thereby gradually effect an improvement in public lighting on sound and rational lines. I therefore venture to draw attention to some statements of principles and facts, tabulated and collated, bearing upon the distribution of light, even though in so doing I may be travelling over well-worn ground and be laying myself open to the charge of being dogmatic.

Now the first point to be thoroughly grasped is that if one has a lamp of a certain candle power, the distribution of the light in the area affected by such a lamp will vary enormously—getting less and less as one gets more distant from the source of light. This variation in distribution depends on two factors: First the distance from the ground level at which the light is placed; and, secondly, the proportion of light emitted at different angles. If the first is known, the radius in which the light at each angle falls can be easily ascertained; and if the second is known, the actual value of the light when it reaches this radius at ground level can be ascertained just as easily. Light, as is well known, diminishes as the square of the distance from the source, and the distance from the source to the ground at different angles differs greatly with each angle—getting more and more as the angle of depression from the horizontal gets less and less.

A reference to Table I. will provide a concrete example and render the point quite clear. The figures on the left are different heights of the light centre; the figures along the top are different angles of depression from the horizontal. So that the light at 80° is nearer the column than the light at 70°, and so on. The lines (a) are distances from the column at which rays at the angles stated will strike the ground. They are arrived at by multiplying the height from the ground to the light by the cotangent of the angle of depression from the horizontal. The lines (b) are distances from the centre of the light to the aforesaid points upon the ground. They are arrived at by multiplying the height from the ground to the light by the cosecant of the angle of depression from the horizontal. The lines (c) are squares of these last distances.

Taking the first set of figures, for a lamp upon a column 11 feet to centre of light from the ground level. The ray at 80° has to travel 11.17 feet to reach the ground, and if the light were 100 candles, its normal illumination would only be $100 \div (11.17)^2$ by the time it reached the ground. In other words $1\frac{1}{14}$ foot-candles. But the ray at 10° has to travel 63.36 feet to reach the ground, and if the light were 100 candles, its normal illumination would only be $100 \div (63.36)^2$ by the time it reached the ground. In other words $\frac{1.00}{4014}$ foot-candles or only $\frac{1}{32}$ nd of the 80° ray. It will be seen, therefore, that, given a certain candle power, the normal illumination decreases in the proportion or ratio of the squares of the distances for the various angles; and taking 80° as 1, these ratios progress until 32 is reached

TABLE I.
Angle of Depression from Horizontal.

| Height of Light from Ground. | 80° | 70° | 60° | 50° | 40° | 30° | 20° | 15° | 10° |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|--------|------|
| 11 feet . . { (a) . . . 1'9 | 4'0 | 6'35 | 9'3 | 13'1 | 19'0 | 30'2 | 41'0 | 62'37 | |
| { (b) . . . 11'17 | 11'7 | 12'7 | 14'35 | 17'1 | 22'0 | 32'15 | 42'46 | 63'36 | |
| { (c) . . . 124 | 136 | 161 | 206 | 292 | 484 | 1033 | 1802 | 4014 | |
| 12 feet . . { (a) . . . 2'1 | 4'37 | 6'92 | 10'0 | 14'3 | 20'75 | 33'0 | 44'8 | 68'0 | |
| { (b) . . . 12'184 | 12'76 | 13'84 | 15'66 | 18'66 | 24'0 | 35'0 | 46'3 | 69'1 | |
| { (c) . . . 148 | 162 | 191 | 245 | 348 | 576 | 1227 | 2145 | 4777 | |
| 13 ft. 6 in. { (a) . . . 2'36 | 4'9 | 7'79 | 11'3 | 16'0 | 23'35 | 37'0 | 50'4 | 76'5 | |
| { (b) . . . 13'7 | 14'36 | 15'58 | 17'61 | 21'0 | 27'0 | 39'5 | 52'1 | 77'8 | |
| { (c) . . . 187 | 206 | 242 | 310 | 441 | 729 | 1557 | 2715 | 6046 | |
| 15 feet . . { (a) . . . 2'64 | 5'46 | 8'65 | 12'58 | 17'85 | 25'9 | 41'2 | 56'0 | 85'0 | |
| { (b) . . . 15'23 | 16'0 | 17'3 | 19'57 | 23'3 | 30'0 | 43'8 | 58'0 | 86'4 | |
| { (c) . . . 232 | 256 | 299 | 383 | 544 | 900 | 1921 | 3352 | 7465 | |
| 20 feet . . { (a) . . . 3'52 | 7'28 | 11'54 | 16'78 | 23'8 | 34'6 | 55'0 | 74'6 | 113'4 | |
| { (b) . . . 20'3 | 21'28 | 23'0 | 26'0 | 31'1 | 40'0 | 58'46 | 77'2 | 115'2 | |
| { (c) . . . 412 | 452 | 532 | 681 | 967 | 1600 | 3417 | 5960 | 13,225 | |
| 25 feet . . { (a) . . . 4'4 | 9'1 | 14'4 | 21'0 | 29'7 | 43'25 | 68'7 | 93'3 | 141'75 | |
| { (b) . . . 25'4 | 26'6 | 28'8 | 32'6 | 38'8 | 50'0 | 73'0 | 96'5 | 144'0 | |
| { (c) . . . 644 | 707 | 832 | 1064 | 1511 | 2500 | 5339 | 9312 | 20,736 | |
| Ratio of (c) 80° = 1 | 1 | 1'1 | 1'28 | 1'64 | 2'34 | 3'88 | 8'27 | 14'4 | 32'2 |

TABLE OF MEASUREMENTS AT VARIOUS ANGLES.

(a) = distance from column
(b) = distance from light centre to the ground
(c) = the square of (b)

} All distances are in feet and decimals.

TABLE II.

| Feet from Ground (proposed new column) | 11'0 | 12'0 | 13'6 | 15'0 | 20'0 | 25'0 |
|--|------|------|------|------|------|------|
| Feet from Ground (existing column). 11'0 | .. | 1'2 | 1'5 | 1'8 | 3'3 | 5'0 |
| | .. | 1'07 | 1'21 | 1'33 | 1'78 | 2'24 |
| 12'0 | '8 | .. | 1'26 | 1'6 | 2'8 | 4'3 |
| | '93 | .. | 1'13 | 1'24 | 1'66 | 2'09 |
| 13'6 | '66 | '8 | .. | 1'23 | 2'2 | 3'4 |
| | '62 | '88 | .. | 1'1 | 1'47 | 1'84 |
| 15'0 | '54 | '64 | '8 | .. | 1'8 | 2'8 |
| | '75 | '8 | '91 | .. | 1'34 | 1'67 |
| 20'0 | '3 | '36 | '45 | '56 | .. | 1'5 |
| | '56 | '6 | '68 | '74 | .. | 1'25 |
| 25'0 | '2 | '23 | '3 | '36 | '64 | .. |
| | '445 | '48 | '54 | '6 | '8 | .. |

NOTE.—The top row of figures shows the ratio of increased light required to yield the same illumination of ground area if one height of light centre is substituted for another.
The figures in italics show the increased length of road which will be illuminated if one height of light centre is substituted for another. The proportion varies somewhat with "hit and miss" lighting, as the road widths vary, and the above figures are therefore approximate.

at the 10° angle. These ratios are always the same, and are set out at the foot of Table I.

What is to be gathered from the above facts? Surely this: That if street-lamps are so placed in the streets that the 10° ray of one lamp meets the 10° ray of the next, then one will be relying for the lighting of each area upon the unaided illumination of a single lamp, and the illumination on a line between the lamps will decrease in the proportion of 1 : 32 (with portions of the street having even less illumination) unless it can be corrected by either providing lamps with a distribution at each angle which will remedy this disproportion, or else by altering the relative positions of the lamps. This point should be clearly understood, for it is universal in its application to all heights, types, and forms of light.

Looking now at the 12 ft. light, it will be seen that here the proportions are just the same as before; but because the lamp is higher the squares of the distances to the ground are greater, but the area covered (which is reckoned as length of street) is larger. It follows from this that given a light of a certain candle power upon a certain height of column, if it is required to place it upon a higher column in order to illuminate a larger area, the light itself must be increased in candle power if the same illumination is required.

In Table II. are set out these two relative properties. In it, the top row of figures shows the ratio of increased light required to yield the same normal illumination of ground area if one height of column is substituted for another,

while the second row of figures shows the relative areas illuminated by lights of various heights. Thus, supposing it is required to replace 11 ft. columns by 20 ft. columns, and get the same normal illumination, the candle power must be increased 3'3 times, but the area or length of street illuminated will be 1'78 times as large. That is to say, if there are 17'8 100-candle power lamps 100 feet apart in a road 1780 feet long, one would require 10 330-candle power lamps 178 feet apart to yield the same light. It will be gathered from this that, unless the relative cost of providing a 330-candle power lamp is less than is the ratio of 3'3 : 1'78, it would not be a paying proposition to make the substitution suggested in the example.

The overlooking of this simple rule is the cause of much mystification of councillors, and much harm to public lighting. If it is overlooked, it might be said 20 1800-candle power lights which equal 36,000 candles (neglecting the rule referred to) will give twice as good normal illumination as 200 90-candle power lights which equal 18,000 candles (neglecting the rule referred to); and yet, of course, such a comparison would be totally fallacious. But is not this sort of comparison made very often, and is it not only by a clear grasp of this question of relative distribution that one can deal with such fallacious comparisons? As a matter of fact, it is only when considering lights with reference to the same height from the ground that the candle power shows the true proportion of increase. Thus, 200 candles on a 15 ft. column is twice 100 candles on a 15 ft. column, but is not twice 100 candles on an 11 ft. column.

Before dealing with the part of the subject which I approach with some diffidence—viz., the proper spacing of lamps—I wish to make three points clear. Firstly, I reckon the distances in feet on a line parallel with the kerb to the nearest lamp, whether considering central lighting or whether the lamps are placed in hit-and-miss fashion. That is to say in the latter case 70 feet will mean 70 feet (not diagonally) to the next lamp on the opposite side of the carriage way. Secondly, all such distances are approximate only, because naturally they will vary as the width of the carriage way varies. Thirdly, in considering the candle power on the ground surface, I simply divide the candle power at the angle by the square of the distance, and do not multiply by the sine of the angle of depression (equivalent to the cosine of the angle which the rays make with the normal to the illuminated surface). Had this course been followed, it would have been introducing something problematical, because the propriety of the application of the cosine law is affected not only by the angle of incidence, but also by the angle at which the illuminated spot is viewed, by the nature or condition of the surface, and so on. I would point out, however, that had I multiplied by the sine of the angle of depression, I would be multiplying the disproportion of the lighting enormously, and making my point stronger; so that this multiplication is not omitted from any motive of "special pleading." Moreover, the object of street lighting is not only to illuminate the flat ground surface to which the sine multiplication only applies but also objects lying upon it and vertical moving figures as well. The figures given, therefore, are all comparative, and are literally true in terms of an imaginary surface receiving normal illumination.

If it is desired to express them in terms of illumination upon a horizontal or a vertical surface, they should be multiplied by the sine and the cosine respectively of the angle of depression of the rays from the horizontal.

Now, by consulting Table I. it will be seen that as between 80° (near the column) and 10° (away from the column) the illumination will decrease to $\frac{1}{32}$ nd. If, therefore, one does not desire greater unevenness of illumination than 1 to 32 (surely an enormous variation) one must place the lamps at a distance apart equal to twice the radius of the 10° angle,

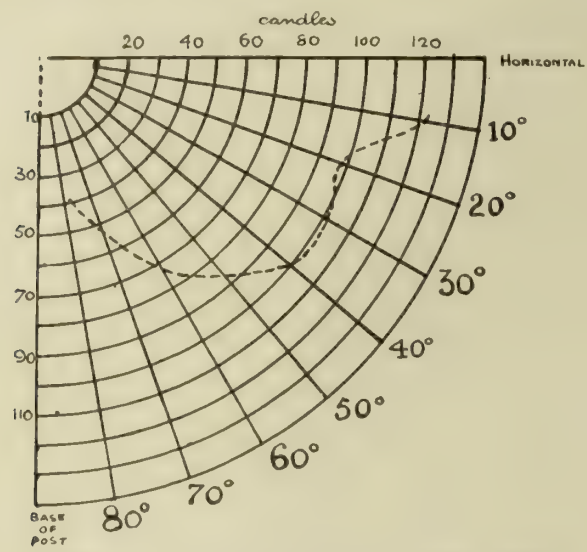


Diagram No. 1.—No. 4 Kern Burner, in 16-Inch Lantern.
Candle Power: 93 Candles.

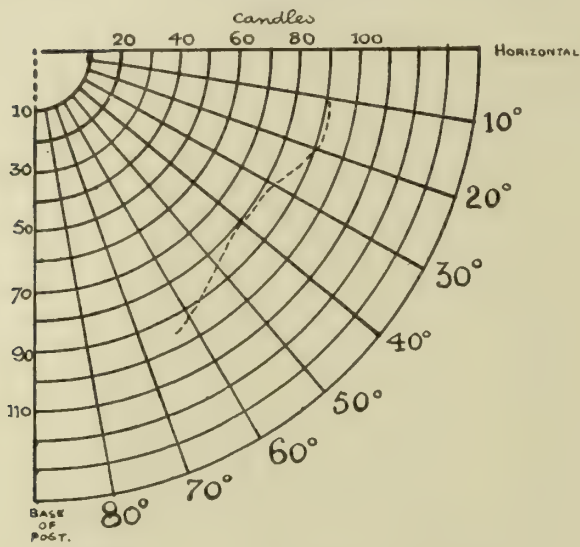


Diagram No. 2.—Inverted Burner in Lantern.
Candle Power: 86 Candles.

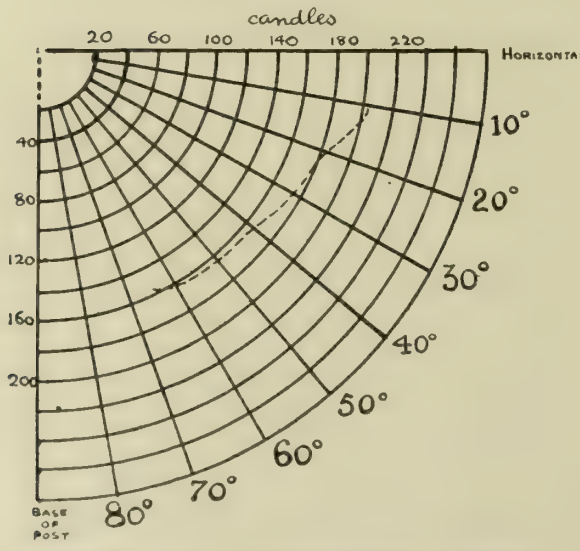


Diagram No. 3.—Two Inverted Burners in Lantern.
Candle Power: 174 Candles.

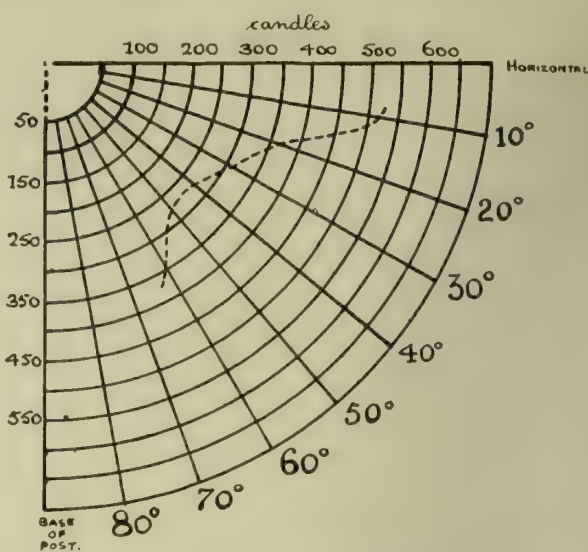


Diagram No. 4.—Three Inverted Burners in Lantern.
Candle Power: 319 Candles.

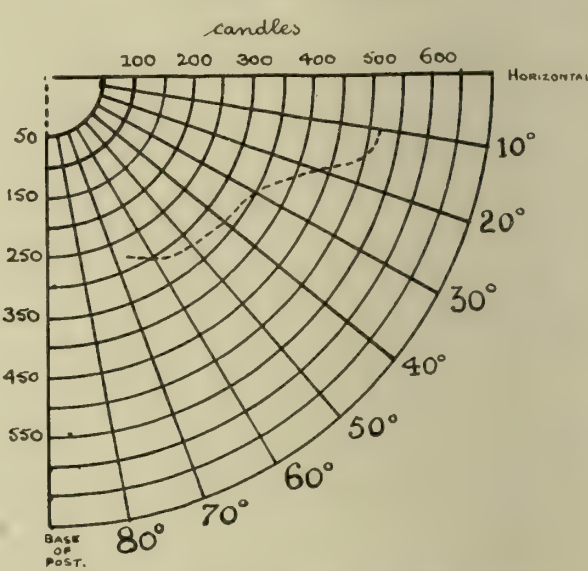


Diagram No. 5.—Three Inverted Burners in Lantern.
Candle Power: 368 Candles.

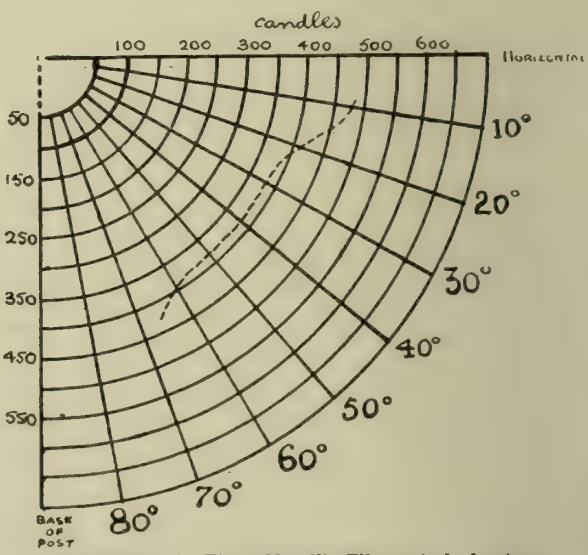


Diagram No. 6.—Three Metallic Filaments in Lantern.
Candle Power: 387 Candles.

so that the 10° ray of one lamp meets the 10° ray of the next. These approximate distances for various heights of light are as follows:—

| Height of Light, | 10° Meeting 10°. |
|------------------|------------------|
| 11 ft. | 125 feet |
| 12 " | 136 " |
| 13 " 6 in. | 153 " |
| 15 " | 170 " |
| 20 " | 227 " |
| 25 " | 284 " |

A variation of from 1 to 32 cannot be considered a satisfactory one; and it is a mistake to think that, in order to

make the light stronger at the distant points, all that is needed is to increase the candle power of the source. Naturally, this does increase the light at the distant points; but it also increases the light round the column in the same proportion, and if carried to its extreme (as it often is), this course only results in a very glare of light round the column, which glare, by reason of the contrasts it introduces, makes the disproportion apparently worse. Everyone knows the effect of going out of the sun light into a darkened room—how at first one cannot see at all, and how after the eye has lost the effect of the sun's glare, the vision accommodates itself to the feeble light of the dim room.

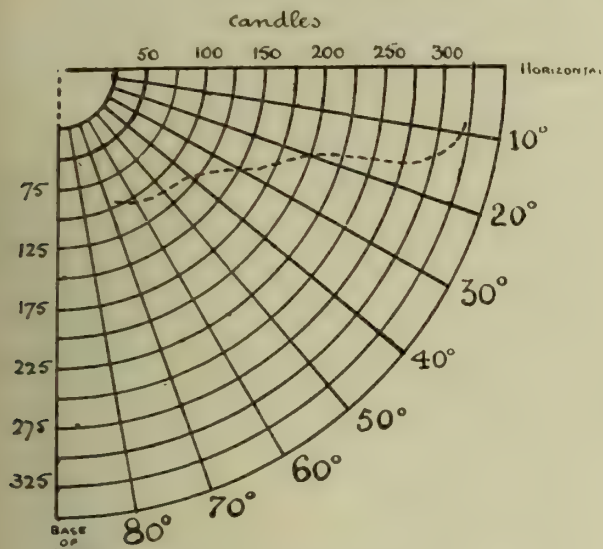


Diagram No. 7.—Two Metallic Filaments in Lantern.
Candle Power: 161 Candles.

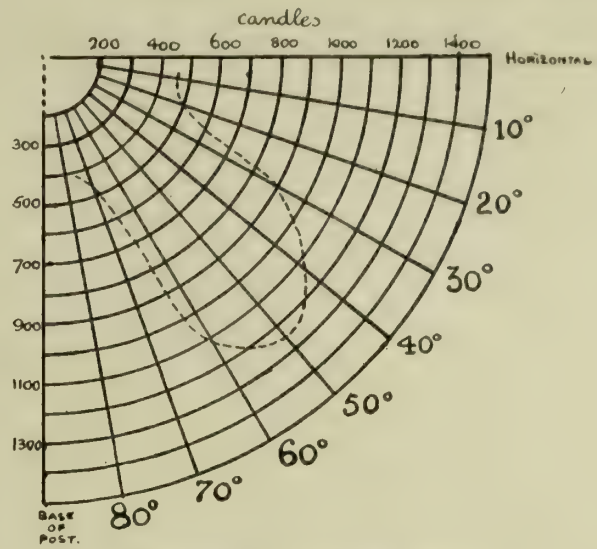


Diagram No. 10.—Ten-Ampere Open Arc.
Candle Power: 1000 Candles.

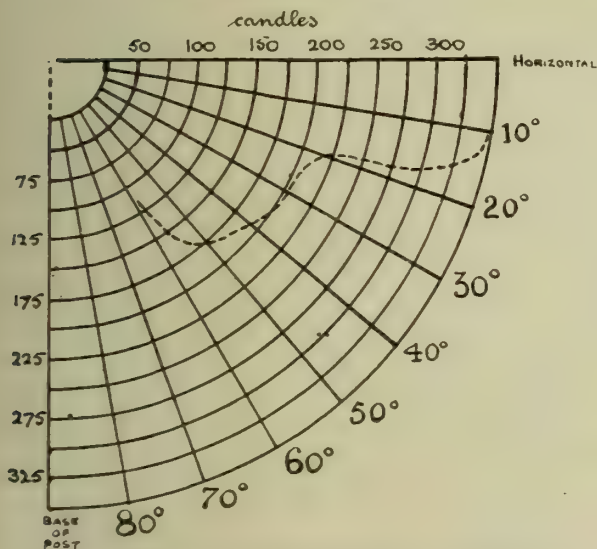


Diagram No. 8.—Two Metallic Filaments in Lantern.
Candle Power: 201 Candles.

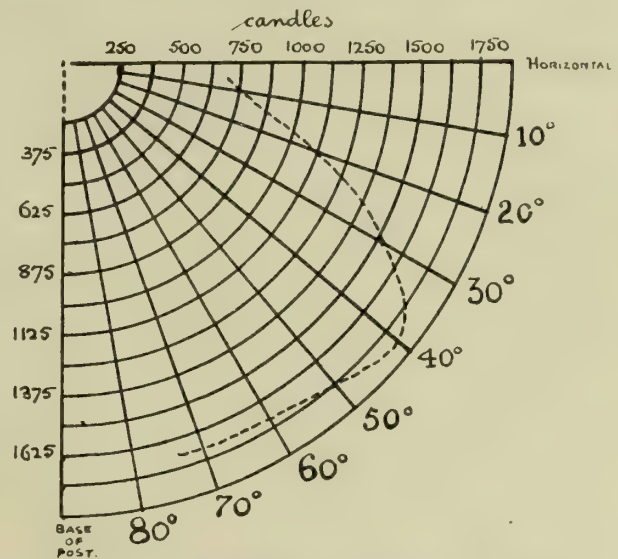


Diagram No. 11.—Eight-Ampere Flame Arc (Old Pattern).
Candle Power: 1435 Candles.

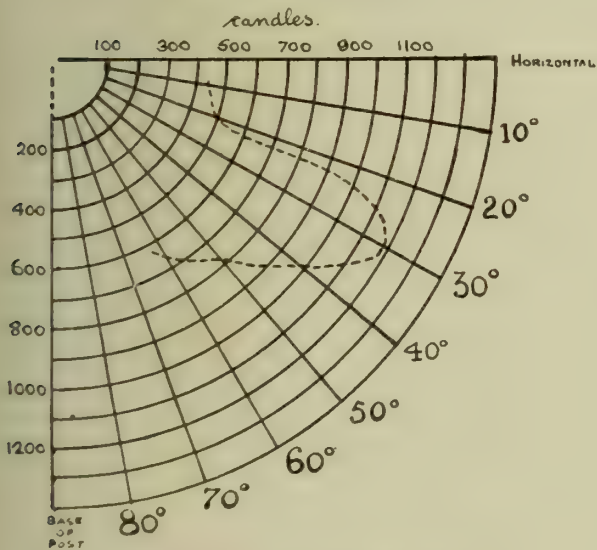


Diagram No. 9.—Five-Ampere Enclosed Arc.
Candle Power: 616 Candles.

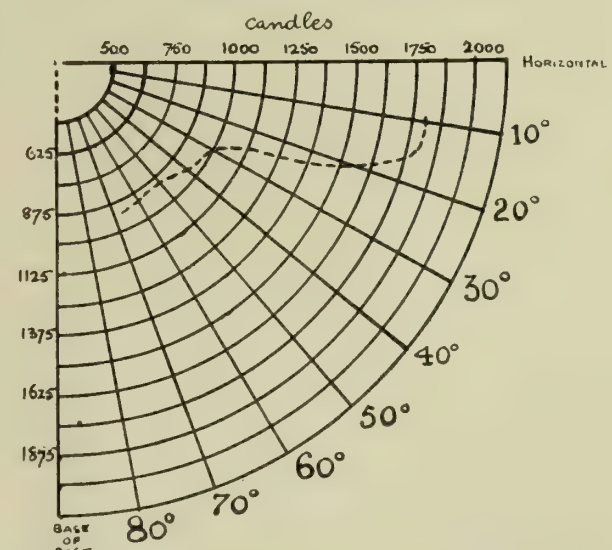


Diagram No. 12.—Ten-Ampere Flame Arc.
Candle Power: 1326 Candles.

That is just the effect which the eye encounters in walking along a street lighted in this manner; and it is astonishing that this practice is followed to the extent that it is.

Reverting to the list set out above, if they are compared with the distances at which lamps are actually placed, it will be found that in many cases the distances are far greater, and that there are small areas of over-bright light and larger patches with practically none at all. Thus, through want of a little thought and the application of simple rules, street lighting in many cases degenerates into a haphazard scheme of point lighting, instead of being, as it should be, the even and uniform distribution of artificial light.

The more attention is drawn to it, the more will this disproportion of light diffusion and the unevenness of distribution probably be noticed, and it is hoped in course of time remedied. The question is, what can be done to improve this state of things, even though the standard set up for attainment is an ideal one? It appears to me that there are two ways. The first way is to select lamps with lighting curves which are greater at 10° than at 15° , greater at 15° than at 20° , and which get less and less as they approach the 80° angle. To do this involves the use of dioptric arrangements or reflectors, and, of course, the disproportion can at best only be partially remedied.

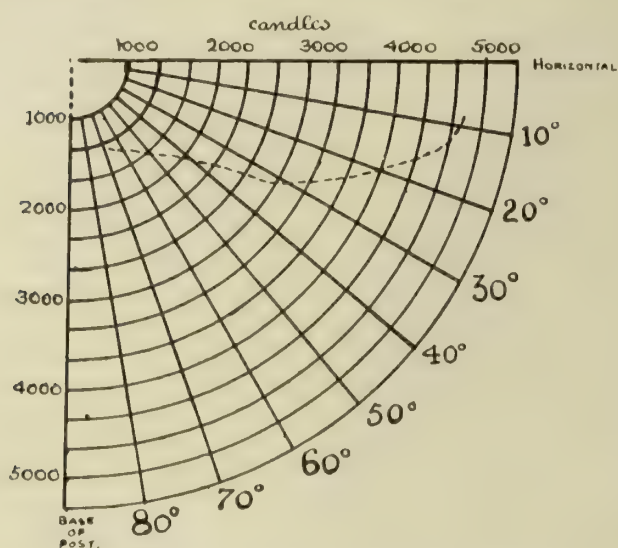


Diagram No. 13.—"Excello," 660-Watt, Flame Arc, with Dioptric Globe.
Candle Power: 2812 Candles.

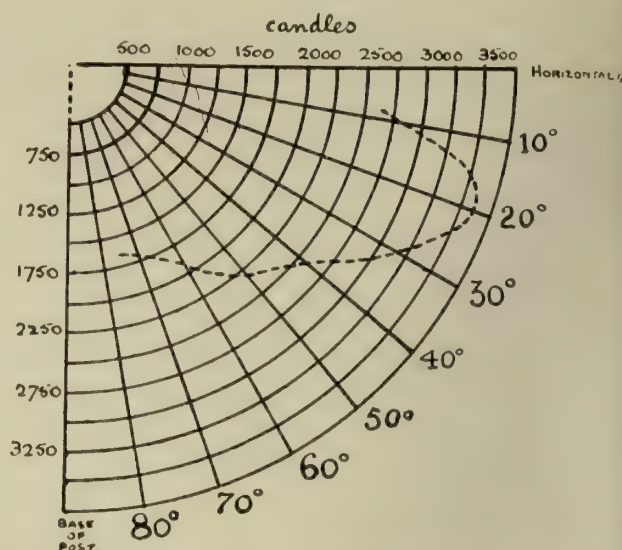


Diagram No. 16.—Three High-Pressure Inverted Burners in Lantern.
Candle Power: 2965 Candles.

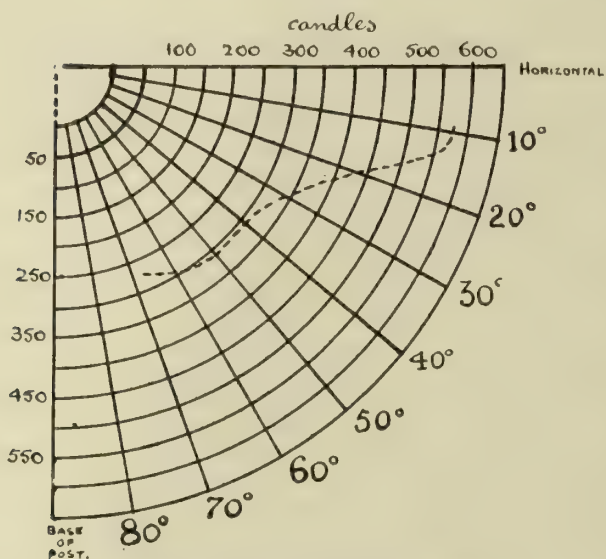


Diagram No. 14.—Open Arc, 500-Watt.
Candle Power: 363 Candles.

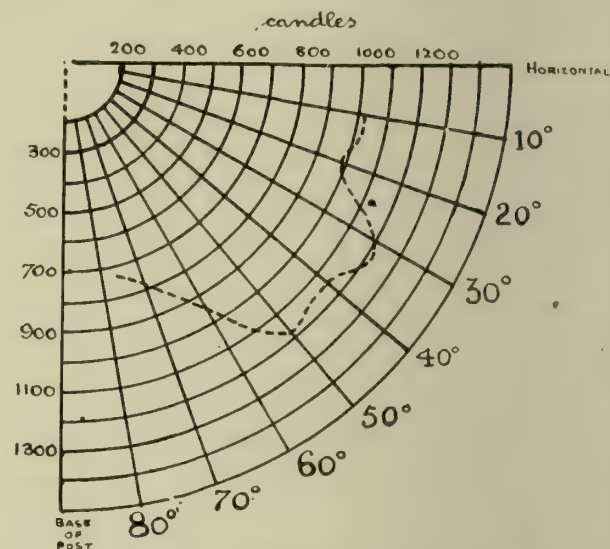


Diagram No. 17.—Three High-Pressure Burners (Small) in Lantern.
Candle Power: 960 Candles.

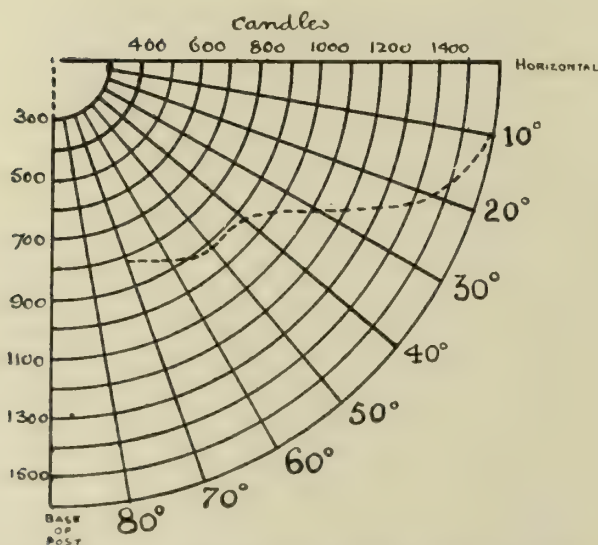


Diagram No. 15.—High-Pressure Upright Burner in Lantern.
Candle Power: 1193 Candles.

Attention may here be drawn to polar curves Nos. 13, 15, and 16. No. 13 is from a 660-watt "Excello" arc lamp with dioptric globe; and it will be seen that this is entirely in the right direction, and that the light gets less and less as one approaches the angle nearest the column. No. 15 is from a high-pressure vertical incandescent burner; and No. 16 from a high-pressure 3000-candle power triple inverted burner. It will be seen that here also the lighting curve is in the right direction, but not to the same extent as the "Excello" lamp. They show what can be done by makers of electric and gas lamps if the necessity to do it is grasped and insisted

upon; and they contrast signally with the light curves of some of the other specimens, which comprise all types of light and are the diagrammatic representation of figures obtained, not from makers' but from independent tests. A bad example is curve No. 11—a flame arc without dioptric globe. That is the sort of thing which would give a mass of brilliant, dazzling, glaring light near the column and comparatively little in the midway position. A bad example of a gas lamp is No. 2—an inverted burner in lantern. Here the maker has evidently tried to get even distribution of candle power *per se* and very well he has succeeded. But in the light of Table I. it will be seen how unsuitable for public lighting this is. Perhaps when one says that an even polar curve is unsuitable for public light one ought to limit the application of this criticism and add "if each area is to be illuminated by the practically unaided light of a single lamp."

And this brings one to consider the second way in which evenness of illumination can be procured—perhaps a costly method, but certainly a most effective one. In Table III. there is set out the foot-candle illumination given by the lamps of which the polar curves are appended, and it will be seen that they all diminish towards the 10° ray. Failing, therefore, the possibility of making lamps with such a polar curve as will compensate for this disproportionate distribution curve, it appears that the only method of producing anything approaching even lighting is to bring the lighting units closer together, and that it is no remedy to increase the power of the units on each column. For if this is done, while it increases the light generally, it utterly fails to alter the relative distribution; and, indeed, by inducing a glaring effect at each column, it only serves to increase the contrast and make the lighting effect worse. It is obvious then, that if one brings the columns closer together, the lighting effect at its weakest point will be reinforced and the unevenness of the distribution diminished. It will also be possible to reduce the candle power of the sources of light, because there

TABLE III.

| No. of Lamp Diagram. | Height to Centre of Light in Feet. | Distance in Feet Between Lamps. | Foot-Candle Normal Illumination at Angles of Depression Specified. | | | | | | | | | | | | Ratio of Greatest to Least Light. | |
|----------------------|------------------------------------|---------------------------------|--|------|------|------|------|-----|------|-----|------|------|------|------|-----------------------------------|----|
| | | | 60 | 50 | 40 | 30 | 20 | 15 | 10 | 15 | 20 | 30 | 40 | 50 | | 60 |
| 1 . . | 11 | 125 | .46 | .427 | .34 | .21 | .095 | .06 | .03 | .06 | .095 | .21 | .34 | .427 | .46 | 15 |
| 2 . . | 12 | 136 | .47 | .34 | .23 | .14 | .07 | .04 | .019 | .04 | .07 | .14 | .23 | .34 | .47 | 24 |
| 3 . . | 13.6 | 153 | .8 | .53 | .38 | .24 | .11 | .08 | .033 | .08 | .11 | .24 | .38 | .53 | .8 | 24 |
| 4 . . | 15 | 170 | 1.18 | .73 | .52 | .35 | .19 | .13 | .07 | .13 | .19 | .35 | .52 | .73 | 1.18 | 17 |
| 5 . . | 15 | 170 | 1.0 | .86 | .6 | .38 | .21 | .15 | .07 | .15 | .21 | .38 | .6 | .86 | 1.0 | 14 |
| 6 . . | 15 | 170 | 1.3 | .9 | .7 | .42 | .21 | .15 | .06 | .15 | .21 | .42 | .7 | .9 | 1.3 | 21 |
| 7 . . | 15 | 170 | .38 | .35 | .25 | .17 | .1 | .08 | .044 | .08 | .1 | .17 | .25 | .35 | .38 | 8 |
| 8 . . | 15 | 170 | .43 | .46 | .36 | .24 | .11 | .09 | .046 | .09 | .11 | .24 | .36 | .46 | .43 | 10 |
| 9 . . | 20 | 227 | 1.27 | 1.1 | 1.0 | .73 | .13 | .07 | .033 | .07 | .13 | .73 | 1.0 | 1.1 | 1.27 | 38 |
| 10 . . | 20 | 227 | .8 | 1.6 | 1.3 | .7 | .26 | .1 | .034 | .1 | .26 | .7 | 1.3 | 1.6 | .8 | 47 |
| 11 . . | 20 | 227 | 3.2 | 2.8 | 2.0 | 1.0 | .32 | .16 | .056 | .16 | .32 | 1.0 | 2.0 | 2.8 | 3.2 | 57 |
| 12 . . | 20 | 227 | 1.7 | 1.3 | 1.0 | .62 | .46 | .31 | .136 | .31 | .46 | .62 | 1.0 | 1.3 | 1.7 | 12 |
| 13 . . | 25 | 284 | 1.8 | 1.55 | 1.37 | 1.21 | .74 | .46 | .23 | .46 | .74 | 1.21 | 1.37 | 1.55 | 1.8 | 8 |
| 14 . . | 20 | 227 | .56 | .46 | .33 | .215 | .11 | .08 | .043 | .08 | .11 | .215 | .33 | .46 | .56 | 13 |
| 15 . . | 20 | 227 | 1.6 | 1.37 | .96 | .7 | .42 | .25 | .12 | .25 | .42 | .7 | .96 | 1.37 | 1.6 | 13 |
| 16 . . | 25 | 284 | 2.3 | 2.2 | 1.7 | 1.26 | .65 | .34 | .134 | .34 | .65 | 1.26 | 1.7 | 2.2 | 2.3 | 17 |
| 16 . . | 20 | 227 | 3.6 | 3.4 | 2.8 | 2.0 | 1.0 | .53 | .21 | .53 | 1.0 | 2.0 | 2.8 | 3.4 | 3.6 | 17 |
| 17 . . | 20 | 227 | 1.8 | 1.6 | 1.5 | .75 | .28 | .16 | .075 | .16 | .28 | .75 | 1.5 | 1.6 | 1.8 | 24 |

NOTE.—The ratios of the greatest to the least light show how the illumination varies. Ideal ratio = 1.

TABLE IV.

| No. of Lamp Diagram. | Height to Centre of Light in Feet. | Distance in Feet Between Lamps. | Foot-Candle Normal Illumination at Angles of Depression Specified. | | | | | | | | | | Ratio of Greatest to Least Light. |
|----------------------|------------------------------------|---------------------------------|--|----------|----------|----------|----------|----------|----------|----------|----------|-----|-----------------------------------|
| | | | 60 10 | 50 10 | 40 10 | 30 15 | 20 20 | 15 30 | 10 40 | 10 50 | 10 60 | | |
| 1 | 11 | 60 | .49 | .43 | .37 | .27 | .190 | .27 | .37 | .43 | .49 | 2.6 | |
| 2 | 12 | 66 | .489 | .359 | .249 | .28 | .14 | .28 | .249 | .359 | .489 | 3.5 | |
| 3 | 13.6 | 74 | .833 | .563 | .413 | .32 | .22 | .32 | .413 | .563 | .833 | 3.8 | |
| 4 | 15 | 82 | 1.25 | .8 | .59 | .48 | .38 | .48 | .59 | .8 | 1.25 | 3.3 | |
| 5 | 15 | 82 | 1.07 | .93 | .67 | .53 | .42 | .53 | .67 | .93 | 1.07 | 2.5 | |
| 6 | 15 | 82 | 1.36 | .96 | .76 | .57 | .42 | .57 | .76 | .96 | 1.36 | 3.2 | |
| 7 | 15 | 82 | .424 | .394 | .294 | .25 | .2 | .25 | .294 | .394 | .424 | 2.1 | |
| 8 | 15 | 82 | .476 | .506 | .406 | .33 | .22 | .33 | .406 | .506 | .476 | 2.3 | |
| 9 | 20 | 110 | 1.30 | 1.13 | 1.03 | .8 | .26 | .8 | 1.03 | 1.13 | 1.30 | 5.0 | |
| 10 | 20 | 110 | .834 | 1.63 | 1.33 | .8 | .52 | .8 | 1.33 | 1.63 | .834 | 3.1 | |
| 11 | 20 | 110 | 3.25 | 2.85 | 2.05 | 1.16 | .64 | 1.16 | 2.05 | 2.85 | 3.25 | 5.0 | |
| 12 | 20 | 110 | 1.83 | 1.43 | 1.13 | .93 | .92 | .93 | 1.13 | 1.43 | 1.83 | 2.0 | |
| 13 | 25 | 138 | 2.03 | 1.78 | 1.6 | 1.67 | 1.48 | 1.67 | 1.6 | 1.78 | 2.03 | 1.3 | |
| 14 | 20 | 110 | .603 | .503 | .373 | .295 | .22 | .295 | .373 | .503 | .603 | 2.7 | |
| 15 | 20 | 110 | 1.72 | 1.49 | 1.08 | .95 | .84 | .95 | 1.08 | 1.49 | 1.72 | 2.0 | |
| 16 | 25 | 138 | 2.43 | 2.33 | 1.83 | 1.6 | 1.3 | 1.6 | 1.83 | 2.33 | 2.43 | 1.9 | |
| 16 | 20 | 110 | 3.81 | 3.61 | 2.81 | 2.53 | 2.0 | 2.53 | 2.81 | 3.61 | 3.81 | 1.9 | |
| 17 | 20 | 110 | 1.87 | 1.67 | 1.57 | .91 | .56 | .91 | 1.57 | 1.67 | 1.87 | 3.3 | |

NOTE.—The ratios of the greatest to the least light show the great improvement compared to those produced by the arrangement of which the effect is tabulated in Table III.

is always an excess of light near the column on account of the initial candle power necessary to give enough light at the distant points. I, therefore, urge attention to this view—viz., the desirability of decreasing the initial candle power of light units and placing them closer together.

I am well aware that cost enters largely into the question of street lighting, and with this in mind suggest that it is better lighting to give a comparatively feeble but even illumination than it is to give a more powerful illumination full of contrasts between the light near the columns and that towards the midway position between them. I find that a suitable arrangement (though possibly not an ideal one) of what might be termed “overlapped” lighting, is to plot the positions so that the 20° angle of one lamp meets the 20° angle of the next.

A moment’s thought will make it evident that to do this involves placing the lamps very close together; but it will also be evident from a glance at Table IV., in which the effects from the lamps instanced in Table III, when so placed are shown, that the disproportion of the lighting effect is very much less in most cases—the worst examples being those lamps having a relatively small illuminating power at the distant angles. Now if this method sets up an unattainable ideal on account of cost, at any rate it sets up something to approach if not to attain, and indeed if the question of a suitable polar curve (greater light at 10°, 15°, and 20° than at the nearer points) is also considered and properly-made lamps are insisted upon, then it is not necessary to do more than to arrange the distances so that the 15° ray of one approximately overlaps the 20° ray of the next, or even overlaps the 15° only.

Applying these methods to the Curves Nos. 13 and 16, we arrive at the following effects:—

| | 60° | 50° | 40° | 30° | 20° | 15° | 10° | 10° | 10° | 60° |
|--------|-----|------|------|------|-----|-----|------|------|------|------|
| No. 13 | 1.8 | 1.78 | 1.60 | 1.44 | 1.2 | 1.2 | 1.44 | 1.60 | 1.78 | 1.8 |
| No. 16 | 2.3 | 2.33 | 1.83 | 1.39 | .99 | .99 | 1.39 | 1.83 | 2.33 | 2.3 |
| | 60° | 50° | 40° | 30° | 20° | 15° | 10° | 10° | 10° | 60° |
| No. 13 | 1.8 | 1.55 | 1.37 | 1.44 | .97 | .92 | .97 | 1.44 | 1.37 | 1.55 |
| No. 16 | 2.3 | 2.2 | 1.7 | 1.39 | .78 | .68 | .78 | 1.39 | 1.7 | 2.2 |

Assuming, then, that either of these three arrangements is possible, or perhaps it would be better to say attainable, the distances are as follows, and in setting them out the distances for the first arrangement of lamps with practically no effective overlapping are repeated by way of contrast:—

| Height of Light. | 10° Meeting 10°. | 15° Meeting 15°. | 15° Meeting 20°. | 20° Meeting 20°. |
|------------------|------------------|------------------|------------------|------------------|
| 11 ft. | 125 ft. | 82 ft. | 72 ft. | 60 ft. |
| 12 „ | 136 „ | 90 „ | 78 „ | 66 „ |
| 13 ft. 6 in. | 153 „ | 101 „ | 88 „ | 74 „ |
| 15 ft. | 170 „ | 112 „ | 98 „ | 82 „ |
| 20 „ | 227 „ | 150 „ | 130 „ | 110 „ |
| 25 „ | 284 „ | 187 „ | 162 „ | 138 „ |

It is very difficult indeed to lay down any standard of lighting, and to say what lighting is suitable for a particular street. In all cases, naturally, positions have to be varied to coincide with street corners and to give greater light at crossings, &c., while the demands of a business street with heavy traffic will naturally not be the same as those of a residential street. Nor even if the demand were made or put forward in competition would the same type of light suit all streets. Thus, high unit lights on tall columns would be most unsuitable for a residential street, because the direct light produced at the level of bedroom windows is not to be desired. All one can do is to point out what effect, with respect to evenness of distribution, will be produced by various combinations of heights and distances. In case it will be of any guidance I give some approximate particulars of some streets in Westminster; but in looking at these members should bear in mind that when the new scheme of lighting is completed at the end of the year, the City of Westminster will be lighted by the following units spaced as regard heights and distances as nearly coincident with the figures given above having regard to the character and needs of each individual street:—

Units now Adopted by Westminster City.

12 ft. for 90 candles; 12 ft. for 180 candles; 15 ft. for 300 candles; 20 ft. by 1800 candles; 20 ft. for 3000 candles.

Some Examples of Existing Lighting in Westminster.

| Street. | Description. | Height of Light. (Approximate) | Distance Apart. (Approximate) | Approximate Arrangement. |
|---------------------------------|----------------------|-----------------------------------|----------------------------------|--------------------------|
| Atterbury Street . | 60 c.p. Incandescent | 12 ft. | 130 ft. | 10° meets 10° |
| Berwick Street . . | 100 " " " | 12 " | 80 " | 15° " 20° |
| Bond Street . . . | 500 " Open arc | 20 " | 140 " | 15° " 15° |
| Bow Street . . . | 100 " Incandescent | 12 " | 55 " | 20° " 20° |
| Kensington— (Main Road). . . | 60 " " " | 12 " | 60 " | 20° " 20° |
| Palace Street . . . | 60 " " " | 12 " | 90 " | 15° " 15° |
| Princes Gate . . . | 60 " " " | 12 " | 45 " | 20° " 30° |
| Regent Street. . . | 3000 " Flame arc | 23 " | 170 " | 15° " 15° |
| Sackville Street . . | 100 " Incandescent | 12 " | 80 " | 15° " 20° |
| St. George's Road . | 500 " Open arc | 20 " | 150 " | 15° " 15° |
| St. James's Street . | 900 " Arc | 20 " | 145 " | 15° " 15° |
| Shaftesbury Avenue. | 100 " Incandescent | 11 " | 45 " | 20° " 30° |
| Tachbrook Street . . | 500 " Arc | 20 " | 150 " | 15° " 15° |
| Tothill Street . . . | 60 " Incandescent | 12 " | 45 " | 20° " 30° |

I fear that I have dealt with the subject at some length and with a discursiveness which it has been a difficult matter to try to avoid, and can only conclude by expressing the hope that some at least of my remarks may be of service in helping forward the movement for the improvement on rational lines of street lighting.

APPENDIX I.

EXTRACT FROM THE CALCUTTA CORPORATION STREET LIGHTING CONTRACT.

3. The said Company agree, in respect of all lamps fixed after the 1st of May, 1911, at their own expense, to supply, fix, and maintain all the necessary piping, both below and above ground, to convey an ample supply of gas, at the agreed pressures, to each and every public light in Calcutta, together with a brass cock of a design to be approved by the said Corporation. The said brass cock will be screwed by the said Company to the end of each pipe at each public light, at such a height and in such a position as may be directed by the said Corporation, in order that the burners belonging to the said Corporation may be readily and securely attached.

4. The said Corporation undertake at their own expense to supply, fix, and maintain all lamp posts, brackets, lanterns, burners, and mantles used in connection with the public lights of Calcutta, all of which shall remain the property of the said Corporation, and the said Corporation shall also at their own expense undertake the lighting and extinguishing of all public lights.

5. In accordance with the terms of this agreement the said Company shall supply gas only, and will be paid by the said Corporation at a fixed rate per 1000 cubic feet delivered in such manner, in such places, and in such quantities as provided in the various clauses of this agreement.

6. The period over which this agreement shall extend is twenty years, commencing on the 1st day of May, 1911.

In agreeing to such a lengthened period, the said Corporation have been influenced by the fact that it will be necessary for the said Company to spend considerable sums of money to bring their plant and piping to the state of efficiency required by the provisions of this agreement, and it is reasonable that such large expenditure should be spread over a lengthened period.

7. The said Company shall for a period of twenty years from the 1st of May, 1911, have the exclusive right of supplying with gas all such public street-lamps as during that period may be lighted with gas throughout any part of Calcutta, or other districts, or places, which now are, or hereafter may be, under the jurisdiction or control of the said Corporation of Calcutta, or their successors, subject always to the faithful fulfilment of the terms of this agreement.

8. The said Company shall only manufacture and supply gas which is the product of the distillation of coal, commonly known as coal gas, and the said Company shall neither dilute nor enrich this gas with any other agent, gas or vapour, without first obtaining the consent of the said Corporation in writing.

9. The said Company shall cause to be provided, at their own expense, before the 1st day of May, 1911, in any part of Calcutta selected by them, a testing place, or places, with suitable apparatus therein for testing the illuminating power, purity, and pressure of the gas supplied, and the said Company shall at all times thereafter keep and maintain such testing places and apparatus in good repair and working order, and the result of any testings or examinations made in such testing place, or places, belonging to the said Company shall be receivable in evidence.

10. The said Corporation may, if they think fit, on each occasion of the testing at any testing place of the illuminating power, purity, and pressure of the gas supplied by the said Company at any testing place belonging to the said Company, be represented by some officer, and the said Company shall state at what times it is proposed to make such testings on any particular day upon receiving a request in writing from the said Corporation in the forenoon of the previous day.

11. A representative of the said Corporation shall from time to time, after giving notice to the said Company, visit the testing places of the said Company, for the purpose of ascertaining that all instruments are kept in good and proper repair and working order.

12. The said Company shall on each day make and deliver to the said Corporation a report of the result of the testings of the gas supplied by the said Company for illuminating power, purity, and pressure conducted by the Gas Examiner to the said Company, on the immediately preceding day, and the books kept by the Gas Examiner to the said Company for recording the results of the testing of such gas by him shall be open at all reasonable times to the inspection of the said Corporation.

Note.—Here follow similar clauses *re* Corporation testing places.

17. The general procedure in conducting tests for illuminating power, purity, and pressure of the gas to be supplied under this agreement at the various testing stations shall be as described in the various clauses and appendices of this agreement.

18. The said Company may at their own expense cause to be affixed to each public lamp the instrument known as a street-lamp governor, of a pattern to be approved by the said Corporation, and the said Corporation shall be entitled at all times to have access thereto for the purpose of examining the same.

23. The said Corporation may at any time during the period of this agreement alter the position, or increase or reduce the candle power, of any public light or lights. But the said Corporation shall pay to the said Company, at a rate to be mutually agreed, the cost of taking up and relaying any pipes which may be necessary to reach the altered position of such public light.

24. The said Corporation undertake that an irreducible minimum of 9000 public lights, irrespective of position, candle power, or consumption of gas, shall be kept burning for an average of ten hours each night, or an annual average of 3650 burning hours per annum. Should the said Corporation for any reason desire to reduce the number of public lights below the said 9000 they may do so, but they shall be bound to pay to the said Company the same amount for gas as if the said 9000 lights were burning for the minimum of 3650 burning hours per annum.

28. The words "minimum pressure" used in the various clauses of this agreement shall mean the lowest pressure at which gas is supplied to any public light in any part of Calcutta when all the lights are burning, measured at a point between any governor, or regulating device or cock, and the burner when the burner is lighted.

29. The pressure at which gas is supplied in accordance with this agreement is expressed in terms of the number of inches or roths of an inch in height of a column of water which such pressure will counter-balance.

30. The minimum pressure at which gas shall be supplied by the said Company during the hours of public lighting to each and every public light in Calcutta shall be as follows:—

- For the first five years of this agreement from the 1st day of May, 1911, to the 1st day of May, 1916, not less than two inches.
- After the 1st day of May, 1916, not less than two and five-tenths inches.
- Should the said Corporation after the 1st day of May, 1916, desire to increase the minimum pressure over and above two and five-tenths inches, the said Corporation may do so by giving to the said Company notice in writing, when the said Company shall be bound to increase the minimum pressure to an extent not exceeding a total minimum pressure of four inches on payment of the increased price arranged in clause 39 of this agreement. Any increase of pressure shall not be less than $\frac{5}{10}$ ths of an inch, and shall be in multiples of $\frac{5}{10}$ ths of an inch.

Note.—Here follow clauses as to penalties for defects in illuminating power or purity of the gas.

37. The measurement of the quantity of gas consumed by the public lights shall be estimated from the average consumption of gas by at least 30 of each size of gas-nipple to be used by the said Corporation, when tested in the following manner. A test gas-meter, such as is used for photometric measurements, shall be used having a capacity of $\frac{1}{16}$ th of a cubic foot for each revolution. The water-line of this meter shall be adjusted by means of a Gas Referees $\frac{1}{16}$ th of a cubic foot measure. A suitable fitting shall be attached to the outlet of the meter in such a manner that the nipple to be tested can be readily attached. A King's pressure-gauge which has been carefully verified with a column of water shall be attached to the above fitting at a point close to the nipple to be tested. The pressure will then be carefully adjusted to the pressure at which it is desired to know the consumption of gas by the nipple. A test will be made of each nipple for ten consecutive minutes, and the quantity of gas passed through this meter during these ten minutes as recorded on the dial shall be multiplied by six to make sixty minutes, and the gas thus calculated to be consumed in sixty minutes shall be accepted as the hourly consumption of the nipple which has been tested. The average hourly consumption of gas by 30 of one size of nipple, selected at random, at any one pressure tested in this manner shall be accepted by the said Company and the said Corporation as the hourly consumption of gas by this size of nipple when used in a public lamp at the pressure at which it was tested. Should it be found that the pressure of gas is not evenly distributed in all parts of Calcutta, and the said Corporation is satisfied that such unevenness is unavoidable, and likely to be permanent, the said Corporation shall agree to nipples being tested of a size which will be suitable for pressures higher than the minimum pressure prescribed in this agreement. The consumption of gas in cubic feet per hour of each burner estimated by a test of the gas-nipple in the manner aforesaid multiplied by the estimated number of hours each burner is lighted, shall represent the quantity of gas supplied by the said Company and to be paid for by the said Corporation.

40. The said Corporation and the said Company may cause to be erected, at suitable sites in various districts of Calcutta, recording gas-pressure gauges, which shall correctly and continuously record on paper the exact pressure at which gas has been supplied during the 24 hours of day and night. Each of these recording pressure gauges will be placed in such a position as to record the pressure at which gas has been supplied to not more than 2000 public lights. The pressure recorded by these recording pressure gauges may be deemed to represent the pressure at which gas has been supplied to the number of public lights which each pressure gauge controls. The said Corporation may test the pressure at any individual public light, or any portion of any such district, if they have reason to believe the pressure to be lower than that recorded on the district pressure recorders.

Note.—Here follow clauses as to penalties in case of defects in pressure. An appendix giving full details as to apparatus and method of testing is attached to the agreement.

APPENDIX II.

EXTRACT FROM THE WESTMINSTER CITY STREET LIGHTING CONTRACT.

SPECIFICATION OF LIGHTING.

SEE GENERAL CONDITIONS OF CONTRACT.

1. The subject matter of the contract is the lighting of all or any of the districts in the City of Westminster.

The contract so far as it relates to "Installation" includes the provision of any necessary mains, wires, shades, apparatus, lamps, burners, governors, cut-outs, switches, resistances, reflectors, and other fittings necessary for the satisfactory installation of a satisfactory system of lighting of the type quoted for and the execution of all incidental works of every kind, including the cost of the making good of any pavement disturbed, which last mentioned work will be carried out at cost price by the Council at the cost of the Contractor.

The contract so far as it relates to "Maintenance" includes the provision of the illuminant, and the cleansing, lighting, and extinguishing of the lamps, the provision of any carbons, mantles, or any other fittings of any kind to ensure the same burning efficiently, and all repairs necessary

to the things provided for in the "Installation" contract from whatever cause arising.

The illuminant shall be of the minimum specified candle power.

The period of the commencement of the contract so far as it relates to maintenance is the day following the expiration of the existing contract relating to the district in question. Particulars of the dates of expiration of the existing contracts are given in the "schedule of lights as at present existing in the four districts." The Installation works must previously be completed in accordance with the "Conditions of Contract."

2. The contractor shall provide all materials, labour, tools, tackle, implements, plant, water, and other necessary things for the proper execution of the works. All the materials used shall be the best of their respective kinds, and applied in the most workmanlike and substantial manner possible, and the work shall be executed to the entire satisfaction of the City Engineer, who shall have full power to reject any materials which he may consider unfit to be used in the work.

3. In the case of "large units" the lamps are to be erected on suitable and approved columns of such a height that the centre of light shall not be less than 20 feet above the adjacent surface of the ground. In the case of "small units," the centre of light shall be not less than 12 feet from the adjacent ground surface.

4. The design of electric lamp pillars is subject to the approval of the Council, and such pillars must be of cast iron or cast iron and steel tube construction. The approved type of gas-lamp columns is that recently erected in Whitehall and Parliament Street. In the case of electric lamps, provision must be made for the winding gear to the footway columns. Arc lamps shall be fitted with automatic substitutional resistances, so that the failure of one lamp will not interfere with others in the same group.

5. Each lamp is to be fitted with burners, mantles, globes, and fittings, as the case may be, giving a minimum of 90, 180, 1800, or 3000 standard candle power, respectively, as directly measured by the Council's portable photometric apparatus placed at ground level, and is to burn 3940 hours per annum in accordance with a daily schedule to be hereafter supplied by the Council. The fittings and lamp must be in every respect to the satisfaction of the City Engineer, and in particular the reflectors above the light are not to be concave to the light so as to concentrate the illumination at the foot of the lamps, but horizontally, flat, or slightly convex as approved by the City Engineer so as to disperse the rays. The tests will be taken in such a manner as to ensure that glazing bars shall not interfere with the results obtained. The candle power shall be arrived at by taking the average of two readings in any position with regard to the light under test, one reading at an angle of 20 degrees and a second reading at an angle of 50 degrees to the horizontal. A test standard unit of 1-foot candle or of any size in excess of this up to 10-foot candles may be used according to the character of the photometer with which the tests are made and the class of lamp being tested, all as the City Engineer shall direct. The photometer shall be of the Simmance-Abady Flicker type, or of any type approved by the City Engineer. The intention of this contract is that the Contractor shall assure himself by continued test and inspection that the lamps he provides are during lighting hours fulfilling in all respects the requirements of this contract, and he shall not claim relief from the conditions of this contract on the grounds of non-notification on the part of the Council of any failure to comply with the terms of this specification. The light given shall be of a steady, invariable character, of a white or yellowish-white colour.

6. The whole of the metal work of the lamps shall be cleaned down and painted once in every two years with two coats of oil paint, the last coat being mixed with hard-drying outside varnish, of the special shades of colour generally used by the Council for lamps and as required by the City Engineer, after thoroughly scraping and cleaning. All old paint shall be completely burnt off once in every four years, when three coats of paint, as before mentioned, shall be applied instead of two coats. The painting shall be done at such time of the year as shall be approved by the Council. The glass shall at all times be kept thoroughly clean.

7. The whole of the installation is to be complete and in thorough working order by the time specified.

8. Such of the existing pillars and lamps as are now the

property of the Council may be used in present positions, free of cost, subject to adaptation as particularized in Tender Form, if they can be adapted in such a manner as to have the approval of the Council. In case any new lamps or parts thereof are required under any scheme submitted by any tenderer, the existing lamps shall be carefully taken down, and, if the property of the Council, shall become the property of the Contractor, who should make allowance for the value of the same in his tender. The existing mains, surface boxes, &c., are *not* the property of the Council. Possession of the existing lamps, columns, &c., will be given at various dates prior to the end of the year 1910.

Discussion.

The PRESIDENT said they were all much obliged to Mr. Abady for an extremely useful and most interesting paper, which those who had not already done so ought to carefully study, for they would find in it a great deal of what would be useful to them in connection with the lighting of the towns they represented.

Mr. C. E. BOTLEY (Hastings) said he had listened with great attention to the remarks made by Mr. Abady; but he had not had an opportunity of reading the paper, and therefore he might perhaps make some mistake in the observations he was about to offer. There could be no doubt that the principles the author had enunciated as desirable in providing public illumination were those with which they could all agree, whether they were engaged with gas companies or municipal authorities. All that was desired was that there should be fair competition with regard to public lighting, and that things should be treated on their own merits, without side-issues being interposed. The paper was headed "Public Lighting from a Municipal Point of View;" but this was open to two interpretations. He knew the interpretation put upon it by the author; but there was another put upon it by municipal authorities. In many instances, it was not a question of electric lighting or of electricity value, but of a municipal electricity undertaking which was competing against a private gas company; and in such a case as that, the principles set forth in the paper would be of no consideration whatever. It was not a question about getting the best light in the interests of the ratepayers, but of the employment of their electrical undertaking, perhaps, to give an inferior light at an increased cost. And so they sometimes said: "We don't care a hang what light the ratepayers get; we have a municipal undertaking, and we are going to use it for lighting the streets." If this point was dealt with in the paper, he must apologize for mentioning it. They would all agree that this was most unfair. He quite admitted that if a municipal undertaking could provide a better light at a lower rate than it could be supplied for by a gas company who were large ratepayers, they were justified in doing it, but not otherwise. Generally speaking, an electricity undertaking did not pay. It contributed very little towards the rates; and therefore the ratepayers were paying an increased price for the lighting, and getting no benefit either in the rates or in the amount of light. The question of the distribution of light was most important. The arguments put forward, that so many thousand candle power was offered by electricity in excess of what was offered by gas, were absurd when put into practice; but he was afraid that, with so large a number of electricity undertakings in the country as were now carried on by corporations in competition with gas companies, the question of securing the best light at the lowest cost had no consideration whatever.

Mr. F. W. GOODENOUGH (London) said he had not much to say on the paper, except to congratulate the author upon it, and the Institution on getting so admirable a communication on its records. He was quite sure, when the members came to study the tables it contained, they would find them of the greatest value and assistance. The author spoke of what "everybody knew." But common knowledge was something like common sense—a thing that was rarely found at the moment one wanted it. The tables in the paper would form a basis on which to decide what was the proper arrangement of lamps in a street; and they were just the tables which he had been intending to produce for the last seven years. He was much obliged to Mr. Abady for having done what he (the speaker) had not found time to do. He had frequently had to work out a street-lighting problem by itself, simply because he had not the tables which were now before them, and which would form an admirable basis for any lighting scheme. He could quite

sympathize with Mr. Botley in his strong feelings about municipal trading. They had had something to do with it in regard to lighting in bygone years; and he knew of one borough which was spending about £6000 a year more on its street lighting than adequate gas lighting would cost. They had already taken from the ratepayers about £37,000, in direct contributions from the rates, to make up their deficit. So that in about eight years the scheme in question had cost the ratepayers something like £80,000 in excess of the cost of street lighting and in contributions to make up the deficit. But if they were to take Mr. Abady's principles to them, and asked them to scrap their arc lamps because the nominal candle power was not of practical value, they would say, as Mr. Botley had remarked, that they had their own baby to feed and were going to feed it. One could only wish that all municipalities had on their committees men with the same expert knowledge of street lighting as Mr. Abady. The difficulty was frequently to get a municipal committee to thoroughly understand lighting problems. His figures erred, if anything, in favour of the high-power light, because he was comparing the value of the light on the ground level. For instance, he was taking a lamp-column 11 feet high and dividing the light by the square of 11, and then a lamp-column 20 feet high and dividing by the square of 20 or by an angle line; whereas the actual practical level at which the light was required was at an average of somewhere about 3 to 4 feet from the ground. This was about the height at which one looked at a watch; and if they took from the ground level to about 8 feet above the ground, this was about the area for which the light was actually used. If they took the mean of this, and measured from there to the height of the column, they would get a still stronger argument in favour of small units and low posts. Still, if 3-candle power on a 20-foot post was required, they were quite prepared to deal with it. Such a light would be found in Aldwych; and if anyone was interested to see the latest thing in high-pressure inverted gas lighting, he should go and see it. It was not an economical light; but it was a very good advertising light. He joined issue with Mr. Abady on the question of upright as against inverted burners for street lighting, because he quite believed that the inverted burner was the burner of the future for this purpose. Its efficiency was very high, and with a proper reflector its distribution was very good. He did not quite follow the author's point as to the authority making a contract to secure for the ratepayers the advantage of progress in efficiency during the period of the contract, because if the municipality entered into a contract with a company for a 100-candle power light for five years, and if during this time the gas company could give this candle power with half the gas it started with, those who benefited were the company, not the municipality. It seemed to him that the gas supplier or the electricity supplier had all the advantage from increased efficiency obtained during the period of the contract. In conclusion, he again recommended the members to study the paper very carefully, and to keep it at hand for reference.

Mr. GEORGE HELPS (Nuneaton) said he should like to join his thanks to Mr. Abady for his admirable paper; for he had dealt with the matter in the very thorough way they all expected from him. To attempt to discuss all the points raised would be impossible; and, as there was a good deal in which he was absolutely in accord with the author, he need not go into that. But on two or three points on which he was not in agreement, he would make some few remarks. Mr. Abady said he did not think the gas sold by nipple consumption was so good as something else; but what that "something else" was, he (Mr. Helps) did not quite understand. They all knew the importance of pressure; and he had sometimes thought money would be well spent if the Research Committee of the Institution used some of their energies in the direction of trying to discover, while some of them were alive, how to send out 18-candle gas at 10-10ths or 15-10ths pressure. They also knew that low-grade gas was far more useful to their customers than high-grade gas; but he did not know whether they thoroughly assimilated this knowledge. When they did, it would be far better for the consumer. They could all understand the importance of the height of the light from the ground; but there, again, perhaps they did not appreciate it, because, if they looked round, they saw many lights which were not of the height they should be. He was more at variance with Mr. Abady when he said he believed the vertical mantle was better than the inverted one, than in any other remark he made,

because he thought he was absolutely wrong. He should like to show him some lighting with which he had had something to do at a large railway station where they had vertical burners, and were replacing them by inverted ones. There the consumption had been reduced 25 per cent., and the light had been considerably increased. He should be much indebted to anyone who could show that these were not the facts. There was one matter which he thought had been omitted, and it was of huge importance in a scheme of gas lighting—viz., maintenance. The maintenance of an inverted burner against a vertical burner was a very big feature indeed. He had some figures with him showing, over eighteen months, the number of mantles actually used in inverted and vertical lamps. The number of lamps was 400, and the vertical mantles were in ordinary square lanterns which were not originally made for incandescent lights, and consequently were not the best fitted for the purpose. But the actual mantle consumption over several years worked out at 24 mantles per lamp a year. The cost of the mantles was, of course, not the only consideration, because the labour in dealing with them was also an important matter. A good many people imagined that they only used three or four mantles in a lamp per annum; and they might go on imagining it. But if they kept a true record, they would find the number would approach much nearer to the figure he had given than they would at the moment credit. In the case of inverted burners, the number of mantles used had come down to less than six.

Mr. C. E. JONES (London) said, if his memory did not deceive him, it was 35 years since he read his first paper on street lighting; and at that time very little attention was paid to such a subject. It was thought to be the correct thing to sell as much gas as one could, irrespective of the illumination got out of it. He remembered a director of a company with which he was then associated who objected to improvements in burners, and wanted the old iron burner all along; his reason being that it consumed more gas than the new-fangled burner then being put on the market. This was a fair type of a large number of administrators of gas companies 35 years ago. But they saw a great difference now. There was a wonderful change in the street lighting of all towns. As a fellow-citizen of Westminster with Mr. Abady, he could not allow the opportunity to pass without expressing his congratulations to him for elevating this subject of street lighting from the pavement to a higher level; and he not only congratulated him, but also the Institution on possessing a paper which would adorn its "Transactions." The value of lighting, not the value of the gas, was what they were now taught to consider. It was too late to say that a lamp was taking so much current, or that they were supplying so many cubic feet of gas per hour to the lamps. What they wanted to see was what they were getting out of it. The proper basis of a contract was an intelligent idea of illumination—what was the illuminating effect of the gas or the electricity. Then came the great point to a commercial people—the question of cost. He might tell the members that Mr. Abady had a very uphill fight in Westminster over this matter; but they had stuck to their guns. In his municipal capacity, he had been a stalwart; and he (Mr. Jones) was pleased to say he had voted for him. Everyone interested in gas ought to feel indebted to Mr. Abady; and, if his idea were adopted and carried into full effect, he (the speaker) had not the slightest doubt that the City of Westminster would be the best-lighted city in the United Kingdom, and he hoped in the world—bearing in mind always, the security that it gave for the protection of life and property. He had always contended that one gas-lamp was equal to three policemen; but this was in the old times, when they did not get much illuminating power out of gas. Now, with a decent burner, they could obtain 100 candles easily out of 30 to 40 cubic feet of gas, which was an unknown quantity in his young days. According to the calculations of the electricians, it was possible to get thousands of candle power out of one light. They multiplied by 32 all the points of the compass, so as to get the volume of their light by the square of the distance, and all that sort of thing. In Mr. Abady's system, they had an elevation of the subject. It was reduced to mathematical accuracy; and the author deserved their thanks for bringing it before them in so clear a manner. He desired to endorse particularly what Mr. Abady said about high-pressure gas. Assuming the distributing apparatus and the fittings were correct, there was no reason why gas should not be distributed now at much higher pressure than it had hitherto

been; and the time was coming when it would be. He had advocated it in the Institution; and he had told the members, if they could not make tight mains, to send for water engineers, who managed to lay down mains for carrying pressures which gas men knew nothing whatever about. Having got their mains and apparatus completely gas-tight, there was no reason why gas should not be supplied at much higher pressure than it was now. In his domestic economy he had only one fire—a gas-fire. All his food had been cooked by it for the last fifty years, and he did not think he looked any the worse for it. But they must have higher pressure gas for cooking purposes. In his judgment, the paper was a most valuable contribution. It marked a new departure, and inaugurated a better feeling between municipalities and the purveyors of artificial light. He was glad to think that the City of Westminster had taken the lead in this matter of street lighting.

Mr. R. G. SHADBOLT (Grantham) said he should like to add a few words from the point of view of a Company's Gas Engineer who had to meet the requirements of a municipality. In his own case, he had laid down similar lines to those advocated by Mr. Abady; and he might remark on the very masterly style in which that gentleman had placed all the members under deep obligation to him by preparing the tables in connection with his paper; and by the lucid manner in which he had presented the subject, so that any ordinary director or member of a committee could follow the lines of his argument and the basis on which he had worked out his tables. Having had the opportunity of reading the paper, he must confess that not only in the main but practically throughout he found himself compelled to agree with the author in what he said with regard to the vertical burner, as to the distribution of light, as against the inverted one. His observations on the placing of the lights, on the reflector, the height of the light, and the decrease in the unit of light, were most valuable features of the paper. Having had occasion, some few years ago, to enter into competition with an electricity undertaking (fortunately a company) over a long-standing contract where they supplied everything, even the lighting, cleaning, and all the rest of it, on the old basis of so many cubic feet an hour to a certain number of lamps, and so many cubic feet to another set, and having turned-over from this to practically an electricity specification, the members could appreciate—after an experience of two terms of three years in which he beat his electricity competitor out of the field, and having entered on a further term of five years for which they had secured the contract for the entire lighting—his desire to speak. He quite agreed that the entire system of lighting—providing, maintaining, extinguishing, and so forth—was to-day much more satisfactory, from the point of view of the supplier, than it was; but possibly not in Mr. Jones's time, because they would find that, where the gas company maintained the lamps as well as supplied the gas, more particularly if this was done under penalty clauses and tests, the lights were, generally speaking, in far better condition than those which were left to the local authority to maintain—the gas company being simply responsible for the gas. Again, there was the great advantage of the advertising value; and he thought even Mr. Abady would be very much at sea if he attempted to estimate it. One could not by testing estimate the value of retaining the entire street lighting of even a small country town. On the other hand, like all other things, it was quite possible to go to an extreme. He had in his mind a neighbouring town where the electricity people were ousted from the public street lighting quite recently by the local gas company; and the chairman of that electricity company made a remarkable statement at the general meeting. He said he was sorry to say that the sale of current had considerably diminished owing to the loss of the public lighting; but, on the other hand, he was glad to be able to report that they could pay a little better dividend than before, because they had been relieved of an "advertising incubus." It was quite possible to quote a figure in order to get a contract, if one had to tax unduly the ordinary consumers. This might apply more to electricity as a competitor than to themselves. He thought that in most gas-lighting contracts there was not the slightest difficulty in putting them on a fair basis. In a general specification, they were still able to take the lighting at a lower price than their competitors, and to do it remuneratively. With regard to the Calcutta clauses, and their bearing on the point of view of gas companies' engineers supplying according to Mr. Abady's requirements, he

did not know what his intention was; but it seemed to him (Mr. Shadbolt) that this was a specification which ought, by all possible means, to be avoided, for the simple reason of the undue interference it contained with various applications of gas, by limiting the illuminating power, specifying the pressure, and putting on all kinds of restrictions, simply to ensure that the corporation or the municipality might receive a given quantity of gas. The spirit of these powers, from beginning to end, seemed to him to leave the supplier to furnish a specified quantity of light distributed in a certain manner, but not to give him a free hand to use various improvements as they came along. Although the supplier might benefit with regard to one term, it was the municipality who benefited when the next term came round, because the gas supplier would be able to quote a lower figure owing to the experience he had gained and the various improvements he had been able to introduce.

Mr. H. W. COPP (West Bromwich) said towards the end of the paper the author made a statement to the effect that at present the most efficient means of street illumination was that of a particular electric lamp, which he believed was No. 15. He took it that Mr. Abady meant that this lamp possessed greater efficiency owing to the arrangement of its components, not necessarily that it was the best agent for illuminating streets. The paper was a complete guide, so far as public street lighting went, with regard to the arrangements which ought to be made between a company and the public authority. But he could assure the author that the same difficulties very often existed with the municipal supply as well, though with this difference—that with regard to a company supplying light they generally had a free hand, and their success depended more or less on their own merits, whereas in a municipal concern the whole thing was frequently biassed. One reason for this—especially in remote Provincial towns more than in those near London—was that there was a great prejudice in favour of electricity, solely due to a popular idea that it was more up-to-date than gas lighting. This was one point requiring to be strongly combated. With reference to the question of efficiency—supplying so much light for a certain amount of money—the tests specified by Mr. Abady were very complete; but he thought that tests should not altogether be relied upon, and that common sense was an important factor. His experience was that it was not always the quantity of light that mattered. In some places, the public preferred glare to illumination. The feature was one which the people responsible for public lighting should also bear it in mind. Two or three years ago, when he had the honour of reading a paper on street lighting before the Institution, he had occasion to study this subject rather thoroughly; and he came to the conclusion, after trying a number of experiments with large units of different types, and also with single burner inverted lamps, that the ideal in street lighting was small units at a fair height, close together. He proved this to his own satisfaction; and he thought, by reference to the paper, it would be seen that the point was fairly clearly shown. Another thing he should like to refer to was the subject of reflectors. As he said in the paper, the point seemed to him to turn mainly on the efficiency of the reflectors, especially in the case of inverted burners; and his own opinion was that the ideal public lighting would be eventually found to be the inverted burner with suitable reflectors for diverting the light in the direction of the roadway. He was not himself prepared to submit a design for a reflector which would effectively do this; but he was convinced it was possible, and that in the future someone would discover the right form of reflector to attain this end. With regard to the first appendix to the paper, in which Mr. Abady set forth the lighting conditions at Calcutta, he (Mr. Copp) did not think they were altogether to be congratulated on confining themselves, as they did, to low-pressure gas for the next twenty years, because his opinion was that, for practical purposes for the public lighting of large towns, low-pressure gas would soon become almost obsolete.

Mr. T. CANNING (Newport) said he should not like the paper to pass without some notice from himself, as he had had considerable experience of what a municipality was attempting to do in the way of public lighting. But before saying anything on the matter, he should like to refer to one reason why he so highly appreciated the paper. It was because it was scientific, and because the author had attempted to make a contract upon what he might call a scientific basis. He believed the Westminster contract to be founded on a scientific and proper basis; and he com-

mended this portion of the paper more especially to the attention of the members of the Institution. He had made some experiments with public lighting, both with gas and electric lamps; and he generally found, taking various zones at certain well-apportioned distances from the base of the column in either case, that the principles laid down by Mr. Abady were the general scientific principles governing the intensity of light compared with the distance applied to gas-lamps. But he had not found them apply to electricity lamps; there was some other quality which interfered—the quality of non-diffusiveness. At a certain distance from the zone, the light given by a gas-lamp was greater than that given in the same zone by an electric lamp, although, if tested photometrically, they would both be shown to be of the same intensity at the source. He should like, therefore, some further explanation on this point. It was a matter he had observed; and he could only say that it was not an explanation that the light coming from the electric arc or from the incandescent filament might be very intense at the source, but did not seem to be diffusible. It was something like what he saw some years ago in South Wales. A very able man, before the days of patent fuel, brought out a method of compressing coal dust. It was his own; and it had not been repeated. Its calorific power was stated to be tremendous; and so it was. But when it was used under boilers, its intensity was so enormous, and its want of diffusion so remarkable, that it performed scarcely any work whatever in the boiler, although under the boiler it did a great deal of disastrous work. So much with regard to the scientific side of the paper. He welcomed it because it was an attempt to work out a very difficult problem, and to give them a chance of making a proper and fair scientific comparison between gas lighting and other methods of lighting competing with it. With respect to the question touched upon by Mr. Botley—viz., the manner in which municipalities dealt with gas companies when they happened to have an electrical establishment of their own—he must remark that in a particular case of which he knew, there could not be said to be any competition whatever. The electric light installation went up as soon as the municipality in question became the proprietors of the electric power works; and the gas company had to offer, but were not asked, to tender. He was not sure whether this was in accordance with the Act of Parliament which had been passed regulating the action of municipalities; but he distinctly thought it was illegal. He had said so elsewhere, and he thought he should not be going too far in repeating it. At any rate, the gas company in the particular case referred to had had to offer their tenders voluntarily, with the certainty that they would be rejected, and with the equal certainty that no knowledge of their existence would be given to the public—that, in point of fact, they would be suppressed. Again, certain tests had been asked to be made between the electric light and gas light; and they had been scornfully refused, because the statement of the corporation, through the electricity department, was that they made a commodity of their own which the ratepayers owned too. Certainly, it ought to be their own, as they paid two or three times over for it. But they said this commodity was theirs; and because it was theirs they would use it for their own purposes. He wished to point out, in a plain, common-sense way, how they might have evil consequences. Some years ago, he knew of a firm who were about to establish themselves on some good marsh land where there was excellent clay for brick-making. He advised the firm to have nothing to do with brick-making. But they said they would; they had the clay, and the bricks would be their own commodity. And so they were. They tried to put the bricks into the building; but it came down because the bricks were no good. They were the firm's own commodity, but were the worst commodity they could touch; for after they had made the bricks they had not the heart to condemn them. So, in like manner, they never got the electricity department of a corporation to condemn its commodity, no matter how bad it really was. Once they got it there, they would continue to use it. All this sort of thing going on had, no doubt, a very evil effect, so far as gas companies were concerned. The public thought it was through some fault of their own—through some want of power in the light, or some disadvantage on their side—that they were unable to do what was required with respect to the public lighting of the principal portion of a town, but were relegated to the side streets, where it was too expensive to take the electric cables. The gas company were ratepayers—often very

heavy ones—and had to pay a portion of the cost of public lighting; and when the electric lighting concern went on from year to year losing money, and falling back on the rates to the extent of some thousands of pounds, he thought that when a public Government inquiry was held, the gas company ought to come forward and state the whole facts of the case. He did not say they ought to show any spirit of animus or unreasonable opposition, but simply and solely to state the facts of the case. The community had a right to have its own electric lighting and to supply it, and also to have loans from time to time authorized by the Local Government Board for carrying on the work. To this they had no objection; but it was to the system, which was so unfair, by which they were relieved entirely from competition, and by which they only retained their standing by selling current frequently below cost price.

Alderman GRIFFITHS (Southport) said, as representative of a municipality, he was much interested in the paper, which appeared to be a valuable one for gas undertakings. But he was not interested in the discussion upon it, as it seemed to him to savour too much of private companies *versus* municipalities. He thought the question for an Institution of the character of that of which those present were members, ought to be the gas industry, the whole gas industry, and nothing but the gas industry. It so happened that his municipality owned both the gas and electricity undertakings, and they lighted the streets by gas. He thought it was wise—and this was why he rose to speak—to look at both sides of all questions. It was very foolish for an institution devoted to electricity to say too much about gas; and equally inept for a gas institution to say too much about electricity. Each would be wiser to attend to its own business. As his municipality had both undertakings, he was in a somewhat impartial position; but he was Chairman of the Gas Committee. He found, whether the Institution did or did not realize it—but they would have to do so—that the public required electricity both for house and for street lighting. He found in his own town that every house of more than £20 value was being wired for electricity, and not being piped for gas. So that the Institution would have to take full account of what their customers were very largely demanding—a supply of electricity. He hoped that the President's advice would be taken into serious consideration at an early date, and that there would be absolute cohesion between the companies and municipalities who supplied gas; for he thought this was the only way in which the gas industry could properly maintain its present important and useful position.

Mr. ABADY, in reply, said the lines the discussion had taken showed the great advantage of the form that he had adopted for presenting his paper, because practically every point which had been mentioned was contained in it, and therefore the discussion only showed those points which were foremost in men's minds. There were two subjects which seemed to run through the remarks of most of the speakers; and therefore he would deal with them without reference to anyone in particular. One was the question of the woeful position of a gas company owing to an electric corporation undertaking; and the other was the question of the Calcutta contract, which he had dealt with at length. With respect to the municipal question, he had touched upon it in the paper; and he thought if anybody read it he would see this was so. But he felt that a general discussion as to how to combat the Collectivist tendency of the present age was somewhat outside the scope of the subject he had in hand; and this was the only reason why he left it alone. As a politician, he had his own views on the question, and he should like to have the opportunity of occupying the rostrum for an hour or two upon it. But it really had nothing to do with lighting. What he did suggest was that they wanted, in the matter of lighting, a thorough understanding of the real meaning of what the competitor's offer was, as this would enable them better to combat municipal competition. That was the point. With respect to the Calcutta contract, he did not think those gentlemen who had mentioned it could have read the text of his remarks carefully, or the clauses of the agreement he had quoted. The contract was one which replaced an existing contract that was for the supply of so much light; and, under the circumstances, in a city like Calcutta, where the principal use of gas was for public lighting, and where there was native labour as well as all sorts of difficult conditions to cope with, a contract for a long period was necessitated. This, he learnt from the source from which he obtained the informa-

tion, which was authentic, had been found unsatisfactory, and it had become necessary to make the agreement for a nipple test. He put the agreement in because he thought it was so admirably complete. It was suitable for Calcutta; and, for its circumstances, it was admirable. But he ventured to think it was not in a general way, where ordinary and normal conditions prevailed, an advantageous form of contract in the same sense as was one for the supply of light. One or two statements had been made about it which were not correct. It did not tie them down to low pressure. There were very elaborate precautions by which an increased pressure could be taken advantage of when this became, so to speak, the fashion. He did not think the Calcutta Corporation looked upon the matter from the point of view of shackling the Gas Company. All they wanted to have was power to buy the gas, and then to look after the lighting themselves. This was the position they took. Under the circumstances, remembering what they knew of the matter, this was inevitable. But he did not think the general observations which had been made would have been offered if the facts had been clearly understood. Mr. Botley had dealt with the municipal question, and was good enough to preface his remarks by saying that he had not read the paper. If he had done so, he would probably not have made them, as they simply confirmed what he (Mr. Abady) had said. Mr. Goodenough asked how the photometric tests enabled a municipality to take advantage of any improvement. It seemed to him that this would be to the advantage of the gas company, if not to the municipality. In reply to this, he might simply refer to one passage in his paper: "Does this contract facilitate or encourage the adoption by either party of improved methods? It seems to me that it does, because if the contractor finds he can produce the same light at a cheaper cost, or a better light for the same cost, he would surely approach the corporation and offer to share the benefit of such improvements." He did not suggest that the Directors of the Oriental Gas Company or the Engineer was an angel without wings; but he was reasonably certain that improvements in lighting would come through the adoption of a burner which enabled gas at an increased pressure and of a lower quality to be utilized. Therefore the mere change in conditions would probably necessitate the provision of a new burner or apparatus of some kind; and no gas company could afford, in the middle of a contract period, to voluntarily go to the expense of a new burner for the saving it would effect in the gas. But the Gas Company would go to the Corporation and point out that there was efficiency to be obtained, and a saving to be effected, by capital expenditure on a new burner, and offer to share the benefit and saving with them. In this respect the Corporation were quite safeguarded. With regard to the question of whether or not the light on the ground was the light that was wanted, he had really not taken the actual light on the ground. He had taken the light at the source, and divided it by the square of the distance from the source to the ground, so as to be comparable all through; and this was something definite. One man might want to read his watch at the height of 4 feet, and another at 4 ft. 6 in. But if he dropped a three-penny bit or a half sovereign, he would want the ground level. Mr. George Helps said he did not understand what he (Mr. Abady) was trying to get at in comparing the nipple with "something else." But when Mr. Helps had read about the "something else," and had arrived at a definite conclusion as to what it meant, he (Mr. Abady) would be willing to discuss it with him. With regard to the vertical burner, Mr. Helps and a subsequent speaker quite misrepresented him. He did not say that the vertical burner was the most suitable for street lighting. He said that the natural distribution curve of the vertical burner was more suitable for street lighting than that of the inverted burner, but that the inverted mantle saved in maintenance. The mantles would give a better light with less gas; and therefore, if they were to be used efficiently, the unnatural distribution of the light must be provided for by the position in which they were placed in the lanterns and by the use of proper reflectors. He agreed with what had been said by Mr. Shadbolt, who had had experience of a contract for the supply of light; and he also agreed with the inadvisability of maintenance by the local authority, subject to special circumstances, such as those at Calcutta. Mr. Copp was in error about the most efficient lamp. What he (Mr. Abady) said was that, in settling the question of the distribution curve, the best example was the flame arc lamp; and they got the distribution by using dioptric reflectors—a type

will be $113\frac{1}{2}$ inches. This, divided by nine—for the purpose of determining the points 20° , 40° , 60° , and 80° above and below the centre reading, as described fully in the 1909 report—makes each division $12\frac{2}{3}$ inches. These should be marked off above and below C M (fig. 1).

The angles at which the horizontal readings should be taken—i.e., to the right and left of the centre of the stove—are marked off on the board E (figs. 1 and 2). This rests rigid on the base D (fig. 1); and the pointer F (seen in section in fig. 1 and in plan in fig. 2) is attached to the revolving bar at B (fig. 1), and marks off the angle required on E (fig. 2). The fittings J H G (fig. 1) are made of 2-inch by $\frac{1}{4}$ -inch mild steel, as is also the plate surrounding the base-box D. These may be adapted to the conditions under which the apparatus is used. This modification reduces considerably the time which the determination occupies.

THE DETERMINATION OF THE EFFICIENCIES OF VARIOUS MAKES AND TYPES OF STOVES.

With a view to making an examination into the principles underlying the efficient working of the open gas-fire, a number of makers were invited to lend certain of their stoves to the Committee; and these were each put through a series of tests and their results compared. The working of the stoves themselves was also varied until the greatest efficiency was attained. In one or two instances it was found that stoves, after being adjusted to suit the conditions under which they were tested, gave 4 or 5 per cent. better efficiency than when used as they were forwarded from the makers. It is always expected by the makers that stoves will be adjusted afresh after installation, but this is frequently neglected.

In the Appendix will be found a table containing the results of the experiments made on the various types of stove. Where flue-heat loss is recorded, it is the result of a separate experiment. During radiation determinations, the temperature of the room was quite normal—ranging from 15° – 18° C. But during the flue-heat loss experiments, the door of the room was closed; and this accounted for the high temperatures shown in Column L.

All the radiation determinations were made with the radiometer-thermopile apparatus, as described in the 1909 report, with the modification described in this report. The modified form gave extremely consistent results, and showed that the older form tended to give low results.

Gas volumes have all been reduced to 60° Fahr., 30 inches of mercury pressure, and wet gas, although in actual working readings were taken in millimetres and degrees Centigrade, and calculated to 0° C. 760 m.m. dry.

As the method of making these experiments is described substantially in the 1909 report, no useful object will be served in repeating the account here.

By reference to the table in the Appendix, most of the details of the various stoves will be found; but a short paragraph describing each stove more fully, and also giving a few notes on the stove as a whole, will no doubt add to the value of the experiments.

Experiment No. 1.—In construction, this stove is of very plain design. The "fuels" are columnar, 7 inches high and slightly wider up their centre than most other fuels. They are almost cylindrical and regular in shape. This stove would have given a large percentage radiation if either the fuel had been narrower or the flames wider. The gas and air adjustment was good and convenient; but the flames were uneven in size. The amount of heat passing up the flue was very low, as arrangements were made in the top and back of the stove for taking much of the heat from the waste products without diverting them down the back of the stove. The fuel guard was replaced by a single bar of iron. In all experiments the gas and air were adjusted to give a flame showing an indistinct inner cone.

Experiment No. 2.—This was made under conditions almost identical with those of Experiment No. 1, the only difference being a higher calorific value of the gas. It will be seen that this is increased by about 3 per cent. If 30 to 40 per cent. of this increase in heat evolved be radiated, the total percentage of heat radiated will be increased by about 1 per cent. This is approximately the case within the experimental errors of the determinations. A rise in calorific value has caused a rise in the amount of heat radiated, the size of the flame remaining the same.

Experiment No. 3.—This stove was from a different maker. The "fuels" were longer, and not so regular as those used in Experiments Nos. 1 and 2. They were also

less in diameter. The fire-brick back was of good construction and increased the radiation efficiency. No attempt appeared to have been made in the construction of the top of the stove to abstract heat from the waste hot products. This accounts for the high flue loss. The perforated iron casting directly above the burner prevented a large volume of cold air being pulled up through the fuels with the flames. This is a point sometimes overlooked. The gas and air adjustments were convenient and satisfactory. No fuel guard was used.

Experiments Nos. 4, 5, 6 were made with a stove having a convex front of fuel. It was fitted with a duplex burner and an iron fuel guard. Experiments Nos. 4 and 5 were similar in every respect, except that it will be seen that in No. 5 the increased size of flame, owing to a greater gas consumption, increased the radiation efficiency of the stove—although there was no corresponding increase in the numbers of calories being produced per hour. The stove was by the same maker as those used in Experiments Nos. 1 and 2. The special significance of the tests with the duplex burner is explained in another part of the report.

Experiment No. 7.—This is another maker's stove. The fuels were much shallower than is usual, and extremely irregular on the inner side. The construction of the fire-brick back added much to the value of the stove as a radiating appliance; the composition and conformation of the material intercepting and retaining heat that would otherwise have been convected. The construction of the body of the stove was such that the waste products were deprived of a larger amount of their heat than is usually the case. This stove had a sheet-iron back attached to it, and there were holes in the top of the stove from which much heat was convected. The gas and air adjustments were simple, adequate, and convenient.

Owing to the construction of the "fuels," slight changes in the position of the burner, or of the fuels themselves, would reduce the radiation efficiency 4 or 5 per cent. There was an iron grating in front of the "fuel." The width of this fire is greater than that of any other fire dealt with in this report. It will be noticed that the radiation efficiency of this stove is slightly higher than that of other stoves of a similar type. It may be taken that wide fires of a given type give higher radiation efficiencies than narrower ones. The mean temperature of the fire is increased; and although this increase be small, the increased amount of radiation is proportionately greater.

Experiment No. 8.—The stove had horizontal iron frets. Much has been said recently on the subject of the superiority of the old iron-fret stoves as radiating appliances. All the experiments and determinations that have been made in the course of this inquiry go to show that although the iron-fret stove is equal to the fire-clay type, still it is no better, and the advantages the latter have from the point of view of appearance and cleanliness—having no oxide dust—make it much to be preferred. Again, on first lighting the stove, there is more likelihood of the escape of carbon monoxide from the iron-fret stove than in the fire-clay "fuel" stove, owing to the much higher conductivity of the iron than that of fire-clay preventing the iron from warming up as quickly as the fire-clay.

Experiment No. 9.—The stove used had identically the same arrangement of horizontal iron frets, but the construction of the body of the stove was very different. Extending from the foot of the stove was a tray or fender projection, and at the top of the stove was a canopy acting as part of an arrangement for extracting the heat from the waste products of combustion. Both these projections cut off radiant heat which would otherwise have come into the room.

Experiment No. 10.—This stove was of massive construction, and the iron frets were in a vertical position in the form of iron sprays lying against the flames, one side of which touched the iron frets and the other side the small knobs of fire-bricks with which the whole of the back of the fire was studded. There were no gas and air adjustments in any of the iron-fret stoves. It would have been an advantage to have had them. The large upper body of this stove cut down the flue heat loss so much that it was with difficulty that a sufficient draught could be maintained up the main chimney.

Experiment No. 11.—The reflector stove consists of a number of long luminous flames, which burn horizontally inside the top of the stove. The heat and light from these flames are reflected by means of a curved copper reflector into the room.

Experiment No. 12.—The fire in this stove consisted of a number of perforated cylindrical tubes of fire-clay, each resting over a small non-luminous flame. The gas and air adjustment was elaborate, but easy to operate; but some difficulty was experienced in getting the correct adjustment to ensure the highest radiant efficiency with this stove.

Experiments Nos. 13 to 18 are experiments with stoves already reported on, but having fuels specially treated as described in another part of this report.

The Incandescent Mantle Stove.—This stove is of quite a new type, and is still in the experimental stage. It was submitted by the designer to the Gas Heating Research Committee for their examination. Its main principle is the utilizing of the heat passing from an incandescent gas light by absorbing it in the cast-iron framework of the body of the stove. At the same time air passing in at the foot of the burner is preheated by passing through the stove. The body of the stove was found to be very efficient in taking up the heat from the products. At the end of three hours the surface of the stove and the flue gases attained their maximum temperature, the latter being 81°C . Good combustion does not take place until a sufficient draught is set up in the flue, but was generally satisfactory at the end of $1\frac{1}{2}$ hours.

The stove was covered with polished copper sheeting, which prevented radiation from the body of the stove; the heat passing from it as convected heat. The average flue heat loss at the end of three hours was 9.5 per cent. The heat radiated from the mantle and passing through the glass chimney was 21 per cent.; the remaining 69.5 per cent. being taken up by the stove and glass chimney, and passing away as convected heat. There were no arrangements for the reception of the water condensed in the stove.

The object in constructing the stove appeared to be to find a more efficient substitute for the so-called "gas-radiator."

GENERAL REMARKS ON THE ABOVE TESTS.

In every case, two, three, and sometimes four, confirmatory experiments were made. The radiant heat efficiencies of different stoves of the same type are fairly constant, ranging from 37 to 43 per cent.

The stove dealt with in last year's report is included among the stoves reported on here. It will be remembered that the highest figure found for radiant heat efficiency was over 35 per cent. The new apparatus and careful attention to the various details outlined here relating to correct size of flame, its proper aëration, and a better adjustment of fuel, have increased the figure considerably.

There is great divergence in the figures in column K, showing flue-heat loss. This is entirely due to variations in the construction of the top of the stove and to the size, shape, and position of the outlet from the stove into the flue. No fan was used in any of these experiments for abstracting flue gases.

It would not be possible to state, even if it were permissible to do so, that any one make of stove stood out above all others as a type of what should be. There are a number of very good makes, each differing materially in details. Where one stove has an advantage in one respect, it falls short in another.

One stove having a high radiation efficiency might be improved by making arrangements for more heat to be extracted from the flue gases. Another, good in many respects, is worthy of a better design in the casting, or a better construction of burner enabling it to give even flames.

The aim of most makers in their design of gas and air adjustment is to make them as simple in construction as possible, and yet not to serve as a plaything for children and servants.

The "cheeks" and "chin" and canopy of some stoves seem to have had very little attention paid to their form and construction. Much can be done in the construction of the fire-brick back of the stove. Its shape should be designed to fit the fuel and keep it in place, as well as to intercept and deflect the hot products missed by the fuel. In composition, it should be as high a non-conductor of heat as possible, and yet act as a good radiator from its surface. Its object is not so much to radiate, however, as to conserve the heat to the "fuels."

In all probability the highest efficiency attainable with the present type of open fire, where the air of the room has free access to the front of the hot fuel, will be little more than 50 per cent.

There are four sources of heat-loss from the fuels:

- (1) By radiation in all directions.
- (2) By conduction to the air in contact with the front of the fuels.
- (3) By conduction to the back and sides of the stove.
- (4) By the convection of the waste products passing away from the top of the fuels.

The first of these is the one it is desired to increase. To do this, some or all of the other channels must be cut down. The waste products always leave the "fuel" at a slightly higher temperature than that of the top of the fuel; so that the higher the temperature of the fuel the greater the heat loss in the waste products. If the temperature of the main body of the fuel is raised, the loss by conduction to the air (2) and to the fire-brick back and body of the stove is increased. In many stoves in which the whole of the fuel is usually maintained incandescent, it would add to their efficiencies to increase the length of the "fuels;" for although the added fuel would not be incandescent, and would not radiate as much as the rest of the fuel, it would take up some of the heat of the waste products and conserve the heat of the "fuel" below it.

A better radiating material seems to be the only means by which the radiant efficiency of the stove might possibly be increased. But even with this the temperature of the material would be lower, owing to its having radiated more heat; and as the amount of radiation varies approximately as the fourth power of the temperature, it is very doubtful whether there would be any great increase in radiation efficiency by employing a better radiating material, the gas consumption remaining the same.

Although it appears that with the present type of stove the radiant efficiency will not be increased much beyond 50 per cent., there is no reason why the heat usually allowed to pass up the flue should not be utilized more than has been the case. It is, of course, not practicable to cool the products below a certain point, as a definite percentage of heat is necessary to maintain the flow of the products of combustion up the flue. This amount will vary with the height and construction of the flue.

RADIATION FROM BUNSEN AND LUMINOUS FLAMES.

The point of most importance in the study of the principles underlying the working of a gas-stove of the radiating type is the convenient and economical generation of the requisite amount of heat and the transference of the heat of combustion to the "radiating material" employed. In this connection, the question of the amount of heat the flame itself radiates is worthy of consideration. Very little has been done on this subject, the only references which had come to our notice previous to the few experiments reported on here being:

- (1) That of a thesis by Robert Von Helmholtz (Beiblätter 14, p. 589, 1890), in which he finds that most hydrocarbon non-luminous flames radiate about 5 per cent. of their heat of combustion. He used flames of 6 m.m. diameter and 60 m.m. high.
- (2) That mentioned in the discussion on a paper by Professor B. Hopkinson, "Explosions of Coal Gas and Air" (Proc. R.S.A. 77, p. 400, April, 1906), relating to some qualitative experiments of Professor H. L. Callendar on the loss by radiation in internal combustion engines.

These were summarized more fully in the discussion of a paper on "The Effect of Size on the Thermal Efficiency of Motors" (Proc. Inst. Aut. Eng., April, 1907), by Professor H. L. Callendar. Here it is stated that the heat radiated from an ordinary non-luminous bunsen flame might amount to 15 or 20 per cent. of the total heat of combustion, but that it depended on the duration of incandescence. It is further suggested that the larger the flame—whether due to increased gas consumption or to decrease in the air supply—the greater is the percentage radiation. This is explained as being due to the increase in the mean temperature of the flame.

These experiments have quite recently been repeated and confirmed by Professor Callendar and Mr. G. H. Nelson. They used a Meker burner of 3 c.m. diameter, consuming gas at the rate of 11 cubic feet per hour.

The results of the following experiments will be seen to agree quite well with those obtained by Professor Callendar. No special apparatus was used for the determination, the radiometer described in last year's report and employed in

other work being adapted to this use. It was assumed that the flame radiated equally in all directions; and the method employed to measure the amount of radiation was to absorb the radiations from the flame falling on the 12-inch square surface of the radiometer at a distance of 6 inches. On the above assumption, calculating from the fact that the radiometer surface formed one side of an imaginary 12-inch cube, the number of calories radiated from the flame will be six times the radiometer value.

This method is subject to a number of minor inaccuracies; but for the purpose in view it was quite satisfactory. There were four sets of experiments, a Meker burner being used in the first. This had a deep nickel grid, and was 3 c.m. in diameter. No estimation was made of the relative proportions of air and gas entering the burner. There were small cones at each perforation in the grating. These were about one millimetre in height. The flame was noiseless, steady, and quite conical. Its height was approximately 210 m.m. The gas consumption was measured by means of a standardized wet meter, account being taken of temperature and pressure at the meter.

The gas rate, reduced to 60° Fahr. and 30 inches of mercury, was 7.12 cubic feet per hour, and the calorific value 132.2 calories net. In this case, the flame radiated 14.9 per cent. of its heat. This was checked immediately afterwards, in order that similar conditions could be maintained, and the same result was obtained.

The second set of experiments were with a large type of Bunsen burner with a wire gauze taking the place of the nickel grid. The gas consumption was 8.9 cubic feet per hour, and the calorific value of the gas 137 calories net at 60° Fahr., 30 inches, wet. The width of the foot of the flame was 35 m.m., and at the middle 40 m.m. The mean height of the flame was 180 m.m., and the mean height of the inner cone was 70 m.m. This was distinct but not sharp, and the flame could be heard; but there was no spluttering, and it was not noisy. This was about the type of flame, in respect to its aëration, usually found in a gas-stove, although its volume was much greater. The mean of a number of experiments, which were practically constant in their results, showed that 15.2 per cent. of the heat was radiated from this type of flame.

The third and fourth sets of experiments were with the same burner as in the second; but in the third set the gas consumption was raised, and the proportion of air to gas in the mixture largely increased. The flame was noisy, and the inner cone distinct and sharp. The width of the flame at its widest part was 35 m.m. Its mean height was 160 m.m., and the mean height of the cone 60 m.m. For gas-stove practice, the flame was too well aërated. The gas consumption was 10.1 cubic feet per hour, and the calorific value 132.3 calories net at 60° Fahr., 30 inches, wet. The amount of heat radiated was 12.25 per cent.

In the fourth set of experiments, the amount of aëration was decreased, and, consequently, the size of the flame was increased. The inner cone was less distinct, and the flame was almost quiet. The gas consumption was 7.3 cubic feet per hour, and the calorific value 137.7 net at 60° Fahr., 30 inches, wet. Total heat radiated was 14.25 per cent.

It will be seen from these figures that variations in gas consumption—i.e., the size or volume of the flame—vary considerably the radiation efficiency; Helmholtz, with a very much smaller flame, having found its efficiency to be of the order of 5 per cent. It can also be seen that variations in the amount of aëration of the flame varies the radiation efficiency—the less the aëration the greater the efficiency, until a point is reached when there is no pre-aëration at all, a luminous flame is obtained, and the radiation efficiency is considerably increased, as will be seen from subsequent experiments.

When the flames are surrounded with fire-clay fuel, the heat is being conserved to the flame, and in all probability the flames themselves in a gas-fire are radiating more than without the fire-clay fuels.

It is probably safe to suppose that these flames radiate at least 16 per cent. of their total energy.

RADIATION FROM LUMINOUS FLAMES.

These determinations were made in a similar way to those with the non-luminous flames. A Bray's slit batwing burner was used, having the usual steatite tip. In the first experiment, the gas consumption was 10.55 cubic feet per hour, and the calorific value 141.0 calories at 60° Fahr., 30 inches, wet. The percentage of heat radiated was

18.12 per cent. In the second experiment, with the same burner, the gas consumption was 10.1 cubic feet per hour, and the calorific value of the gas 132.3 calories per cubic foot of gas, measured at 60° Fahr., 30 inches, wet. The percentage of heat radiated was 18.15 per cent.

In the reflector stove reported on in another section of this report, it will be seen that the percentage of heat radiated is 26 per cent. This is probably due to a better conservation of the heat of the flame and to the flame having relatively a much larger luminous area. The actual amount of heat radiated from the flames in this stove is likely to be well over 30 per cent., as much of the radiant heat is absorbed by the fire-brick back and the copper reflector.

EFFECT ON RADIATION EFFICIENCY OF A GAS-STOVE OF VARYING THE GAS CONSUMPTION.

In most of the modern types of open gas-fires, the fuel is arranged so that a column of fire-clay fits directly over each of the flames of the burner. The conformation of the inside of each column of fuel is usually such that the outer edge of the contained flame will be in contact with it. The aim of most manufacturers of the modern shapes of fuels is to present as large a surface of fire-clay as possible to the flame, the fuel having a minimum capacity for heat.

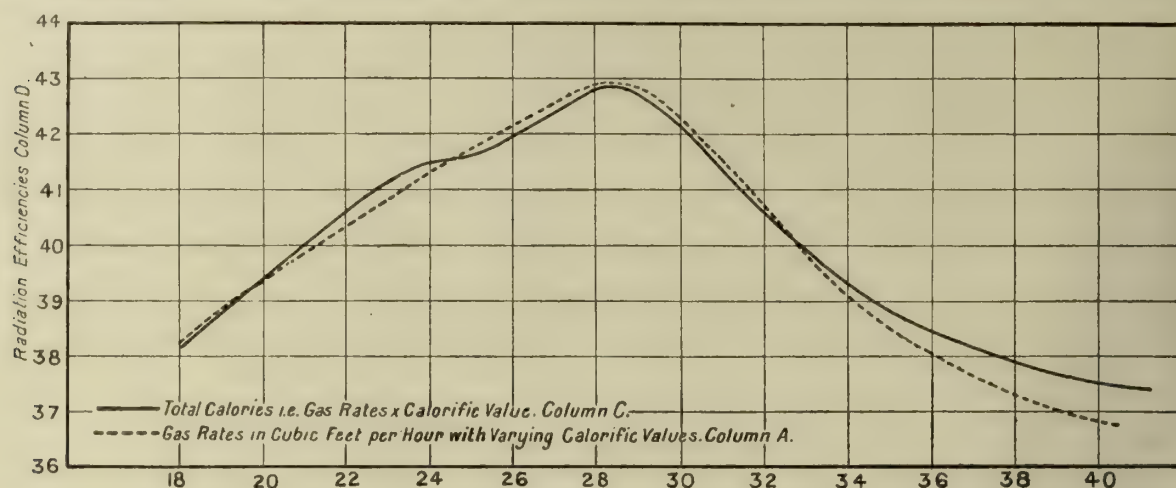
The larger the amount of combustion taking place while the reacting gases are in actual contact with the fuel, the higher will be the temperature of the fuel and the greater the percentage radiation attained, other conditions remaining the same. Should the column of fuel not fit the flame as well as it might—owing either to the shape of the fuel not conforming to the shape of the flame, or owing to the burner being out of centre with the fuel, or to the flame being too small, due either to an insufficient supply of gas or to a too large supply of air entering the burner—there must inevitably be much combustion taking place out of contact with the fire-clay, and the percentage radiation is consequently reduced.

Once it has been settled what type of flame is the most efficient from the point of view of its own radiation* and from the point of view of efficiency of combustion, then the shape of the flame can be studied under varying conditions, and the fuel adapted to it. Perhaps it will be well to consider at this point a few of the factors that determine the shape of the flame, apart from mechanical conditions connected with the construction of the outlet of the burner. It is well known that different gases singly burnt under exactly the same conditions vary in the shape of the flame they give. The well-aërated hydrogen flame is long and narrow, while the carbon monoxide flame, although only requiring the same volume of air for its complete combustion, is wider and shorter.

If the amount of these gases in coal gas varies to any considerable extent, the shape of the flame will be to this extent affected. It is also a well-known fact that although the composition of the gas may remain constant, or approximately so, and although all other conditions may remain the same, a variation in aëration of the burner will produce at the same time a change in the shape and size of the flame. A well-aërated flame is short compared with a non-luminous, but poorly aërated flame, which is long and cigar-shaped, the gas consumption having remained the same. The greater the supply of primary air, the smaller the flame.

The shape of the surrounding fuel itself is probably of as much importance in determining the shape of the flame as any other factor, especially when the flame is only partially aërated, as is usually the case in gas-stove practice. The air necessary for complete combustion of the gas has not as free a course to the flame when the flame is surrounded by fire-clay as when the flame is burning free in the atmosphere. As the fuel becomes heated up, the mixture of gas and air escaping from the burners, as well as the products of their combustion, will occupy twice to three times their original volume at atmospheric temperature, and the shape is still further affected. Nearly all these factors are determinable and controllable in the modern gas-fire; and the object of the following experiments was to determine to what extent the radiation efficiency of an open gas-fire is affected by variations in the gas consumption. The stove used was one of the most modern types, having long columnar fuels. The burner was one that ensures good mixing of gas and air, and gave even flames. The air and gas were regulated to

* The question of the radiation efficiency of the Bunsen flame is dealt with in another part of this report, as also is the question of shape and composition of the fuels.



give a quiet flame showing an inner cone clearly but not sharply defined. The gas consumption for the stove was stated by the maker to be about 27 cubic feet per hour. If stoves are used with the gas adjustments as sent out by the maker (this is usually the case), then the gas consumption will vary with the pressure of gas at the stove, and it will be a matter of chance whether the adjustment be right for the particular mean gas pressure maintained in any particular district.

In the accompanying table are given the results of five radiation determinations with the same stove working under the same conditions, except that in each the gas consumption was varied. In column A are found the gas rates, all reduced to 60° Fahr. and 30 inches of mercury, wet. In column B the calorific value of the gas used—the gas volume (1 cubic foot) being also reduced to 60° Fahr., 30 inches, wet. Column C is the product of the gas rate and calorific value, giving the total number of calories produced per hour in the stove; and column D shows the percentage of the heat that is radiated from the stove.

| | Gas Rate in Cubic Feet per Hour | Calorific Value per Cubic Foot of Coal Gas | Total Calories Evolved per Hour. | Percentage of Heat Radiated. |
|---------------------------------------|---------------------------------------|--|--|------------------------------------|
| at 60° Fahr., 30 in. m. Mercury, Wet. | | | | |
| | A. | B. | C. | D. |
| 1 | 19'35 | 141'4 | 2733 | 38'1 |
| 2 | 25'31 | 136'2 | 3445 | 41'1 |
| 3 | 26'42 | 141'7 | 3743 | 41'5 |
| 4 | 30'96 | 136'7 | 4230 | 42'8 |
| 5 | 37'22 | 142'2 | 5368 | 38'6 |

It can be seen that maximum radiation is reached when the gas consumption is 31 cubic feet per hour, and that if the consumption be increased or decreased, the radiant efficiency is decreased. This is still more marked in stoves where a more open type of fuel is used than that in the stove upon which these experiments are based. If this variation is expressed graphically with the percentage radiation values (column D) as ordinates and the gas rates per hour (column A) as abscissæ, a curve is obtained of some regularity (dotted line).

One would have thought perhaps at a first glance at the table that as the calorific values vary considerably between each experiment there would have been a greater regularity had column C been taken as abscissæ instead of column A. If this is plotted out, it will be found that this is not so, as the graph (the continuous line) so produced is very irregular compared with the gas-rate curve (the dotted line). This would lead one to the conclusion that the percentage radiation depends more on the shape of the flame than upon variations in the calorific value of the gas used, except in so far as the calorific value influences the size of the flame. In other words, if the gas rate be kept constant and the calorific value of the gas varies, the variation in radiation efficiency is less than if the total calories in the stove are kept constant and the gas rate varied. In the first case, the size of the flame remains approximately the same, and in the second place it varies with the gas consumption.

A point of immediate practical interest arising out of this question is found in connection with the use of "Duplex" burners. After a stove has been burning for some time in a room, it is frequently found that, when the desired temperature has been reached, it may be maintained by turning the

gas off a little. It is noticed, however, that lower than a certain consumption—usually about two-thirds of the full consumption—the radiant heating efficiency falls with the consumption, owing to the shrinkage in the size of the flame causing it to burn completely out of contact with the fuel. To remedy this, the "Duplex" gas-burner has been introduced. This gives a series of seven to twelve flames, some of which—usually the side ones—may be turned off, leaving the middle flames burning. The gas consumption varies with the number of flames lighted. In this way the size of the remaining flames remain unchanged, and although the gas consumption is probably the same as if the flames had been turned down, the radiant efficiency is much higher.

The following three experiments show this to be the case:—

| Experiment. | Calorific Value 60° Fahr., 30 Inches, Wet. | Gas Rate 60° Fahr., 30 Inches, Wet. | Radiant Efficiency, Per Cent. |
|--------------------------------|---|--|-------------------------------------|
| | A. | B. | C. |
| 1 Seven burners full on . . . | 136'1 | 18'01 | 37'73 |
| 2 Seven burners turned down . | 137'4 | 9'62 | 30'74 |
| 3 Three middle burners full on | 136'5 | 9'75 | 36'93 |

Care must be taken not to consider radiant efficiencies (column C) as amounts of radiant heat in considering these tables. By radiant or radiation efficiency is meant the percentage of the total heat evolved by the combustion of the gas in the stove that is experienced as radiant heat. The stove used in this instance was not one of the latest modern types, but nevertheless one that was quite satisfactory.

It will be seen from the table that when the seven burners are full on the radiant efficiency is a little higher than when only three are full on. This was to be expected, as the mean temperature of the incandescent surface of the "fuel" will be higher when seven burners are lighted and full on than the mean temperature of the surfaces of the three pieces of fuel within which three burners only are burning. One flame radiates to another and increases its temperature, while the end ones largely radiate into space.

VARYING COMPOSITION OF FIRE-CLAY FUELS.

So far very little attention has been paid to the subject of radiating materials used as "fuels" in an open gas-fire. Since the iron fret and asbestos fibre were replaced by fire-clay fuel the chief variations have been in the kind of fire-clay employed and in the shape of the fuel made from it. These two points are of the utmost importance, but there is a third point that is worthy of thorough investigation. The question must have occurred to everyone that if it is possible by means of a mixture of ceria and thoria of a certain composition to convert part of the energy of a non-luminous flame into light as seen in the light of an incandescent mantle—having a selective effect on the radiations—it is not possible to find a material which will convert the energy of the flame into radiations of longer vibrations, consisting chiefly of heat radiations and a smaller proportion of light?

It is a well-known fact that black bodies radiate heat much more than lighter coloured bodies. They also absorb more. This would lead one to conclude that it would be an advantage to make the "fuels" of some black material. This would, of course, reduce the amount of light radiated from the fire, as, being a better radiator of heat, the fuel would

be at a lower temperature than a worse radiator. This would detract from the brilliant appearance of the fire.

Iron "fuels" are known to be better radiators than fire-clay fuels if the temperature in each case is the same. If the same amount of heat is applied in either case about the same radiant efficiency is attained, as the iron fret radiates its heat at a much lower temperature than the fire-clay.

Then the question of heat conductivity of material enters in. The "fuels" are heated up in air and not in a vacuum, and the higher the conductivity the greater the loss of heat to the air. If a better radiating material were found, it would not be very difficult to improve the method of applying the heat to the material so as to raise its temperature to that of the usual fire-clay fuel.

There are two main courses of investigation open to those desiring to increase the radiant efficiency of a stove by modifications in the composition of the fuels. In the one, determination might be made of the effect of colour on the amount of heat radiated from the fuel, and in the other, the effect of varying constituents in the composition of the fuels bringing about selective radiation for heat in somewhat the same way as the thoria-ceria mixture causes selective radiation for light—apparently quite irrespective of the colour of the material.

During the course of the work in connection with the Gas Heating Research Committee, it was decided that some preliminary investigation should be made into this subject. Two gas-stove manufacturers generously lent the Committee sets of moulds for making their types of fuel. A supply of fire-clay was obtained from the Farnley Fire-Clay Company, and in a short time it was found possible, with care, to make the fuels of uniform shape and weight and perfectly satisfactory for testing for their relative values as radiating materials. Some difficulty was at first experienced in getting the pressed clay out of the moulds. After trying a number of lubricants, it was found that most thin oils were satisfactory for this purpose, but that the point of greatest importance was to have the moulds at the right temperature before use. This was found to be 25°-30° C. The pressed clay fuels were dried in air, the holes knocked out, and then heated in a muffle furnace at about 950° C.

All the fuels made were strong and durable. The first experiment had for its object the determination of the effect of varying porosities of fire-clay on the radiant efficiency of the fire-clay. The porosity of the fuel is regulated by the amount and grade of sawdust introduced into the fire-clay before it is moulded into fuel. Sometimes the sawdust is mixed with the clay while the clay is dry, but more often it is mechanically mixed (and sometimes hammered by hand by means of wooden mallets) with the clay after it is wet and ready for making up into fuels. Where convenient, it is better to mix the sawdust with the dry clay, as a better and more homogeneous material is obtained and more uniformly porous material is produced. There seems to be no fixed standard of porosity in many of the fuel works; a "few shovelfuls" of sawdust being mixed with almost any quantity of clay.

Two sets of fuels were made, having varying porosities. The sawdust used was white pine, over 90 per cent. of which would go through a $\frac{1}{8}$ -inch sieve. In the first set, about 5 per cent. by weight of sawdust was introduced into the clay, and in the second set of fuels about 12 per cent. It is impossible to give the exact weights, and it is unnecessary, as the fire-clay was not perfectly dry, nor was the sawdust. But the 5 and 12 per cent. are relatively correct.

Both determinations of the radiant heat efficiency were done under the same conditions (see Experiments 14 and 15 in the table in the Appendix). From these figures it will be seen that with 5 per cent. of sawdust the radiant efficiency of the fuel was 44.7 per cent., while with more sawdust, and consequent greater porosity, the radiant efficiency was only 42.8 per cent. This would lead one to suppose that for this clay there is a maximum porosity which is useful as an aid to radiation. The value of a degree of porosity in the fire-clay lies in the fact that the porous clay requires less heat to get it to the same temperature than the less porous clay. The porous fuel also has a rough surface which appears to take up the heat from the flames better than a smooth surface.

It will be seen that the stove usually gave about 40 per cent. (Experiment No. 3) of radiant efficiency with the fire-clay sent by the makers. In this experiment, the gas consumption was slightly less than in Experiment No. 14. It might have been 1 per cent. higher had its gas consumption been the same.

HALF-FUELS.

Comment has frequently been made that the front portion of the columns of fuel obstructs radiations from the back portion. This is obviously the case; but there are compensations. The outer surface of the fuel is not as hot as the inner surface, so that the inner surface of the back of the fuel must be radiating more than the outer surface of the front of the fuel. But the inner surface of the front of the fuel is itself at a very high temperature and radiating towards the back of the fuel, raising not only the temperature of the fuel but the temperature of the flame itself and causing them to radiate to a still higher degree.

Arising out of such comments it was decided to make a set of half-fuels, and test the radiant efficiency of the stove with them in exactly the same position as they would occupy had the complete fuel been used instead. It will be seen from Experiment 13A in the Appendix that instead of the radiant efficiency being increased by the removal of the front of the fuel, it is actually slightly decreased. Another experiment was made with the half-fuels slightly rearranged so as to catch the flames better than they did when in their usual place. The radiant efficiency increased to the figure obtained when whole fuels were used and the stove working under normal conditions—40.57 (Experiment 13).

This is most certainly a direction in which much advance might be made, as with one surface of fuels, as is partly got when half-fuels are used, and with a hotter flame such as that obtained from the coneless Meker burner, it should be possible to obtain a surface of fire-clay fuel at a high temperature without the obstruction of the front portion of the present columnar fuel. These experiments show that, without special adaptation, an equal efficiency may be got without the front portion of the fuel.

FUELS OF VARYING COMPOSITION.

As it is hardly possible to distinguish between an increase in radiation brought about by a selective action of a constituent of the fuel and that produced by a variation in the colour, no attempt was made to do so, and the results obtained by varying the constituents of the fuels may have been effected by one or both of these causes. The Farnley fire-clay was used as a basis for all the fuels made up of special mixtures. The following is an analysis of Farnley fire-clay:—

| | Per Cent. |
|--|-----------|
| Loss on ignition | 10.0 |
| Silica | 60.0-62.0 |
| Alumina | 25.0-27.0 |
| Ferric oxide (Fe_2O_3) | 1.5 |
| Lime | 2-3 |
| Magnesia | 2-3 |
| Alkali (K_2O) | 3-6 |

The fire-clay was previously mixed with 5 per cent. of sawdust, as already described. The first mixture made was—

| | Per Cent. |
|-----------------------------------|-----------|
| Fire-clay | 71.25 |
| Sawdust | 3.75 |
| Fe_2O_3 | 25.0 |

approximately

The result of this experiment can be seen in Experiment No. 16 in the Appendix. This was made with the same stove as Experiment No. 8. This shows a distinct increase of 3 per cent. on the radiating efficiency of the stove. Other proportions of ferric oxide were not tried in this way; but this point will be referred to later.

In order that a wide range of fuels of differing composition might be tested in a shorter time, the process of making the mixture of fire-clay and other chemical constituents up into a full set of fuels for testing in the stove was dropped and a shorter and quicker method employed. For this purpose a small stove was moulded out of fire-clay, large enough to take one piece of fuel. This was dried and baked at 1000° C. A special burner was constructed for the stove and placed in position. The stove was mounted on a bench in a fixed position, and a thermopile was placed directly in front of it, 18 inches away. This was also fixed. The space between was covered in to protect the stove from draughts.

When a large series of fuels had been made of varying composition they were quickly placed in position, one after the other, and at the end of a quarter of an hour the number of millivolts shown on the galvanometer read off. By this means—the gas consumption and all other conditions being kept rigidly constant—the relative radiating value of each piece of fuel could be quickly determined, and should one piece prove very much better than the rest a set could be made, and a full test made for the radiation efficiency of the stove containing that type of fuel.

There were two methods of making the experimental types of fuel.

- (I.) In the first, the necessary ingredients were mixed together before moulding and baking the fuels.
- (II.) In the second, a piece of fuel, as supplied by the maker, was dipped in a solution of the salt of the metal the oxide of which it was desired to deposit on the surface of the fuel. After being dipped, the fuel was allowed to dry in air, and then baked for a few minutes at 950° C. in a muffle.

Under the first head, fuels of the following composition were made up—

| | Per Cent. |
|--|-----------|
| (1.) Farnley fire-clay | 70 |
| Iron oxide (Fe_2O_3) | 20 |
| Sawdust | 10 |
| (2.) Farnley fire clay | 85 |
| Iron oxide (Fe_2O_3) | 10 |
| Sawdust | 5 |
| (3.) Farnley fire-clay | 87 |
| Iron oxide (Fe_2O_3) | 9 |
| Sawdust | 4 |

From each of these mixtures strong fuels were made; the greater the percentage of fire-clay present, the easier they were to make.

No. 1 was a dark red fuel; Nos. 2 and 3 being lighter, the colour depending on the amount of Fe_2O_3 present.

| | Per Cent. |
|----------------------------------|-----------|
| (4.) Farnley fire-clay | 81'4 |
| Magnesia | 14'2 |
| Sawdust | 4'4 |

This gave a white fuel, light in weight.

| | Per Cent. |
|----------------------------------|-----------|
| (5.) Farnley fire-clay | 93 |
| Ammonium chromate | 2 |
| Sawdust | 5 |

This mixture had to be dried more carefully, in order that the ammonia might be driven off without breaking the fuel. The fuel obtained was a sage green colour.

| | Per Cent. |
|--|-----------|
| (6.) Farnley fire-clay | 79'8 |
| Iron oxide (Fe_2O_3) | 14'0 |
| Ammonium chromate | 2'0 |
| Sawdust | 4'2 |

This mixture was made for the purpose of testing whether the presence of two metallic oxides would tend to bring about a selective radiation. The colour of the fuel was a reddish brown.

| | Per Cent. |
|----------------------------------|-----------|
| (7.) Farnley fire-clay | 71'0 |
| Manganese dioxide | 25'0 |
| Sawdust | 4'0 |

When baked this fuel was the dark brown colour of the manganous oxide.

| | Per Cent. |
|--|-----------|
| (8.) Farnley fire-clay | 70'0 |
| Manganese dioxide (MnO_2) | 24'0 |
| Ammonium chromate | 2'0 |
| Sawdust | 4'0 |
| (9.) Farnley fire-clay | 86'0 |
| Kieselguhr | 10'0 |
| Sawdust | 4'0 |

This mixture gave a fuel of brown appearance. It was difficult to make with this amount of Kieselguhr present.

| | Per Cent. |
|---|-----------|
| (10.) Farnley fire-clay | 81'4 |
| Alumina (Al_2O_3) | 14'2 |
| Sawdust | 4'4 |

The fuel from this mixture was white and light in weight.

Under the second method, the fuels were treated in the following way: Four ounces of the nitrate of the metal were dissolved in 400 c.c. of water, and the white fire-clay fuel put into the solution and allowed to remain until thoroughly impregnated with it. The fuel was then lifted out, drained, and slowly dried, after which it was gradually raised to a temperature of 950° C.; the nitrogen oxides being driven off much below that temperature, the oxide of the metal remaining.

Fuels were dipped in solutions of the nitrate of the following metals—

- (11.) Cobalt giving a black fuel.
- (12.) Nickel „ „ dirty brown fuel.
- (13.) Copper „ „ black fuel.
- (14.) Half fuels were also tested in this way, and the results showed that the amount of radiation given out from this type of fuel equalled that from the whole fuel.
- (15 and 16.) The alumina and magnesia (10 and 4) mixtures were dipped in cobalt nitrate solution, and subsequently tested in the usual way.
- (17.) A mixture of fire-clay, sawdust, and asbestos was also made into fuel and tested.

Fuels were also dipped in a solution of ammonium chromate of the same strength. The results obtained in millivolts as described above are as follows. The first figures are for a piece of fuel as sent out by the manufacturer.

| Experiment. | Method. | Millivolts. |
|--------------|---------|-------------|
| 0 | I . . | 6'1 |
| 1 | I . . | 6'6 |
| 2 | I . . | 6'3 |
| 3 | I . . | 6'2 |
| 4 | I . . | 6'1 |
| 5 | I . . | 6'7 |
| 6 | I . . | 6'3 |
| 7 | I . . | 6'4 |
| 8 | I . . | 6'3 |
| 9 | I . . | 6'2 |
| 10 | I . . | 6'3 |
| 11 | 2 . . | 6'3 |
| 12 | 2 . . | 6'0 |
| 13 | 2 . . | 6'8 |
| 14 | — . . | 6'1 |
| 15 | I-2 . . | 6'4 |
| 16 | I-2 . . | 6'2 |
| 17 | I . . | 6'3 |

As a result of these experiments, immediately before drawing up this report full sets of fuels as supplied by the manufacturer were dipped in (1) copper nitrate solution, (2) ammonium chromate solution, and full stove tests were made with them. The result of these is that where the fuels were dipped in copper nitrate solution—giving a deposit of copper oxide after baking—the radiant efficiency proved to be 48'5 per cent. (Experiment No. 18 in the Appendix); and where the fuels had been dipped in ammonium chromate solution, the radiant efficiency was found to be 44'02 per cent. (Experiment No. 17). These figures clearly indicate that, with simple treatment, the radiant efficiency of the stove can be increased to an appreciable extent.

The oxides deposited on the fuel were found not only on the surface, but, before drying, evenly distributed through the fuel. While drying, the solution concentrated near the surface, where the fuel would be the driest. The oxides were found to a visible depth in the fire-clay. After extended use in the stoves, no wearing effect could be traced on the fuels. The change in appearance due to the use of a dark coloured fuel may militate against such a treatment of the fuel. That is for others to judge.

CONDENSING STOVES.

These stoves are often described as “gas-radiators” or “flueless” stoves, both of which names seem open to criticism. With the exception of a small number of types embodying open gas-fires from which the waste products are conducted to the main body of the “radiator,” most of these stoves only give out a small quantity of radiant heat. The heating is almost wholly by convection, and this is the essential characteristic.

The air is heated by contact with the hot metal surface of the stove, and an upward current of this hot air draws continuously a fresh supply over the surface. The coils of the radiator are in effect a flue, and it is only in view of the fact that this flue is not usually connected with the room chimney that the apparatus can be called flueless. The flue has an important bearing on the whole design of the stove, as it depends almost entirely on its structure how far condensable products, such as water and sulphur acids, are removed from the gaseous combustion products before the waste gases pass out into the room.

The chief advantages claimed for this type of stove are:

- (1) That the whole of the heat from the gas burnt, passing as it does directly into the room, is available for heating the room; whereas in ordinary stoves connected with a chimney quite 30 per cent. of the heat is lost.
- (2) It is also claimed that as regards the more injurious combustion products, chiefly sulphur acids, the condensed water removes these, and only the comparatively harmless carbon dioxide passes into the room, and carbon monoxide, if formed at all, is only found in minute traces.
- (3) Another advantage claimed for this form of stove is that, owing to its not requiring a chimney, it may be put in any position in the room or house.

The objections usually put forward are that the stoves are unfit for use in any but well-ventilated rooms, and that the better the ventilation the less is the amount of heat available for use in the room. The first objection is easily disposed of by the makers. Most of them refuse to supply such stoves for use anywhere but in halls or amply ventilated

rooms. Unfortunately, such stoves can still be found in small badly ventilated workshops, and under other conditions for which they were never intended.

There are several tests of this class of stove on record—e.g., by Mr. H. Leicester Greville, Mr. F. R. Branston, Sir T. E. Thorpe, and Dr. Rideal, chiefly relating to the percentage of carbon dioxide and carbon monoxide in rooms where these stoves are used, and also some figures relating to the proportion of the condensed sulphur acids. The conclusions are that, under good conditions of ventilation, they need not be regarded as injurious—would, in fact, be less so than the overcrowding of human beings under the same conditions.

How much of the heat is actually usefully applied has not been discussed. This will vary so much with the amount of ventilation maintained, with the size of the room, and the amount of free space in the room, that any data obtained under this head would be of little practical value.

The stove that was used for these experiments was of simple construction, having an open gas-fire, from which the hot products were led through eight vertical tubes to the shallow reservoir provided for the condensed water at the base of the stove. There were six bunsen flames in the burner, which were controlled by a gas and air adjustment. The flames were surrounded by fire-clay fuel of the modern form, and the back of the fire was made of refractory brick. There was a projecting hood, which helped to direct the products of combustion up the four middle tubes.

The shallow trough was connected to the stove base by means of an air-tight water-sealed joint. The cooled combustion products from which much of the water they primarily contained had been condensed, then passed out into the room through a single hole 2 inches in diameter at the centre of the trough. A pan is usually placed on the floor under this hole, to catch the dripping that is sure to occur after a few hours' use and the trough has filled, and also to catch the water that is condensed from the escaping products on coming into the cooler atmosphere. The stove was 43 inches high, 30 inches wide, and 14.75 inches deep from front to back. The open fire measured 6 inches by 7½ inches, and was faced with a cast-iron guard.

In order that constant and normal results might be ensured during the course of the experiments, the stove was put in regular use for a period exceeding one month. A quarter-inch hole was bored in one side of the base of the stove through which distilled water might be run when washing out the condensed water, which was run off through a tap attached to the under-surface of the water-seal in the trough.

Before lighting the fire, any residual condensed water was run off through this tap. The tap was turned off and 300 c.c. of water were run into the trough in two portions; the first 150 c.c. being drained away, and the second remaining in the trough to act as a seal. This was done after each experiment. A large porcelain dish was placed below the flue outlet to catch the condensed water in excess of what the trough would hold. A thermometer was placed at the flue outlet with the bulb inside to take the temperature of the outlet products.

Another thermometer was then suspended 8 inches away from the surface of the stove, and was shielded from radiation from the stove by being surrounded by a cylindrical tube of asbestos 3 inches in diameter. From this, thermometer readings were taken of the temperature of the air coming in contact with the main body of the stove. The thermometer was sufficiently far away from the surface of the stove not to be affected by the hot air rising from it.

The experiments were conducted in a large room formerly used as a kitchen. There were five doors to the room, and it had one large window and an old-fashioned wide chimneied fire-place. One door led upstairs; and this and another at the opposite side of the room were invariably kept open to ensure good ventilation. No door leading directly outside the house was kept open. The stove was placed in the centre of the room, and by means of thermometers distributed in different positions in the room a suitable distribution of the heat from the stove could be checked. The mean of the readings always closely approximated the reading of the thermometer suspended near the stove.

The temperature of the room was varied by varying the extent to which the doors were kept open; the door leading upstairs obviously being of most use for this purpose. The windows in the room upstairs were kept open to allow the hot air and products of combustion to escape. The gas

consumption was determined in a similar way to that already described in these reports—account being taken of the temperature and pressure.

Sulphur Determination.—The *modus operandi* was as follows: The stove having been lighted for some time, and all necessary conditions for the particular experiment having been attained, the condensed water was quickly run off—the trough washed out with 150 c.c. of water, which was also run off, a further 150 c.c. was then added and left in the trough to act as a seal. During this operation, which lasted not more than two minutes, the stove was turned out, but immediately relighted at the end of the operation of washing out the condensed water. From this point the amount of gas consumed was determined.

At the end of the experiment, the stove was turned out and the gas consumption noted. The condensed water in the base of the stove was run into the porcelain dish which contained the drippings from the flue hole, and the trough was further washed out with 150 c.c. of distilled water; the washings being added to the main bulk. The amount of sulphur present in this liquid was determined in the usual way—i.e., by preliminary oxidation by means of bromine water and subsequent precipitation of the sulphates by barium nitrate solution.

During the whole of the time the stove was lighted, a determination was proceeding of the total amount of sulphur present in the coal gas being used in the stove. A modified form of the Gas Referees' apparatus was used for this purpose. It consisted of a glass marble condenser followed by an air condenser, as in the Referees' apparatus; but to this was added a water-cooled condenser, to ensure more perfect condensation. There was no rubber about the apparatus, all the joints being of ground glass. This form of apparatus gave slightly (but consistently) higher results than the usual form. The results were checked by comparing them with those obtained by Mr. Edwards, the Chief Chemist at the Leeds Gas-Works.

The estimation of the sulphur present in the condensed water then proceeded in the usual way. The results of the experiments may be seen by reference to Table II. in the Appendix. It will be seen that eleven experiments are reported on. The sulphur (Column A) varied between 11.33 and 13.98 grains per 100 cubic feet of gas. The amount of sulphur condensed varied between 2.87 and 5.18 grains (Column B).

The experiments were not done in the order shown in the table, but are arranged in this way to better indicate how the percentage of sulphur condensed (column D) varies inversely as the temperature of the room (column E). When the room temperature is as high as 23°C., the percentage of sulphur condensed is 22.3. When the room temperature is reduced as low as 14°C., the percentage of sulphur condensed is increased to 38. At a normal temperature (say, 15-16°C.), the percentage condensed is about 30.

The temperatures of the flue gases were determined (Column F), and these indicate the mean temperature (30°C.) at which the flue gases enter the room. They do not vary with the temperature of the room as one might at first have expected. This is probably due to irregular draughts along the floor and to condensation and subsequent evaporation of water taking place on the bulb of the thermometer. This would cause the readings of the thermometer to be irregular. With the thermometer in the position described, it would hardly be otherwise. In columns C and H are found figures relating to the amount of water condensed in the stove and in the porcelain dish beneath the stove. At a first glance one would have thought that the percentage of water condensed would have varied in a similar way to the amount of sulphur condensed—i.e., inversely as the change in temperature. From column H it will be seen that this is not the case, and, on a further examination of the point, the reason for this is evident.

In the condensation of the sulphur acids, the better the washing of the gases the larger the amount of sulphur acids that go into solution. The main part of the washing of the gases takes place on the inner sides of the tubes where water condenses and trickles down into the trough. In all probability, as far as the trough the percentage of water condensed does vary inversely as the temperature, so that the lower the temperature of the room the more water is condensed on the sides of the tubes and the better the washing of the gases. But what happens to the water that accumulates in the open porcelain dish at the foot of the stove? There may be anything up to a litre of water contained in it.

character, he hoped the question would be cleared up whether fire-clay was a fuel or the gas which was consumed to heat it. He noticed with great pleasure the confidence that the gas-fire makers reposed in the Leeds University by actually lending them moulds.

Mr. H. JAMES YATES (Birmingham) said only those who were associated with the class of work carried on by Mr. Smith and the Committee, could realize the large amount of labour and ingenuity which had been expended on these experiments. Speaking of experiments, he found himself in rather an awkward position, because he had naturally been carrying out many experiments in the same field, but circumstances prevented him saying almost anything with reference to them. He was very glad to hear what Mr. Smith had to say with regard to a simpler type of apparatus. As at present designed, it took an experienced chemist to work it; but he agreed with him that they were able to get a higher efficiency out of it as it was now used. Gas-fire adjustment was a very important thing to be considered; but he did not think the time would ever come when the manufacturer could adjust a fire in his works so as to be sure that it was going to act properly when it reached the customer. It must be borne in mind that the gas-fire of to-day was becoming a more scientific apparatus than it ever was before, and that it must be adjusted *in situ* by a competent man to suit local conditions. One could not expect an ordinary gas-fitter with the ordinary training to adjust a delicate piece of apparatus such as a gas-fire if the best results were to be got out of it. The report dealt with the question of the value of the flue heat, and suggested that more use might be made of it; in other words, that they might get more convected heat out of the stove. But there he must disagree with the author. For years past, he had been doing his utmost to eliminate all the convected heat he possibly could in stoves used for ordinary living apartments; and he was quite sure the reason why gas-fires had been in such disrepute was owing to the large amount of convected heat and the small amount of radiant heat which they gave off. He was very sensitive to these two forms of heat; and he had tried experiments on his friends as well. Speaking for himself, he could not sit in an ordinary living-room where the heat was convected; but with radiant heat, he did not suffer any discomfort at all. As Mr. Smith said, with a wide fire one would get a proportionately greater amount of radiant heat; and this was the principle he had advocated for a long time. He believed the wide fire was the solution of the difficulty, and that in this way they would get a much greater amount of radiant heat, and do away with the objectionable form of convected heat. He was glad to say they had been able to exceed the results given by Mr. Smith in his report of radiant heat. Mr. Glover had just forestalled him in his criticism of the word "fuel." The man in the street thought that fuel was something to burn; and many people believed it was the gas that was spoken of. His firm had adopted a word which might not be acceptable to others. They spoke of it as the "radiant," because it was the material through which they obtained the radiant heat. A standard type of "radiant" was, in his opinion, impossible at present. Mr. Smith named varying forms—some giving better radiation than others; and he quite agreed that this was so. But he did not suppose anyone had reached finality; and therefore a standard type was quite impossible. He also agreed with what he said in reference to a fire being the most pleasing to the eye and not always the best for radiating heat. He had been much interested in the shell experiments mentioned, because a long time ago he had experimented in this direction, and had taken out several patents for half fuel. They secured much greater efficiency as regarded radiation; but to the eye it was not so pleasing, and as a commercial article it would not have sold. Coming to the question of the radiating material, he had experimented with nickel, copper, and combinations of various metals, and also various oxides of iron and a number of earths—ceria and thoria; and, seeing that the liability of iron to oxidation so seriously interfered with its otherwise high value as a radiating medium, he tried experiments with barffing the iron, and also of mixing the iron itself with other metals with a view to minimizing the oxidation. In some cases, the result did not show any advantage; but in others, there was an appreciable increase of radiation. Unfortunately, however, the practical difficulty was that the cost of materials prevented it becoming a commercial success; and besides, until the evolution of the present absolute method of determining the radiated energy, there were no authoritative means of convincing

the public of such improved results as were obtained. His remarks with regard to fuel also applied to the brick. There, again, he did not think they could have any standard size or shape at present; and it must always be borne in mind that the brick and the radiant must be so made as to fit together. The one could not work without the other. One could not take a particular fuel, and drop it on to somebody else's brick, or *vice versa*. It was necessary to have the fuel and the brick designed to work together. He was very much surprised at the large amount of ignorance still displayed with regard to the burner and the injector. As usually designed, burners only took the right quantum of air at one given pressure and consumption; whereas with a properly designed gas-burner, one would get an even flame and the correct proportion of air at all reasonable pressures and consumptions. He thought that if gas-fires were ever to become popular and regularly used, the burner must be constructed on this principle. It was a difficult problem, and he had got over it. Mr. Smith, speaking of the radiation of a bunsen flame, said the greater the aëration the less the radiation. The experiments of his firm rather tended to suggest that, provided one kept the envelope of the flame in contact with the fuel, the greater the aëration, the greater the radiation. He thought that this probably must have been Mr. Smith's experience also, seeing that he mentioned the Meker gas-burner in connection with half-fuels. There was a diagram showing results; and as far as he could see, they were all with one stove using fire-clay fuel. If a better radiating material could be found, he believed the maximum radiation might be maintained over a greater range of consumption; in other words, the shape of the graph would become a truncated cone.

Mr. W. H. Y. WEBBER (London) said he did not propose to criticize this valuable report in its entirety; but he wished to draw attention to what appeared to him to be a very important question—the effect of gas pressure on the operation of the bunsen burner. Almost the first thing that struck him on looking at Table I. of the Appendix, was that there did not appear to have been any systematic regulation of the pressures of the gas burnt. They ran from 1.44 and 1.5, which were fairly even, down to 1.12, which was too low for any practical purpose. Then there was 1.39; and then it jumped up to 3.21, and down again to 1.44. In one case, it was as low as 1.01; and in the place where fire-clay fuel was tried, the pressure was absolutely only 0.8. He quite agreed with the remark made on the previous day by Mr. Abady, that they had hitherto taken the element of pressure in gas distribution too much for granted, and they had not sufficiently distinguished that to them really their pressure was their voltage. Whereas, in an electricity supply, it was necessary to maintain the voltage within very small variation indeed over the whole district supplied, because of the imperfection of the apparatus used, in their case they took rather too much liberty in this respect. There were very few gas supplying districts in this country where there was anything like a reasonable uniformity of pressure from the centre to the circumference and all over the area. In his opinion, until uniformity within reasonable range was arrived at, they were simply fumbling in the dark with the various lighting and heating burners, and all the rest of it. At the present time, they seemed to be hovering over a *desideratum* of about 20-10ths; and it was a very general experience that with a pressure of from 20-10ths to 25-10ths or thereabouts, not sinking anywhere below 18-10ths, there was not very much trouble with working either lighting or heating burners. But when one had the variations of pressure which were permitted even here in a matter of testing, from 8-10ths up to 3.21 inches, it was impossible to know where one really was. He also agreed with Mr. Abady that he expected in the future gas distribution would be carried on at much greater pressures than were now customary; and he (the speaker) ventured to suggest that one point to which the attention of research chemists might be fruitfully directed in the future would be, What was the possibility of increasing the radiant efficiency of a gas-fire by increasing the pressure at which the gas was consumed? They had arrived at this stage of knowledge as to the effect of pressure on the operation of the bunsen burner—that the higher the pressure the more efficient the burner. This was a safe generalization. The pressure he spoke of was, of course, the pressure behind the nipple. He quite agreed that when once the proper pressure was arrived at, it should be maintained as much as possible; and the bunsen burner was essentially one of those things that could not be turned up or

down either for lighting or heating—it must be full on or off. Let them consider what went on with an ordinary bunsen burner worked under different pressures. When it was at the lowest possible pressure, which was that of an ordinary inverted lighting burner—he meant the resulting pressure in the burner-tube—that pressure was apt to fall in the tube; and therefore the admission of air was apt to fall off too. The higher the pressure they had at their command at the nipple, the higher the proportion of primary air they could get into the bunsen tube. He did not want to complicate the matter by considering the action of the inverted burner. Broadly speaking, the higher the pressure the higher the proportion of primary air that they could command; and the higher the proportion of primary air they got in, the smaller the flame, because of the less secondary air they required. So they went on till they got to the pressures now used in high-pressure lighting, when the proportion of primary air was somewhere about 4·8 or 4·9 volumes to 1 volume of gas—nearly the total amount theoretically required to burn the gas. For the proper illumination of the mantle, he believed it had not been found desirable to go beyond this, probably because a bath of secondary air was desirable to complete the combustion on the surface of the mantle, where it did most good. It struck him that there was some guidance here; and if they were able to command, for the purpose of heating as well as for lighting, pressures of gas up to 2 lbs. or 3 lbs. per square inch—and he did not at all see why they should not—he wanted to know whether these experiments could not be directed to find out if there was anything to be got for heating purposes with a gas-fire in this respect. It was not perhaps an immediately practical question; but that was what this inquiry was for. One of the objections to this way of treating a bunsen burner for domestic heating purposes was undoubtedly the noise; but this was a technical objection which engineers and manufacturers existed to overcome, and no doubt it could be overcome. But it certainly seemed to him that as they were all turning their attention in the direction of largely increased pressures, they would all of them much like to know what they might expect if those pressures were ever made available for the ordinary gas-fire.

Mr. H. M. THORNTON (London), having thanked the President and Council for the opportunity now afforded to manufacturers of attending the meeting, and learning all they could, and, on the other hand, imparting what they had learnt themselves by their own researches in this particular subject, said he thought that they might congratulate the Leeds Research Committee on having, at any rate, proceeded on lines which could only have the full approval, if he might say so, of the gas-stove makers at large. When one considered that they had not at their right hand, as it were, the facilities of manufacturers for the purpose of constructing, for instance, the various shapes of fuel and other things in connection with gas-stoves which manufacturers had, he thought the results obtained and shown in the report were particularly good. It was also very gratifying to know that the instruments used in preparing the report had become so accurate as to some extent form a standard for manufacturers themselves to work to, which was a very important matter. Turning to the report itself, the question of the adjustment of gas apparatus when leaving the works was a matter which he was glad to hear referred to by Mr. Yates in his opening remarks. It was, of course, a very desirable thing, if practicable, that manufacturers should test their articles, so that when they reached their destination they did not need readjustment. But they knew it was impossible, much as they tried to achieve so desirable an object. Mention was made in the report that the radiant efficiency obtained on this occasion from the testings taking place in Leeds had increased from 35 to approximately 42 per cent., which was something they could congratulate themselves upon. He must say, however, they were not satisfied that 42 per cent. was by any means the highest efficiency to be obtained; and they had shown a higher result by their own tests. Further on, it was noted that if the height was increased with some particular fuels, the radiant efficiency would be increased approximately 2 per cent. In the particulars the author gave in Table I., he noticed that the low height of fuels there apparently gave a very high efficiency; and he should like to ask whether the 2 per cent. higher efficiency referred to would be an increase on the efficiency shown in Table I. Mr. Smith stated that if this were done, the top of the fuel would be naturally less incandescent; therefore the question of appearance at once came in. Of

course, it was a question whether the appearance should be sacrificed for a small percentage of efficiency. They were all anxious to obtain both ends—high efficiency and good appearance. But if they really had very high incandescence and only a very moderate decrease in efficiency, it was an open question whether this was not a better ideal to work to than the reverse. In his opinion, the most important part of the report was that which dealt with the shape of the fuel used, and the shape of the flame. There could be no question that the fuel must be in accordance with the shape of the flame; and the effect of any reduction in the pressure as affecting the flame must be considered. If the shape of the fuel was not in accordance with the shape of the flame, a lower efficiency must take place to a marked degree. Nothing had been said with regard to the arrangement of the brick; but in their own experiments they found that if an “air pad,” as they called it, was placed between the fuel and the brick, they got a higher efficiency than if they used simply the ordinary brick without the pad. He would ask whether, having in view the fact that air had a much lower heat conductivity than fire-clay, the loss of heat by not having an air pad would be material. With regard to the question of half fuel, experiments had been made by themselves for a good many months past, and they had now come to the conclusion that it was not wise to proceed in this direction. He noticed that in the flue temperatures the difference ranged nearly 20 per cent.—one test showed 20 per cent. flow in the flue, as against 40 per cent. in another case; and he should be glad to have an explanation of this. They had a great deal to thank the Institution for in having commenced this very important research; and whatever the future might have in store in the same direction, and under the guidance of the Institution, there was, to his mind, no question that one of the things which wanted further consideration was the shape of fuel and the shape of flame as applied to it, and the effect of the different gases which might be used in various towns.

Mr. W. J. LIBERTY (London) said Mr. Webber, in dealing with pressures, seemed to have lost sight of the important question of cost. He spoke about getting for gas-stoves pressures which, though they might not approximately come up to those employed for public lighting, would be something like them. But, if he had looked at Appendix I., he would have found that where they had a pressure of 3·48 inches, they got a consumption of 32·51 cubic feet; and unless they took into consideration the question of consumption with the pressure, the liability would be that they would make their gas-stoves prohibitive. When they talked about getting (say) 2 lbs. or 3 lbs. pressure, which was equal to about 70 to 80 inches of water, it would simply mean that they would probably have all the gas-stoves thrown on their hands. While they had manufacturers present, he should like to hear something from them about increased consumption, and therefore increased cost of gas-stoves, at high pressures as compared with the small pressures now used. He could quite understand that when a man got up to 32 cubic feet per hour passing through his gas-stove, he would write to the company asking them to take it away, or send him a stove showing a smaller consumption. Pressure, no doubt, was important; but, if they were to get to anything like the pressure Mr. Webber foreshadowed, they would have to put throttle-valves on the services close to the stoves, to break-down both the pressure and the consumption.

Mr. A. P. MAIN (London) desired to associate himself very heartily with the remarks made by Mr. Thornton, in expressing the gratitude of the gas-stove makers for the opportunity afforded them of coming to the meeting and hearing Mr. Smith and being enabled to take part in the discussion. To those engaged in the manufacture of heating and cooking apparatus, the great value of the work of the Leeds University was in its suggestiveness. There were many things in a report such as the one before them with which the individual maker would not agree; but even in this case he would find most valuable suggestions in pursuing his own work of testing and improving. There was this further advantage in the work of the Leeds University, that rival manufacturers, like rival politicians, were objects of suspicion. It was inevitable that they should all be enthusiastic with regard to their own particular ideas; and very often this enthusiasm perhaps carried them beyond the strict limits of truth. It was an immense advantage to them all that they should have this impartial scientific investigation pursued, which acted as a continual check on the experience of individual manufacturers. After all, they had only one

object in view, and that was to arrive at the truth. They wanted to know what was best, and how that best was to be attained. He heartily thanked Mr. Smith for the most instructive and most suggestive investigation which had yet been made in connection with gas apparatus. Mr. Webber had referred to a very interesting problem which every gas-stove maker had no doubt investigated—viz., the question of pressure. There was no doubt whatever that with high pressure they could get wonderful results in the way of heating; but the gas-stove maker was in a difficulty in applying such pressure, even if he had it, to such an article as a gas-fire, because no one would sit in the room with a gas-fire where the gas was coming in at 20 or 30 inches of pressure; the noise would be intolerable. It had been suggested that they might be clever enough in the future to invent a type of burner that would overcome the vigorous combustion which would take place at such a pressure; but he was not very hopeful that they would ever be able to do anything of the kind. They all realized that while they got wonderful results when very high pressure was obtained in a gas-fire, yet the discomfort occasioned by the noise made its use at present quite out of question. He did not agree with Mr. Yates—but there, again, he must bow to the scientific authorities—that one would get better results in a wide fire. But he agreed with Mr. Smith that there was much more to be hoped for in the direction of utilizing higher fuel. These were the lines they had gone upon; and, after all, if the upper portion of the fuel was not quite incandescent, it seemed to him that in this way they got radiation and they got economy, which he could not understand how they could get in any other way. The references to the composition of fuel were most interesting to manufacturers, because they had all been working on these lines. For many years past they had been striving, with all the aid they could command, to get a fuel of a composition which would give better radiation. But they would notice that in the report a kind of damper was put on their enthusiasm in this direction, because it was pointed out that, “as the amount of radiation varies approximately as the fourth power of the temperature, it is doubtful whether there would be any great increase in radiation efficiency by employing better radiating material.” He was glad to find that, in spite of this disheartening view of the subject taken by the Committee, they had persistently gone on; and he hoped they would continue to go on with the investigation into the very best forms of radiating material.

Mr. J. H. BREARLEY (Longwood) said this discussion was intensely interesting to him, seeing that he had been so closely connected with the problem for some seven or eight years. He should himself like to hear from the general body of members something more on the subject of gaseous heating than had been said yet. Personally, he had nothing but praise for the work of Mr. Smith. They had in him an extremely careful and accurate investigator; and he had done a great deal, as exemplified by the report, to bring them into closer contact with the real difficulties in connection with gas-fires. To his mind, the most important points were the one with which Mr. Thornton had dealt—namely, the material in its relation to the size of flame—and the one to which Mr. Webber referred—namely, pressure. In his own paper some four years ago, he laid it down as his belief that no gas-fire should be fixed at less pressure than 15-10ths. But now that they had proceeded further, he was quite sure they could increase that, and say no gas-fire should be fixed at less pressure than 20-10ths, if they wanted to get the best radiating efficiency. He was rather sceptical as to the utility of giving considerably higher pressures than 2 inches, for he had not seen a fire yet which could be worked at a much higher pressure without making a noise which would be absolutely unbearable. He was glad to hear Mr. Yates make the confession that he could not sit in a room where the heat of the stove was almost entirely convected, without having to leave it very soon. He hoped the members would remember this, and be very cautious as to what situations they fixed flueless heaters in. There were one or two points he should like to say something upon; but there was hardly time then, and he would take another opportunity of doing so. He was very glad to notice that Mr. Smith had got as high results from the material which they misnamed “fuel” as he had from iron frets. In his own paper, he placed the superiority of iron frets—with a method of measuring which was, of course, less accurate than Mr. Smith’s—at about 5 per cent. To explain the apparent difference, there was, of course, Mr. Smith’s

more accurate method of testing, and there was also the improvement in fuel-fires. The term “fuel” had been called in question; and he must confess that four years ago he wanted to use another term. He thought of asbestos; and he turned to some of his friends in the hope that they might find a word which expressed the material they used. But he must confess he was unsuccessful. If any member could coin a word he would be glad. Someone had suggested “radiant;” but he did not know whether this would commend itself to general acceptance. He thought they wanted something better. As one who had always taken the greatest interest in the education of the outside employees—and he believed he was one of the pioneers in urging the better education of the distributing employees—he was glad to hear emphasis placed on the proper training of gas-fitters. He had been somewhat surprised during the remarks made to hear so little said as to the good work initiated by the Institution in conjunction with the City and Guilds Institute. He referred, of course, to the Examinations in Gas Supply. This had been a good beginning; and he hoped engineers throughout the country would realize from this report and the President’s address that the education of the outside employees was of paramount importance. In the case of gas-fires, it was essential to success. He had long been of this opinion; and he was glad to hear one or two makers emphasize the point.

Mr. H. KENDRICK (Stretford) desired to add his meed of thanks to Mr. Smith and the Research Committee for giving them a report which was a distinct advance on the one made last year, and which would, he thought, produce some practical results. There were one or two points on which he wanted to ask questions. First, had the test for efficiency been carried out on fires in which 6-inch fuel had been used with cross fuel over the top? This seemed to him a method in which there was less escape of heat up the chimney than with the long fuel of 9 inches. At all events, carrying out a few tests of his own, without the refinements and scientific accuracy of the Committee, he got better results with the short fuel, crossed on the top, than with the long fuel. It had been suggested that one method of reducing the loss and adding to the radiant efficiency might be by pre-heating the air supply to the burner. He did not know whether anyone had yet tried this; but it would be interesting to have some information on the point. One gentleman said that he had made experiments with half-fuels, and had abandoned them because they were not satisfactory. But it occurred to him while he was speaking that with a reduced flame, if the fuel was inclined at an angle, he might get almost equal results as with a full flame in the vertical fuel. If the half-fuel were inclined at the top, so that the flame would impinge on the whole length, one would get very good results indeed; whereas, if the fuel were vertical, the flame, having nothing to meet it, would stand out, and one would not get such a good result. Another point raised was as to the effect of turning down the burner, and the loss of efficiency; and also the use of the duplex burner. The duplex burner referred to was one which cut off the outside burners, and left the middle ones lighted. But there was another one on the market, in which they got the “hit-and-miss” principle. It did not look quite so well, and might not be so good a selling article. But in some few tests he had carried out he found, with Mr. Smith, that with only the burners in the middle lighted there was a slight decrease; but that with the hit-and-miss principle there was an actual increase in efficiency up to 16 per cent., as compared with the whole fire full on. This point should be taken into account by the manufacturers; and, in spite of the apparent lack of interest in consumers with fires of this description, they should endeavour to impress upon them that they would get better value for their money in this way. One question had been raised with regard to the increase in pressure; but the speaker had entirely overlooked the fact that he would not have to put any special reducing valve on the supply-pipe, but could reduce the pressure at the nipple.

Mr. F. W. GOODENOUGH (London) thanked the Research Committee for the valuable work they were doing for those engaged in the supply of gas (because all improvements in efficiency led to an increased sale), and for the assistance they rendered in arriving at proper methods of testing. As the Committee, he said, could not, of course, publish the tests of various makers’ apparatus for the general use of members, or had not so far been able to do so, buyers of apparatus must necessarily make their own tests, because, as Mr. Main had said, the makers did have a tendency to

put the best face on their own apparatus. Mr. Main probably, like Lord Justice Bowen, would say: "Conscious as we are of one another's shortcomings." He did not suppose he was referring to himself. More efficient gas-fires meant an enormous increase in business; and therefore the work of the Research Committee and the makers, which during the last few years had resulted in a great increase in efficiency, must mean largely increased business in the future. One point which struck him had already been mentioned. They could not expect makers to send out apparatus which would require no adjustment according to local conditions; and he wished to associate himself strongly with Mr. Brearley in emphasizing the necessity for the education of all stove-fitters. Not only had they to look to efficient installation, but to efficient adjustment afterwards. It was no use putting in good gas-fires, and leaving them there, and expecting them to remain in adjustment for an indefinite number of years. Periodical inspection and adjustment would necessarily be a condition of the work of the gas company in the future. One of the earliest men in the gas profession to recognize this fact was his own Chairman, Mr. Corbet Woodall, who emphasized the necessity for the adjustment of gas-stoves in use; and with regard to the education of the men who were to carry out the work of the installation and subsequent adjustment, he had been very keen for many years. The Gas-light and Coke Company had shops for the instruction of apprentices, so that they might train the boys up from the time they left school, and make efficient gas-fitters of them. This was due to the initiation of Mr. Woodall. The question of varying pressures might be largely dealt with by the fixing of governors on each individual fire supply. They made a practice now of fixing a governor to practically every gas-fire they put in, in order that they might be certain that the fire would always work efficiently. They asked the makers to adjust the stoves, before sending them out, to 20-10ths; but the question of governing the pressure at which the fire worked was a most important one.

Professor ARTHUR SMITHELLS (Leeds) said he felt it his duty, as Chairman of the Committee, in the first place, to say, what he was sure would be felt by all his colleagues, that they were extremely gratified by the discussion which had taken place; and they were greatly encouraged by the warm and generous testimony which had been given to the usefulness of their labours by those who represented the industry. A great deal had been said which invited remark; and he was afraid that he could occupy their time a great deal longer than would be at all comfortable. He would therefore restrict himself to one or two observations. Let there be no mistake about the object of this inquiry. It was not the casual whim of a few scientific men to play scientifically with the gas-stove. The object of the inquiry was to improve the gas-stove, and to make it a more efficient means of consuming gas. Their objects were thoroughly and entirely—he might almost say exclusively—practical; and he could not understand why he was occasionally singled out (though he did not mind it) as a person who was somehow cherishing, behind all his professions, a desire to do something which was in the clouds. His aspirations were entirely towards working on the earth; and, if there was one title of which he was jealous, it was his claim to be a practical man. Having said this, he was tempted to say a word in reply to the allegation of neglect with reference to the use of the word "fuel." The fact was they were so practical that they were afraid of being pedantic; and, though they felt how inappropriate this term might seem to some, they thought it better to use it from fear of being thought to be spinning things too fine. But the word was put in inverted commas; and he believed that, after all, one could say a good deal for it. He had no doubt that Mr. Glover kept his carriage in a coach-house, but did not call it a coach; and it was very much the same sort of thing. Even in the last resort, he ventured to think there was a black material on the market passing by the name of coal which was not appreciably more combustible than this fuel. They had tried in this investigation to deal with the fundamental principles of the gas-stove, and to devise some accurate methods of determining the various physical quantities they had to measure. Then they proceeded one after the other to the features which required investigation; and Mr. Smith had given a very good summary of the progress of this research as far as it had gone. A member of the Committee pointed out at its last meeting what a splendid thing it would be now if they took all these points one by one, and made them the basis for the construction of a gas-stove "such as was never seen before."

Another member, on general philosophical principles, thought they might not succeed in that way. It might be supposed that if he were to pick out the virtues of the individual members of the audience, and combine them in one man, they would have a paragon gas engineer. Not necessarily. One might have a collection of incompatible virtues. So their gas-stoves, if they included every point that had been investigated and made clear by Mr. Smith, might not be the thing they hoped for. But the real answer was this—that they could not do it. They thought they could do a great deal at the University of Leeds, and probably they could; but when it came to constructing a gas-stove, he did not think that was their business. It was the business of gas-stove makers, who must work on the principles laid down, and construct this ideal gas-stove of the future. They had some other important things to be dealt with; and Mr. Smith was proceeding with inquiries, the results of which would be indicated in due course. Personally, though he was disappointed that nothing greater had been discovered so far, he quite thought they had made distinct progress, and contributed useful information. It would have been very nice indeed, of course, to have hit upon a fuel which was comparable (say) with the Welsbach mantle—*i.e.*, a fuel formed by the accidental combination of certain materials, which suddenly passed from darkness into light. This was the history of the Welsbach mantle—"a pure accident in its initiation." It would have been very pleasant if, in their mixing of fuels, they had hit on something of the kind; but they had not done so—not yet. What eventually might arise, no man could foretell; and he was not going to prophesy. He would not go even as far as Mr. Smith in prophesying the effect of other gaseous fuels when used in gas-stoves. There was still plenty of scope for inquiry. What he believed was the most important point of all still awaited investigation, and this was the hygienic aspect of the gas-stove. After all, that was the thing against which they had to contend—the prejudice that existed against the gas-stove from the hygienic standpoint. He said "prejudice," and he believed he was using the correct word; but he did not know. They continually thought of investigating this aspect of the question; and he believed it was not only the most important, but by far the most difficult. He almost shrank from undertaking it. It was not a question of chemical analysis pure and simple, or of physical measurement, or of doctor feeling the pulse or counting respirations. There was a great deal more than this in it. He believed it brought in real questions of psychology. There were some people who could "feel" when a black cat was in a room. But how they did it, he could not say. There were many who averred they could tell at once when there was any convected heat in a room. Those were the people who really prejudiced the extension of the gas-stove; but he believed that they were more common among the other sex. The previous night (a pure accident) he happened to have the remark made to him by a lady that she had the feeling of an iron band coming across her head when a gas-stove was lighted—in the next street. Those were matters that wanted investigation. Whatever might be the merits of the Committee, he did not feel at all confident that those gentlemen were capable of facing an inquiry of such a character and delicacy. But that authoritative information should be put forward on the subject of the hygiene of gas-stoves, he believed to be most important; and he was rather inclined to undertake the investigation single-handed. He should then be committing no one but himself; and he believed it was a case where a man must back his own opinion only. He did not feel at all confident that it would be possible to get six or seven people to unite in an opinion on this subject in the way they could unite on other more definite questions. The only other thing that he wished to say further was that if the results of their inquiry were of any value, it was owing to the assiduous labours, the ingenuity, and the boundless hopefulness of Mr. Smith.

The PRESIDENT, before calling on Mr. Smith to reply, said the splendid discussion that morning was a practical proof of the appreciation they all felt for the labours of Mr. Smith in this direction; and it was not needful for him to say a single word in addition to what had been said by Professor SmitHELLS in the concluding portion of his remarks. He did, however, think there was one great thing which followed from the starting of this Research Committee at the Leeds University. He was thankful to say the example which was set there of scientifically investigating this matter had been followed up and copied to a very great extent by

the makers themselves, in employing scientific chemists at their works to go carefully into these matters. He thanked the gentlemen who had spoken from the practical side; and he apologized to one or two, such as Mr. Wilson and Mr. Davis, whom they would have liked to hear. But time was inexorable. He thanked the members of the Society of British Gas Industries for the kindly co-operation they had shown that morning. It was an indication of the great work which could be done by co-operation in these matters; and he hoped sincerely that in future they would be able to have even more occasions than in the past for working together on the lines indicated that morning.

Mr. SMITH, in reply, said, in answer to Mr. Glover about the analyses, that rather than trust to one analysis of his own in this connection, he got the average analysis as obtained by competent chemists at the Farnley Iron-Works. They gave it as it stood as being the average for all their fire-clay. The 10 per cent. probably contained a lot of water which was not driven off. Professor Smithells had referred to the question of "fuel." This point had been brought up many times; and it was decided to pander to the general habit. On the question of convected heat and radiated heat, and whether it was increased at the expense of the convected heat, it was not much use throwing away convected heat up the flue for the sake of saying that one had not got any. It might as well be used while it was there. With regard to the efficiency of half-fuels, the fuels tested in their case were put just in the position they would be in if the whole fuel was there. When the fuel was allowed to slightly rest on the flame, then a higher efficiency was obtained. It was not advisable to let them rise too much, because the flame went through the fuel, and one did not get any increased efficiency at all. The question of the brick at the back was most important. He tested two stoves of exactly the same make, and similar in every respect, with the exception that in one case there was one fire-clay at the back and in the other case another. The only difference was in the composition of the fire-clay; but there was 5 per cent. difference in the efficiency of the stove. The point of the question of the air pad spoken of by Mr. Thornton was easily seen. Not only when one had a definite air pad in a definite plan, but a more porous brick on the stove, and therefore more air pads in the pores, there was less conductivity in the back of the stove, and therefore better radiating efficiency. With reference to the effect of pressure, the object of having pressure was to take in more air, and to get a concentration of the heat at a given point. When one did so, it was too concentrated in many cases; and not only that, but there was no necessity to have a high pressure to get a larger volume of air in with the gas. It was quite easy to construct a burner—and the students at Leeds had been able to do it—so as to pull in volumes of air with the gas at quite a low pressure which were sufficient to all but completely combust the gas without any secondary air at all. It was a matter of construction. With regard to the question of increase from 35 to 42 per cent. in efficiency during last year, it came to this—that it was chiefly due to the improved construction of the back of the stove. He had tested another stove by the same maker, which gave an increased efficiency of 2 per cent. by increasing the height of the fuel. Pre-heating the gas and air was mentioned last year; and since then makers had tested the point, and he had tested it. It was found that, owing to the big increase in volume by heating the air before it entered the burner, one could not regulate the mixture sufficiently finely to justify the pre-heating of the air. With regard to informing each maker of the results of a test, he could only say that each maker, on being asked to lend the Committee a stove, was informed that the results of the testing of his stove, and his stove alone, would be given him, on condition that they were not going to be made use of in any way for advertising purposes. One maker wrote back and thanked him, but said that he would prefer not to have the results at all, if he could not use them for that purpose. Others, however, had received the results, and had secured what value they could from them.

GAS CALORIMETRY IN THE UNITED STATES.

By JOHN B. KLUMPP, of Philadelphia.

Gas calorimetry has been attracting as much attention in the United States during the last few years as it has in England and on the Continent. The extensive adoption of the incandescent gas-burner and the development of various industrial gas appliances has apparently created the feeling

of the need, in some minds at least, of a standard of quality that will express more definitely the utility-value of the gas for such uses. It therefore occurred to the writer that a paper stating briefly the more important steps taken in administrative measures by government bodies, and a description of some work that has been done in gas calorimetry in the United States might be of interest to the British Institution of Gas Engineers.

The passing of Public Utility Laws in several of the American States has resulted in Public Service Commissions, whose general powers have been to supervise and regulate the Acts and work of the Public Utility Companies. In some cases the original laws specify definitely the quality and character of service, while in others the draughting of the regulatory clauses has been left to appointed Commissioners. Such actions have led to the passing of regulations controlling the manufacture and supply of gas and electricity; and as such requirements have in some instances been entirely a new step in governmental control, investigations by these Commissions have induced them to adopt the latest and most scientific regulations appertaining to the quality, pressure, and purity of gas. This has been particularly instanced by the Wisconsin Railroad Commission, which in its decision and order of July 24, 1908, adopted the heating value and omitted any regulation in regard to the illuminating value. Such specification is expressed in Rule 8 of its order as follows:

"The Company furnishing gas which, within a one-mile radius from the distribution centre, gives a monthly average total heating value of not less than 600 B.Th.U., with a minimum which shall never fall below 550 B.Th.U., may be considered as giving adequate service as far as the heating value of the gas is concerned."

The decision also contains the following paragraph with reference to candle power, which so well described the situation that it will bear quoting here:

"For the reasons previously outlined, it appears that the candle power standard which has been almost universally used in the past for gas measurements is of minor importance in this State. It is possible to secure a high candle power gas which has but a moderate heating value; and to require companies to maintain a double standard which shall insure the high heating value and a high candle power, would surround them with such restrictions that economy in manufacture might not be attained. And since but few consumers would be benefited by a candle power restriction, and with this number continually decreasing, no regulations as to candle power are prescribed at this time. It should be added, however, that with a 600 B.Th.U. heating standard, and in view of the conditions under which gas is being manufactured in this State, a fairly satisfactory illuminating value is insured. It is hardly possible to manufacture a coal gas of 600 B.Th.U. which shall not have a candle power from 12 to 16, or even more. The enrichment of a water gas up to 600 B.Th.U. will insure an even higher candle power."

These regulations were adopted after a general hearing by the Commission, to which were invited gas engineers and authorities from all over the country.

The State of Indiana, in 1909, passed an Act which compelled the gas supply of cities of the first class to be at least 600 B.Th.U. This State and Wisconsin are the only ones, so far, specifying the heating quality to be supplied.

This standard of 600 B.Th.U. is in the opinion of many American engineers too high to permit of gas being manufactured with the greatest economy to all concerned, or to permit the manufacture of straight coal gas under all conditions, without enrichment. The illuminating power specifications in the past throughout the United States have forced many of the coal gas companies to enrich their gas with cannel coal, oil, or benzol. While they have thereby increased the illuminating power of the gas, they have not proportionally increased the heating value to counteract for the increased cost of production; and in the face of this enrichment the present heating value determinations are being taken, which seemingly is placing a higher heating value upon the product than is desired, or such as would permit coal gas to be manufactured without enrichment. It is further hoped that such determinations will be made under the most economical conditions of manufacture, and such regulations passed as will specify a heating value that will enable gas of all kinds to be made and sold with the greatest of economy to all concerned.

It seems, however, that investigations should be undertaken while manufacturing gas to produce a uniform calorific value under these economic conditions, to determine what results could be obtained, before settling upon a calorific standard to be adopted.

Where the double standard for both illuminating and calorific value is imposed, a hardship is worked upon the supplying company, as the same conditions do not control either the manufacture or distribution of gas for each requirement, and a quality of gas must always be produced

to concur with the highest standard qualification. Such a standard usually limits the process of manufacture to be adopted, without regard to economic conditions of manufacture.

New York State, through its Commission, has regulated the illuminating quality of gas for some years in the past, and to-day specifies sixteen candle power for coal gas, eighteen candle power for mixed gas, and twenty candle power for carburetted water gas; and from this variation in figures it will appear that some attempt has been made to set the illuminating quality so as to obtain a fairly uniform heating value. The Commission of the Second District of the State has directed its engineers to make a series of readings on the gas of the various companies of the State; and the results were published in a report issued by Mr. H. C. Hazzard, which has been ably commented upon by the English publications. This report presents many interesting features, though apparent discrepancies; but it indicates that too few readings were made at each plant to attempt to formulate any rules governing the heating value of the gas as now supplied. This Commission is, therefore, now asking the co-operation of the gas companies to undertake investigations to determine whether it would not be politic or feasible to consider the quality of gas on some other basis besides its illuminating value.

Many of our State laws empower the various municipalities to pass ordinances as they may deem fit regulating the manufacture and supply of gas, and through this power the municipalities have passed regulations specifying the illuminating power, purity, and pressure, and, in some few instances, calorific value, without any particular method or consensus of action. The illuminating value called for is generally from 14 to 16 candle power for coal gas, and 18 to 25 candle power for carburetted water gas. The calorific specifications are included in only about ten of fifty large cities; and these cities require gas of a value of from 570 to 633 B.Th.U. The method of making readings is not specified; and in all but a single case the gross heating value is demanded.

Among the most interesting articles on the subject of gas calorimetry during the past year was the address of Dr. H. Bunte before the German Association of Gas and Water Engineers at Frankfurt-on-the-Main, in June, 1909*. Here Dr. Bunte very strongly expressed his views for considering the calorific value of gas as being the basis of representing its general utility value for either heating or incandescent lighting purposes, and has expressed the opinion, after much research work, that the reading of the illuminating value of the gas is superfluous. He further states that it is not necessary to specify any particular heating value, or to limit the minimum; but he insists that the gas should have a limited variation from the selected heating value to be supplied.

Dr. H. Strache, Professor at the University of Vienna, in discussing Dr. Bunte's address, practically confirms his views; and with such evidence, it seems that the importance of this subject is not being over-estimated.† This opinion is not universally supported in the United States, owing to the still prevalent use of the open flame in many large cities; but it is being more thoroughly investigated from day to day, and is rapidly receiving the sanction of many gas engineers.

The total efficiency of the gas calorimeter having been questioned by some authorities, as to whether the results obtained from the readings of the calorimeter actually represented the total heat evolved in the combustion of the gas, it was thought that any tests that might prove its efficiency would be of a decided advantage. Dr. Immenkötter, of Berlin, in 1905, made some tests on a Junkers calorimeter, in which he determined the percentages of error due to various discrepancies in operation, and came to the conclusion that the calorimeter was an exceedingly efficient instrument.

The tests made by the Calorimetry Committee of the American Gas Institute‡ showed the efficiency in several types of calorimeters to be at least 99.5 per cent. These figures were determined by inserting an electric coil-heater in the calorimeter, in place of the gas-flame, and producing electrically a known quantity of heat, practically equal to that of the gas-flame, and then determining the amount of heat absorbed by the calorimeter in operating under

conditions similar to those when the gas was being burned. With such confirming records and results, it seems reasonable to expect the gas-calorimeter in its present form is an instrument of sufficient precision to adopt for measuring the heating value of gas.

The writer was very much interested in the excellent discussion of this subject presented by Mr. J. H. Coste, in a paper read before the Society of Chemical Industry.* In this paper he speaks of four sources of error affecting results obtained from calorimeters of the water-flowing type. The first source of error seems to be due to the "heat lost or gained in the exit gases, as they are hotter or cooler than the inlet air." Our experience in America shows that this error is reduced to a minimum if the water supply is of the temperature of the surrounding air, as the products of combustion are thereby maintained at practically this same temperature.

Referring to the second source of error, "Heat lost or gained by condensation or evaporation of water during the passage of air through the calorimeter," the gas from the wet meter is apt to be saturated with water vapours, though not necessarily so. The air drawn in for combustion is at various percentages of humidity; while the products of combustion leave the calorimeter saturated. The error introduced by the moisture absorbed by the products is naturally a minimum, as the humidity of the air increases up to a certain point; and experiments made seem to indicate that on percentages of from 60 to 80 per cent., this error is so slight as to be negligible, particularly if the gas can be burned with a small excess of air. By having an adjustable damper in the flue discharging the products of combustion, and controlling this excess air, the errors affecting the results from this source can be made very small.

The third source, "Losses by radiation from the body of the calorimeter," are constants that depend upon the design and construction of the calorimeter itself; and the writer believes that the calorimeters now in use have reduced this to a minimum, and that such losses are practically negligible when the water temperature is at the temperature of the surrounding air.

The fourth source of error that Mr. Coste refers to is the assumption that a litre of water weighs one kilogramme. In America, this possible source of error has been eliminated by weighing the water, instead of measuring it volumetrically, so avoiding the necessity for any corrections due to expansion from increase in temperature, and obviating any discrepancy in volume due to entrained air.

The writer has commented on these remarks, as he wishes to emphasize the fact that the principal errors of calorific observations are due to the operation of the instrument, when the water for circulating purposes is used at temperatures other than that of the surrounding air.

Many essential points have been very ably brought out in Mr. Thomas Holgate's article on calorimetry, recently published in the "JOURNAL OF GAS LIGHTING;" and his general discussion of the various corrections to be made in determining the calorific value of the gas seems to indicate that these corrections would be at a minimum, providing the calorimeter could be so adjusted that the excess of air would be at a minimum, and the products of combustion could leave the calorimeter at temperatures approximating that of the inlet air and gas.† If these conditions are then maintained, the greatest variations then exist in the quantity of water vapours absorbed or precipitated from the products of combustion. He says: "It is impossible when the water is collected from the calorimeter to say how much of it is from the air supply and how much from the combustion." This quantity greatly affects the total condensate, and alters the reading of the net heating value, and is affected by the quantity of moisture in the air during operations.

In the test of the Boys calorimeter, which has a fixed air-passage space, Mr. Holgate seems to show that different gases, requiring varying air supplies, are not directly comparable, as the quantity of air apparently cannot be sufficiently controlled, necessitating, in some cases, excessive dilution; and for this purpose the writer is of the opinion that a calorimeter with an adjustable damper in the exhaust flue will give better satisfaction in determining the heating values for comparative purposes. Under these conditions, he has been able to operate with an excess of air as low as 16 per cent., and obtain perfect combustion; whereas the

* See "JOURNAL," for Sept. 28, 1909, p. 831.

† See "JOURNAL" for June 29, 1909, p. 968; also Sept. 28, p. 833.

‡ See "JOURNAL" for Dec. 29, 1908, p. 904; also Feb. 10, 1910, p. 295.

* See "JOURNAL" for Nov. 9, 1909, p. 407; also Dec. 21, 1909, p. 816.

† See "JOURNAL," Vol. CIX., p. 355 *et seq.*

excess air as shown in Mr. Holgate's paper is in the neighbourhood of 37 per cent.

Mr. Holgate's article is exceedingly complete and interesting, and, with Mr. Coste's paper, gives much valuable light on the subject of gas calorimetry. They both seem to dwell considerably on the net calorific value of the gas, to which, in the United States, very little attention is being paid, as it is there desired to express the calorific value of all gases in the gross heating value. The net heating value of carburetted water gas, it is found, runs from 5 to 7 per cent. lower than that of the gross heating value; and in coal gas, it runs from 6 to 10 per cent., depending upon the character of the gas.

The general tendency in the United States has been to supply gas of a higher illuminating power than has been supplied in the United Kingdom or on the Continent; and this has been due undoubtedly to the fact that a very large percentage of gas made in the United States has been carburetted water gas—60 to 70 per cent.—which in the past has averaged from 18 to 25 candle power, and in some cases even much higher. The tendency of late, however, has been to reduce this illuminating power, with the possible exception of two or three of the larger metropolitan cities. Therefore, where mixed gas is supplied, the illuminating power of the coal gas has been raised several candles. The heating value of the carburetted water-gas plants, on the average, has been as high as, if not higher than, the coal-gas plants, and, consequently, the mixed gas plants have been manufacturing a gas of a higher heating value.

The calorific value of coal gas is variable, and depends upon the grade of gas coal used, the yield per pound, and the general methods of manufacture. The larger coal-gas plants have been reducing their heating value by increasing their yield, and at the same time increasing their heating value by better and more scientific methods of treating the gas during its manufacture. The smaller plants have been increasing their heating value by having a decreased yield, but at the same time reducing their heating value by operating the plants less efficiently.

The calorific value of carburetted water gas manufactured has been very variable throughout all the plants of the United States, owing to the extreme variation in illuminating value demanded and carried, as has been shown by the report of the Engineers of the Public Service Commission, Second District, New York. It will be noticed, however, that the higher illuminating value produces a higher heating value, due to increased enrichment; and, analyzing further, it is seen that the heating value has been generally proportional to the quantity of enriching oil used, but at the same time is affected by the oil efficiency obtained, as the cracking-up of the hydrocarbons in the process of manufacture has changed the character of the illuminants of the gas.

Analyzing the data received from a number of plants, the writer has constructed an empirical formula that, while not entirely correct, in the majority of cases seems to confirm the results obtained in many calorific investigations. This formula is expressed as follows:

Calorific value (B.T.U.) = 310 + A × candle power, in which A = a constant due to oil efficiency.

| | | |
|--------|------|---------------------------|
| A = 18 | when | candles per gallon = 4.25 |
| 17 | " | " " = 5.00 |
| 16 | " | " " = 5.75 |
| 15 | " | " " = 6.50 |
| 14 | " | " " = 7.25 |
| 13 | " | " " = 8.00 |

These figures are shown graphically in fig. 1. The heating value is expressed in B.Th.U., and the illuminating value in candles, as read with a No. 7 or 8 flat-flame burner, similar in construction to a Bray No. 7 slit union. In this formula, the oil efficiency is given in candles per imperial gallon, which increases the heating value by a certain constant—this constant supposing to represent the excess heating value per candle over and above that which would naturally be included in the blue gas before such enrichment was attempted.

These figures do not in all cases correspond, as the many methods of reading illuminating gas are more variable than the calorific determinations. For instance, the adoption of a burner that will produce one more candle in the same gas will mean an increase of from 5 to 10 B.Th.U. in the calculated heating value; but such a formula has enabled the writer to closely check the calorific power of carburetted water gas supplied by many plants in the United States.

CALORIFIC VALUE FROM GAS ANALYSIS.

A number of articles written on gas calorimetry have advocated the calculation of the heating value from the gas analysis. In a general way this might be done; but the writer doubts if either in coal gas or carburetted water gas it is safe to place too much dependence upon such calculations, more particularly where the gas contains illuminants, both fixed and unfixed, in any quantity. The simpler gases—such as hydrogen, carbon monoxide, methane, or ethane—may be easily determined and calculated; but the illuminating hydrocarbons are so complex in character that it is a matter of great difficulty to accurately determine their small percentage in volume sufficiently close to give their exact proportionate heating value to the gas. In the hands of the most experienced gas analysts, analyses can be made to give fairly comparative results, but not close enough to be used for giving calorific values for scientific or regulation purposes.

ESSENTIALS FOR ACCURACY.

In American investigations to establish accurate and uniform methods of determining the heating value of a gas,

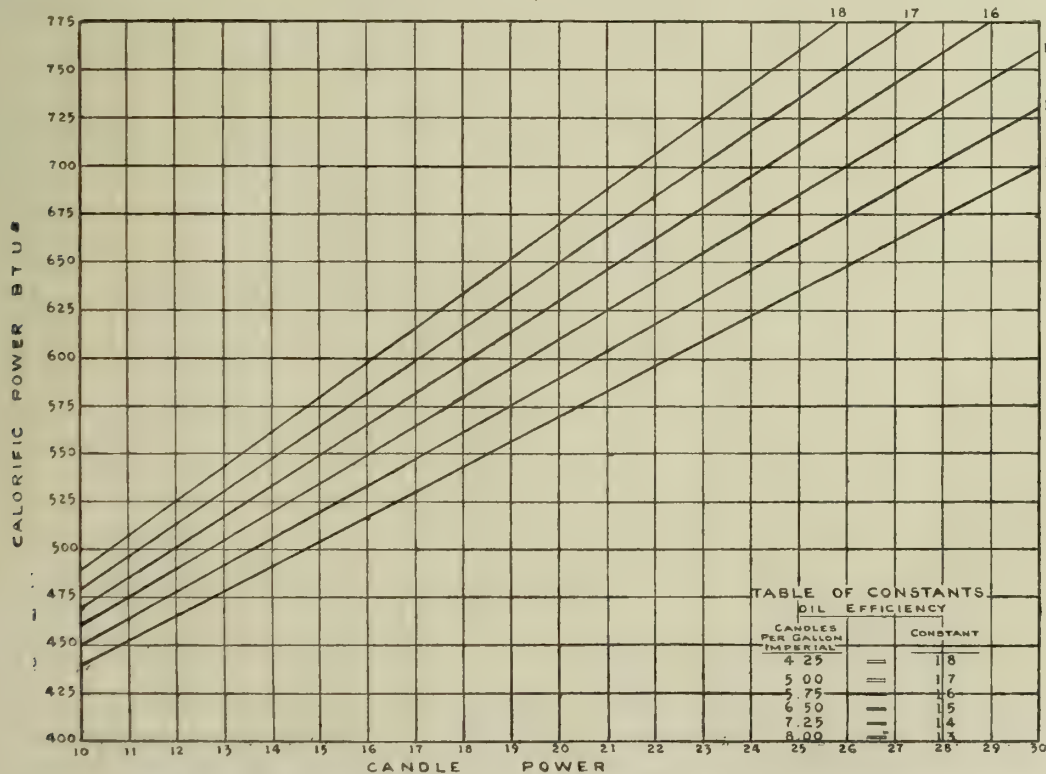


Fig. 1.—Heating Value Chart—Curve for Determining the Calorific Value of a Carburetted Water Gas from its Candle Power and Oil Efficiency—i.e., Candles per Gallon.

it was found that the greatest essential to correct work was that the gas, air, and products of combustion should enter and leave the calorimeter at the same temperature, and that the temperature of the atmosphere surrounding the instrument; and in calorimeters of the water-heater type—as the Junkers, Simmance-Abady, Sargent, and Boys—to arrive at this condition, it was necessary to have the inlet water at the temperature of the room. The inlet water, in nearly all cases, jackets first the outgoing gases, or products of combustion, which naturally assume the same temperature. The gas in the meter and the air entering the calorimeter usually agree within a degree. This being the essential of comparative results, a series of experiments were made on the same gas, by simply supplying water of different temperatures to the calorimeter, and holding all other conditions as nearly as possible constant. A curve of the results, as well as a table of readings during the test, is shown in fig. 2.

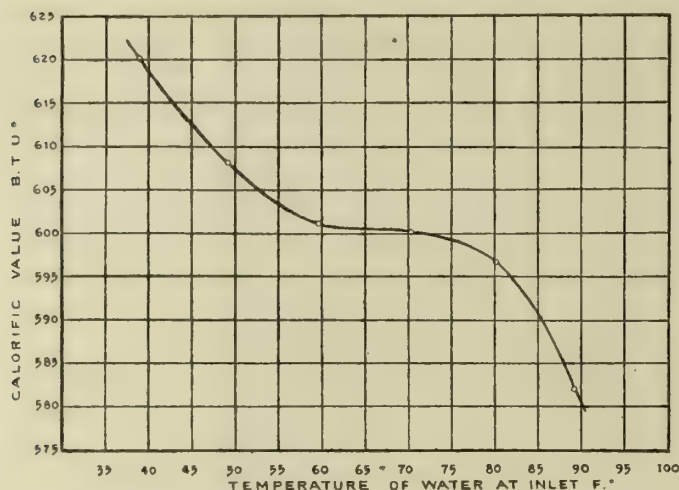


Fig. 2.—Curve Showing Variation of Calorific Value of Gas with Temperature of Water at Inlet of Junkers' Calorimeter.

ENGLISH UNITS OF MEASUREMENT.

Upon investigating the testing conditions in the United States, it was found that calorimeters were equipped with accessories of many varying kinds—meters measuring in litres, and meters measuring in cubic feet; Centigrade and Fahrenheit thermometers; graduations in cubic centimetres, in ounces, in quarts; and scales in pounds and ounces. The Committee on Calorimetry made recommendations to the American Gas Institute to have its companies adopt uniform methods of reading; in the first place, to greatly facilitate the work of making determinations secondly, to establish the adoption of uniform apparatus and operating directions.

The adoption of English units was recommended—that of expressing the heating value of the gas in "British thermal units," which is the natural product of the pound-degree; the measurement of the gas in cubic feet; the reading of all temperatures in Fahrenheit degrees; and the measurement of the water in pounds avoirdupois, preferably by weighing, although some graduations have been constructed to measure in pounds volumetrically. The writer is pleased to state that these recommendations are being generally followed; and reports from a number of companies seem to indicate that many of the bugbears of calorimetry have been eliminated by following these suggestions and other operating conditions which are recommended.

Junkers No. 872.

| Readings. | 1—4. | 5—8. | 9—12. | 13—16. | 17—20. | 21—24. |
|--|---------|---------|---------|---------|---------|---------|
| Barometer | 28.790 | 28.770 | 28.730 | 28.700 | 28.660 | 28.630 |
| Temperature gas | 69.400 | 68.350 | 67.800 | 67.700 | 68.100 | 68.150 |
| Correction factor for gas volume | 0.9354 | 0.9374 | 0.9374 | 0.9366 | 0.9344 | 0.9328 |
| Humidity atmosphere, per cent. | 62.000 | 62.000 | 62.000 | 75.000 | 88.000 | 100.000 |
| Room temperature atmosphere | 69.000 | 68.500 | 68.500 | 69.500 | 70.800 | 70.400 |
| Exhaust temperature Products of Combustion | 45.600 | 54.200 | 63.200 | 72.400 | 81.500 | 88.600 |
| Gas rate, cub. ft. hr. | 6.780 | 6.770 | 7.050 | 6.900 | 6.910 | 6.920 |
| Gas consumed, cub. ft. | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 |
| Water heated, pounds | 7.499 | 7.428 | 7.251 | 7.306 | 7.295 | 7.255 |
| Inlet temp., Fahr. | 39.009 | 49.253 | 59.632 | 50.347 | 80.177 | 89.274 |
| Outlet temp., Fahr. | 54.491 | 64.532 | 75.150 | 85.732 | 95.466 | 104.246 |
| Difference, Fahr. | 15.482 | 15.279 | 15.518 | 15.385 | 15.289 | 14.972 |
| B.Th.U. | 620.200 | 608.200 | 601.200 | 600.200 | 596.800 | 582.100 |

Each result represents at least four distinct readings.

The barometer readings are low, as the place of experimentation was nearly 1000 feet above sea level.

GROSS V. NET HEATING VALUE.

Many misunderstandings have arisen from the use of the words "gross" and "net," as applied to the heating value of a gas; and it has been the consensus of opinion of most of the operators of gas companies in the United States who have taken an interest in the subject and expressed their views, as well as many other investigators, that the gross or total value is the only proper and scientific method of expressing the heating value of a gas.

The American Gas Institute, at its annual meeting in New York, in 1908, passed the following as the definition of "Heating Value of Gas:"

"The heating value of a gas is the total heating effect produced by the complete combustion of a unit of volume of the gas, measured at a temperature of 60° Fahr., and a pressure of 30 inches of mercury, with air of the same temperature and pressure; the products of combustion also being brought to this temperature. In America, the unit of volume is the cubic foot; and we recommend that the heating value be stated in terms of 'British thermal units' per cubic foot of gas."

The reasons for this action were manifold. The heating value of a coal or any other fuel is naturally expressed in its gross value, or includes the heat evolved by its complete combustion, including the latent heat of all water vapours formed. So, for comparative purposes alone, it was assumed the same would be advisable for gas. The gross heating value is the value which is obtained from a direct reading of the calorimeter, when the gas, air, and exhaust products from the calorimeter are at the same temperature; and the heat absorbed by the calorimeter is all the heat developed by the combustion of the gas. The result, under normal conditions of the atmosphere, is not absolutely exact, owing to the varying degrees of humidity of the atmosphere, and the entrained moisture in the gas and air entering the calorimeter not equalling exactly the entrained moisture leaving in the products of combustion. But, under ordinary conditions, this discrepancy is slight, and may be neglected; and under extraordinary conditions the error may be corrected.

The direct reading of the calorimeter gives a reading that is rather easily determined, and comparatively quickly; while the measurement of the condensate requires a much greater quantity of gas to be burned, and its collection and measurement are somewhat uncertain and difficult. Any variation in the temperature of the products of combustion affects the result to a greater degree than that of the gross value. Should the products of combustion leave at a temperature, for instance, as high as 130° Fahr., there would be no condensate; and this condition occurs in one type of calorimeter offered for sale on the American market.

Under such a condition, it must be observed that there is considerable loss in sensible heat of both the escaping gases and the vapours, as well as in the latent heat of the vapours.

The following specification illustrates the type of instruments and accessories recommended for American practice, with some instructions for operation.

SPECIFICATION FOR CALORIMETER OUTFIT.

The calorimeter should be of the water heater type, and one that transmits directly the heat evolved by the burning gas to a measured quantity of water; and at the present time it should be of a type as illustrated by the Junkers gas calorimeter—representing the best form of calorimeter obtainable, as shown by extended investigation.

The calorimeter should be accompanied by accessories that shall measure the gas in cubic feet, determine the quantity of water passed through the calorimeter in pounds avoirdupois, and indicate the temperatures of the air, gas, water, and exhaust products in Fahrenheit degrees.

The volume of the gas shall be corrected to a standard volume as expressed when measured at a temperature of 60° Fahr., and a barometric pressure of 30 inches of mercury; and the result of all calorific determinations shall be expressed in British thermal units, which is the natural product of the pound-degree.

The calorimeter should be so designed that the water will circulate freely, and be so distributed in all its heat-absorbing parts that

before reaching the bulb of the outlet thermometer it will have maintained a uniform rise in temperature. To do this, the water should directly oppose, throughout the entire instrument, the flow of the burned gases. The rate of flow of water should be uniform, and controlled by a graduated cock on the inlet. This uniformity of flow should be controlled by the design of the calorimeter which should preferably have a weir-overflow on both the inlet and outlet, thereby obtaining a constant head of water at all times.

Care should be taken in the design to prevent air pockets forming in the water space of the calorimeter, and also to prevent the outlet thermometer from receiving any radiant heat direct from the combustion chamber.

To reduce radiation to a minimum, the exterior of the calorimeter should be constructed of bright polished metal, and air jacketed in all parts. It should be mounted on legs with sufficient spread to give stability, and with room enough underneath to allow the burner to be readily inserted, and observed after it is inserted.

The exhaust products should escape from a flue the area of which is controlled by an easily adjusted and graduated damper, as the heating value of the gas recorded is altered by varying the excess of air passing through the calorimeter—the least amount of excess to obtain complete combustion giving the highest heating value to the gas.

The thermometers that indicate the water temperature should preferably be placed on the same level. More recently-designed instruments show that this is possible, without any decrease in efficiency.

Meter.

The meter should be a wet meter registering one-tenth cubic foot per revolution of the drum; and, in practice, a complete revolution of the drum only should be taken into consideration. For convenience, the large dial should be graduated in one hundred equal parts. In addition to the large dial, there should be a smaller dial to register the number of revolutions of the large hand.

The meter should have an outside gauge glass, showing the water-level, with a fixed outside pointer, reading to the bottom of the meniscus. Considerable objection has been raised to the interior overflow as supplied on the German meters as not being easily checked or observable as to the water-level condition. The meter should be supplied with levelling screws, and should have securely fastened to the top two levelling tubes at right angles to each other.

The thermometer for measuring the temperature of the gas should be accurate within one degree, and should be in the meter top near the gas outlet. Many of the meters have an additional opening in the side to register the temperature of the water in the meter.

Regulator.

The use of gas-regulators is necessary for best work in calorimetry. One should be placed on the inlet of the meter, so that the gas will not be measured at a pressure over 15-10ths. Another regulator should be placed between the meter and the burner, to give absolutely uniform pressure to the gas as it is being consumed. A wet regulator as supplied with the Junkers instrument is very satisfactory for this purpose.

Burner.

After trying burners of several types, it seems as if the most suitable one is the long-tube bunsen with an adjustable air mixer, and having a spreader at the top to shorten the flame. Such a burner is preferable to the illuminating flame burner, as it is less likely to deposit carbon in the interior of the combustion chamber, and, by observing the flame, complete combustion can be controlled, and the flame will not smoke. The burner should be attached to the calorimeter so that it cannot be shifted, and so that the flame cannot impinge on any metal parts. By means of a reflecting mirror, the flame should be at all times observable.

Rate of Gas Flow.

In making a calorific determination, it certainly should not be necessary to specify the rate of flow, as in reading illuminating values; gases having a higher calorific value should be burned at a less rate than those having a lower calorific value, providing the capacity of the calorimeter is not exceeded. The rate of flow should be such that the products of combustion should not leave at a temperature exceeding the temperature of the air. The temperature of the water should be raised to such a degree that the possible

error in thermometer readings would make the least discrepancy in the results. At the same time, the quantity of water passed through the instrument should be such that the error in weighing this quantity would make the least percentage of discrepancy.

Thermometers.

Accurate measurements of temperatures are among the most important adjuncts of correct calorimetry, especially the temperature of inlet and outlet water, and, consequently, the only very best thermometers should be used. It seems absurd to use telescopic reading glasses when the thermometer readings are in many instances half-a-degree in error. The adoption of the Fahrenheit scale, divided into tenths of a degree, enables divisions about half as great as with the adoption of the Centigrade scale. The thermometers adopted finally by the Institute Committee were carefully made and selected in pairs, reading from 60° to 110° Fahr., and having an auxiliary marking at the freezing point, 32°. These thermometers are usually correct within 1-10th of a degree, and are capable of being read much closer with the reading glass. Each thermometer is carefully gauged, and accompanied by a calibration or correction curve, showing its variation from the standard at all points on the scale. Thermometers with similar correction curves are used as pairs; so that the error will always be at a minimum.

Water Supply.

The temperature of the water best for all purposes has been shown to be that of the room; and it should be uniform, and not drawn from the ordinary house piping system, where the uneven consumption in other parts of the building will make it uneven in pressure and temperature. To obtain these conditions, it has been found advisable to supply the water to the calorimeter from an overhead tank, so situated that the water will acquire the room temperature and supply the water at an approximately uniform head. Such a tank, containing about forty gallons, will be sufficient to operate the calorimeter from one to two hours, under ordinary conditions of operating. Should continuous operation be desired, it is a simple matter to supply the tank with fresh water, regulating the temperature to the right degree by means of a small gas-heated coil. In this manner, the work can be carried on indefinitely.

Gas Piping and Tubing.

While the calorific value of a gas is not affected by the absorption of illuminants by rubber tubing to the same extent as is the illuminating value, it is advisable to connect up all the accessories with the least amount of rubber tubing possible. Metallic piping or tubing should be used to connect the meter with the source of gas supply, and, if convenient, likewise to connect the meter and regulator. This practice is recommended; but where rubber tubing is used it is advisable to see that it is thoroughly saturated by the gas before readings are taken. This precaution is probably more necessary in the higher-value illuminating gases in the United States than in the gas now generally supplied throughout the United Kingdom.

HUMIDITY.

The effect of humidity upon the calorific power of the gas is small, compared with its effect upon illuminating power, although the illuminating power effect is not generally noticed when reading against an open-flame standard, which will vary in power, in most cases proportionally to the gas-flame being measured. Corrections for humidity of atmosphere are not necessary in commercial calorimetry, but can be made, when desired, for more careful readings, especially when the air is so dry that much of the latent heat of the water vapours produced by combustion is carried off in the products of combustion. The humidity conditions may be obtained by means of the wet and dry bulb thermometers, having the wet bulb of the whirling type, or having the air impinging upon it from a small electric fan; or, better still, a more perfect instrument to use is the Assman psychrometer.

INSTALLATION OF THE CALORIMETER.

The operation of a calorimeter may be greatly facilitated by having it installed permanently at some point where it is to be continually in use. For this purpose, the writer suggests a cabinet that may be compared to a chemical laboratory hood. Such a cabinet is shown by the accompanying illustration (p. 828), and could be easily erected in

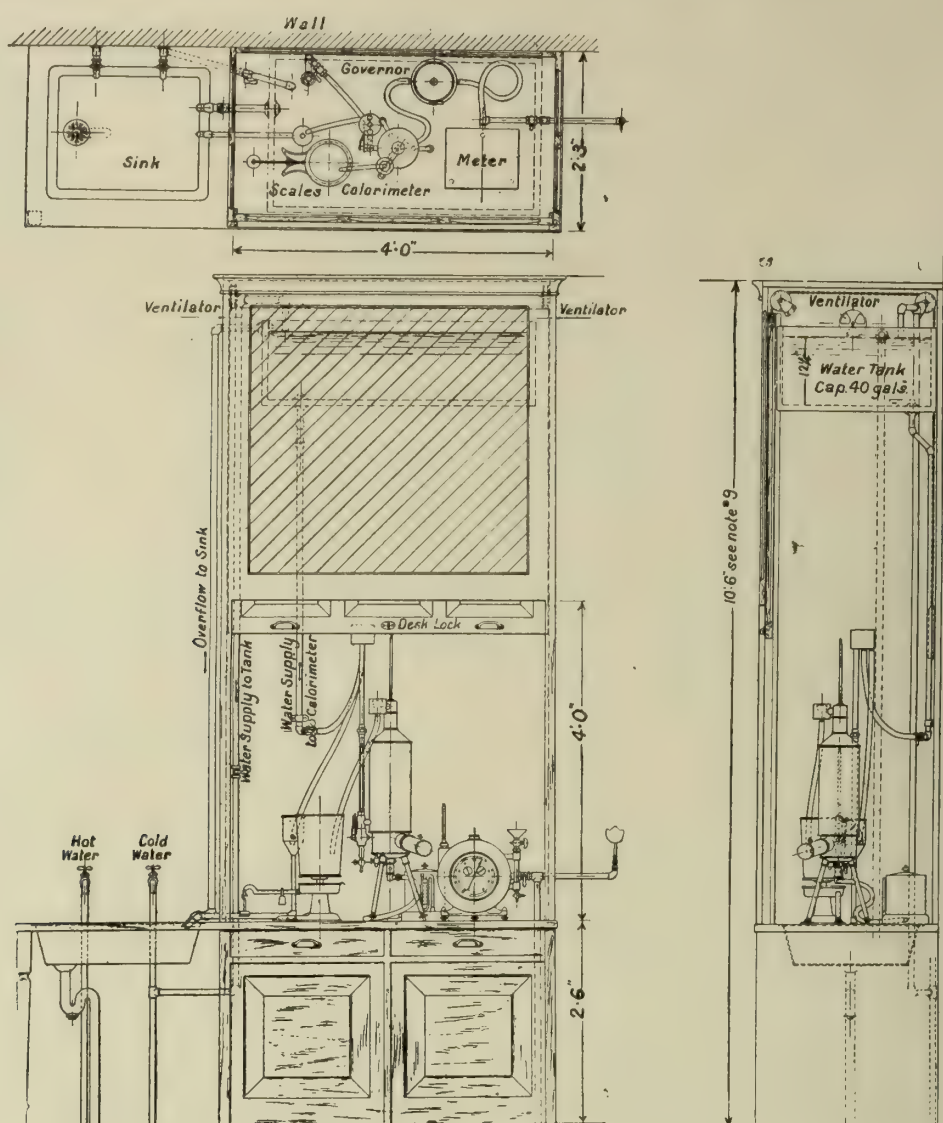


Fig. 3.—Calorimeter Cabinet.

any gas office or gas-works building. It is designed to be practically dust proof, and to contain the calorimeter and all accessories in place ready for use. The thermometers need not be disturbed, nor the water drained from the instrument. The water-tank is shown above, and may be filled through the fixed piping; the water, when used and measured, passing to the waste piping through funnels, or being emptied directly in the sink. All cocks controlling the gas and water supply should be inside; and the cabinet should be kept closed and locked when not in use. Where there is not head-room enough for a vertical sliding door, horizontal folding doors may be conveniently substituted. The sides may be of glass, to permit the light to enter, as no burning jets, except the gas being measured, should be inside the cabinet. The cabinet should not be erected near heating appliances, nor in the direct rays of the sun.

The arrangement of the apparatus in the cabinet can be modified to suit the operator; but the illustration gives an idea of its general construction. The adoption of such an installation has greatly increased the efficiency of calorific readings at many plants by allowing the calorimeter to be ready for operation in a minimum of time, and permitting the work to be done with the least inconvenience.

Should the water supply be muddy or carry matter of any kind in suspension, it is advisable to instal a water filter between the supply and overhead tank. In several installations where the water was not good, it was found convenient to use distilled water, and to have a collecting tank in the base of the cabinet, catching all water from the calorimeter, and when the testing was completed to pump this same water back to the overhead tank.

OPERATING DIRECTIONS.

Supposing the calorimeter to be erected in a cabinet with the accessories conveniently placed for operating, all the apparatus should be so arranged that the thermometers, gauges, and meter may be read easily and with the least movement of the observer's body. It is necessary to see

that the gas-line to the meter is purged, and that a correct sample is being obtained of the gas to be measured; also that the gas-meter is level, and the water-line correct as indicated by the outside gauge glass, when there is no gas pressure on the meter.

If fresh water has been put in the meter, before testing, gas should be passed through it for several hours so as to thoroughly saturate the water.

All rubber tubing connecting the meter, regulator, and burner should be as short as possible, and should be saturated with gas.

The operator proceeds as follows: Turns on the gas and allows it to burn with the burner on the table of the cabinet; shuts the gas off at the burner cock and observes the hand of the meter for any indication of leakage; starts the water through the calorimeter at the rate of about 3 lbs. per minute; regulates the gas to burn at a rate of from 4 to 7 cubic feet per minute, as may be found by experiment to give the highest reading—admitting enough air through the bunsen regulator to just produce a faint luminous tip to the flame; inserts the burner in the calorimeter, and observes the flame again with a reflecting mirror, to see that it is correctly placed and burning properly.

The excess air passing through the calorimeter is controlled to some extent by the adjustable damper at the exhaust outlet; and it will be found that the best results are obtained when this excess is at a minimum. But in all cases the air must be sufficient to produce complete combustion. Experience with the calorimeters already tested has shown this position to be about one-fourth open. The quantity of water passed, and the rise in temperature of the water, seem to allow of some variation; but experience in America has seemed to indicate that the best results with a 600 B.Th.U. gas are obtained by permitting a rise of 15° Fahr., which would mean approximately 4 lbs. of water for each tenth of a cubic foot of gas burned.

There should always be a slight excess of water escaping for the inlet weir of the calorimeter, as such a condition

alone denotes a uniform head of water in the instrument. The outlet water also is running to waste until it is shifted to the measuring vessel.

Before making a test, the barometer, temperature of the air, temperature of the gas, and temperature of the products of combustion should be observed and recorded. If the water supply to the calorimeter is approximately that of the air surrounding the calorimeter, the temperature of the products of combustion should be within one or two degrees of this same temperature, and the results obtained should be as nearly correct as it is possible to get them with this type of instrument.

The gas should be allowed to burn in the calorimeter until a thermal balance is established. The water inlet being uniform, such a condition would mean the least change in the outlet water temperatures.

The test may be started by shifting the water from the calorimeter outlet to the measuring vessel as the hand on the gas-meter passes the zero point. Readings are thus made of the inlet and outlet water thermometers as rapidly as the observer is able to record them during the consumption of preferably two-tenths of a cubic foot of gas. At least ten readings of each thermometer should be made. Two-tenths of a cubic foot are suggested, as the errors of stopping and starting the water flow are reduced, and a better average of temperatures is obtained.

The water is then shifted from the measuring vessel to the waste, as the meter-hand passes the zero-mark the second time. The water is then weighed, and the amount is recorded in pounds and hundredths of a pound.

The heating of the gas is then obtained direct by multiplying the difference of the average of the inlet and outlet temperatures by the quantity of water passed in pounds, and dividing by two-tenths. This heating value is then corrected for gas of standard temperature and standard barometric pressure by dividing by the constant obtained from tables for the indicated temperature and pressure.

In weighing the water in metallic containers or vessels, it is advisable to weigh the container first when wet, inside, to avoid any discrepancies in consecutive tests. A safe method is to fill the container with water, emptying and shaking for about five seconds in an inverted position.

CALORIMETER READING

WORKS

DATE

GAS

CALORIMETER

TEMPERATURE OF GAS

CORRECTION FACTOR

HUMIDITY

TEMPERATURE ATMOSPHERE

TEMPERATURE EXHAUST GAS

CONDENSATE PER CU. FT. GAS

TIME ONE REV. METER

GAS CONSUMED DURING TEST

WEIGHT WATER HEATED

TEST NO.

F.

V.

W.

| WATER TEMPERATURES | | BTU = $\frac{W(T^2 - T^1)}{V \times F}$ |
|-------------------------------|--------|---|
| INLET | OUTLET | |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| AVER. | | |
| THERMOMETER } CORRECTION } | | |
| T ₁ T ₂ | | |
| RISE IN TEMP. | | B.T.U. = |
| REMARKS | | |
| Observer. | | |

Fig. 4.—Form for Calorimeter Returns.

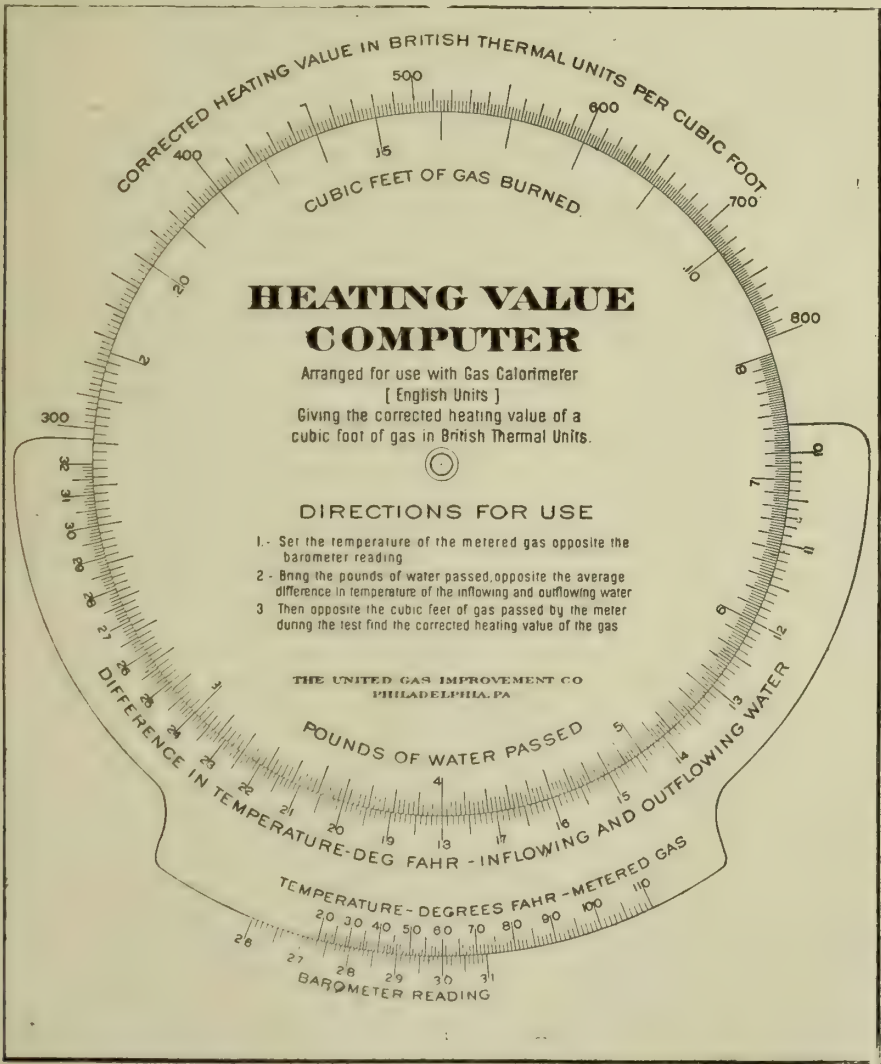


Fig. 5.—Heating Value Computer.

Under these conditions a second and third test may be made without altering any of the conditions, or stopping the flow of gas or water.

CALCULATING THE RESULTS.

When all readings are made in English units, the calculations are necessarily simple; but these readings should be recorded systematically to allow for checking results and making comparisons. A form (p. 829) is given which has been successfully used and found to meet all wants.

This form, it will be noted, calls for entry of all readings of temperature, humidity, and water measurement, whether they are used in the results or not, and is in card form for convenient filing. This form can be modified to suit local conditions.

The average of the water temperatures is determined and the correction error, if any, applied for each thermometer. For a determination of the net heating, the gas may be burned long enough to obtain sufficient condensate to determine the water vapours condensed, which represent only the excess over that required to saturate the products of combustion and excess air. This amount of condensate is variable with the same gas, depending upon the humidity of the atmosphere and the excess air admitted with the burning gas. The net heating value is then determined by subtracting the latent heat of this amount of condensate from the total heating value of the gas.

USE OF COMPUTER FOR CALCULATIONS.

The labour of making the calculations of heating value of a gas from the observations of a calorimeter may be lessened by the use of a slide-rule computer having divisions corresponding to the readings made with the calorimeter. This computer is designed to operate within limits of from 300 to 800 B.Th.U., and gives the corrected heating value of a cubic foot of gas, having the barometric pressure given, the temperature of the metered gas, the difference in temperature of the inlet and outlet water, and the pounds of water passed. Should a gas of lower or higher heating value than 300 to 800 B.Th.U. be measured, the computer can still be used by dividing or multiplying one or other factors in the computation.

GENERAL OBSERVATIONS.

It hardly seems necessary to mention, but in making recommendations to the operators throughout the United States who have taken up the subject of gas calorimetry, it has been found necessary to call their attention to some very important but simple precautions regarding the care and manipulation of the instrument; and those precautions might bear repeating here.

If the calorimeter be set up permanently, it should be installed in some dust-proof cabinet and provision should be made that it be not disturbed by anyone except the operator. If not set up permanently, when dismantled it should be carefully cleaned inside and out, and the thermometers removed and carefully put away.

Do not erect the calorimeter close to heating or lighting appliances whose radiant heat might affect the readings.

Do not forget to check the meter water-level and test-meter and all connections frequently for leakages.

Do not place the lighted burner in a calorimeter when the water is not running through the calorimeter.

Do not shut off the water while the gas is burning; and if the water be accidentally shut off, shut off the gas quickly so as to avoid breaking the thermometers.

Do not make the test with the inlet water more than 5° above or below the temperature of the air surrounding the calorimeter, unless due correction be made for this difference.

Do not move suddenly near the calorimeter during a test. Slight draughts thus caused will vary the outlet readings and might vitiate the test.

Do not fail to fill the overhead tank with water when through with the testing, so that the water will assume the room temperature for the next testing.

Do not fail to note, when operating under the above conditions, that an error of 0.1° Fahr. in water temperature means an error of about 4 B.Th.U. in the gas; that an error of 0.01 lb. of water, when burning 0.2 cubic foot of gas in the test, means an error of about 0.9 B.Th.U. in the gas; that an error of 1° Fahr. in the temperature of the metered gas means an error of about 1.8 B.Th.U.; that an error of 0.1 inch in barometric pressure means an error of about 2 B.Th.U.; that when metering gas, each additional inch

of water pressure to which the gas is subjected means an error of 1.5 B.Th.U.; that any discrepancy (above 5° Fahr.) in the temperature of the inlet water from that of the air surrounding the calorimeter, injects an error into the calorific reading of the gas that increases greatly as this discrepancy increases, and a corresponding correction must be applied to give the true heating value of the gas.

Dr. HAROLD G. COLMAN (London) summarized the paper in the absence of the author.

Discussion.

Mr. JACQUES ABADY (London) said it occurred to him that the paper was really a conglomeration of points which were familiar to all experimentalists in this line. It did, however, add a little to their knowledge with reference to the regulations drawn up regarding calorimetry in America; and it was in this respect that a word of criticism might very fairly be passed. With reference to the change suggested, and he believed to a very great extent carried out, in the method of measurement, it appeared to him that the metric system lent itself very readily, and with quite sufficient accuracy, to the measurement of the rise in temperature in Centigrade degrees concurrently with the measurement of the water which was heated by the measured volume of gas in cubic centimetres, so as to be interchangeable with grammes. The American Committee recommended a departure in this respect, by going back to the Fahrenheit thermometer, and the weighing of water, just as Mr. Hartley did when he read a paper about calorimetry, which probably most of those present would not like to admit they were old enough to remember. He could confirm what Mr. Klumpp said with respect to the relative advantages of taking the gross and net readings. Certainly, a source of error, which might be considerable, would be removed, if the reductions from gross to net were cut out. To get the gross calorific power was a comparatively simple matter, although it involved a certain amount of care—a point which was not altogether recognized. But to get at the net result involved other things which were beyond the power of the observer to regulate. For instance, the temperature of the room and the percentage of humidity would have an appreciable effect on the amount of condensed moisture, besides which there was what he might call the apparatus error, in this respect—that the moisture clung to the wall of the apparatus, and did not flow regularly. In order to get over this, one had to take a very much longer measurement of the gas than would otherwise be necessary. On the other hand, there was this difficulty, that if the reduction from gross to net calorific power was neglected, they might have a gas which gave a very good gross calorific result, but was not equally efficient when reduced to net. It might contain a large percentage of hydrogen; and therefore he did not think, for experimental purposes, the net reading should be neglected for scientific purposes. If one wanted to see what one's gas was, the question of net was a problem to be gone into; but as regarded any official test which might be prescribed, it was a dangerous thing for any gas man to leave the testing of his gas in the hands of the ordinary person who carried out these official tests, and be willing to abide by the net results he produced.

Mr. THOMAS HOLGATE (London) said he must express his thanks to the author for the kindly way in which he had spoken of the little work he (the speaker) had done in this matter. He was in general accord with the remarks of Mr. Klumpp as to the desirability of gas having its value stated in the gross form; but perhaps this conclusion ought to be supplemented by a fact which was made clear—by Mr. Coste's paper—that frequently errors of observation were present in the gross figure, due to the variations in the humidity of the air supply; and that these errors were corrected when the condensation figure was deducted; so that it left the net figure more correct than the gross figure. It was important to remember that in a good many tests which were detailed the gross figure was shown to be erroneous, and the condensation figure was also shown to be erroneous. But when one was deducted from the other, it gave an accurate net figure. This did not always apply; but it did in a great many instances. The relative merits of the gross and net results seemed to be a question very largely of what they expected the calorimeter to do. If they wanted it merely to tell them a certain thing, the gross would be sufficient; but if they required it to give exact information to the gas undertaking about the gas that passed through

it, both figures were needed. If they were correctly given, they would show a great deal as to the actual composition of the gas, and its value for illuminating, and especially for heating, purposes. Mr. Klumpp mentioned one point which it was perhaps worth while considering. He said that, by having a damper placed at the outlet of the calorimeter to control the outflow of the waste gas, a good deal of disparity might be eliminated. Probably this view was right; but the difficulty was to know how to apply a damper without making tests of the composition of the gas. In practice, it would be rather unworkable; and he should look at the matter slightly differently. Take a Boys calorimeter made for a fixed air supply. If this were used for something like a definite quantity of heat per hour, which could be easily ascertained by a preliminary test, they had sufficiently uniform conditions to get an accurate result, using the instrument with a certain rate of gas per hour, determined by its approximate calorific power. Their friends in Scotland had perforce to reduce the quantity of gas passed per hour, because they could not use so much, as the gas was of higher illuminating power; so that to get the power they had to reduce the air supply. Using a Boys calorimeter for a well-defined range of heat per hour, any source of error from an excess of air supply would be largely eliminated. This could easily be done; and it would meet the idea Mr. Klumpp had put forward, in a simpler manner. Another point on which stress was laid was undoubtedly of value—namely, that the supply of water to the calorimeter should be of the same temperature as the air of the room. There would be a ready acceptance of this view. The only difficulty would be whether, where the changes of temperature were rapid, one would be likely to get the proper temperature in water stored in a cistern in the room. Of course, such water would be much better than water supplied from a tap, in which case the temperature was usually considerably below that of the room. Fig. 2 and the table would be found to be useful; but they would have been very much more useful if the net figure had been given, and also an analysis of the gas, so that one could easily see whether these figures did correspond with the actual heating property of the gas. He was not aware that in this country anyone suggested that the official test should be made by first analyzing it. The only way he thought in which the analyses had been used was as a check on figures which were obviously incorrect as readings of the calorimeter. It could be shown beyond doubt that readings from calorimeters had been put forward which could not be substantiated when compared with the analyses. There was a great advantage in having the two sets of figures side by side, where accurate work was demanded. Mr. Klumpp used an argument relative to the net and gross value which did not seem to him very cogent. He said that, because coal was sold, or its value assessed, on the gross figure, this was a reason why they should not pay much attention to the net. He thought there was not much in this, because, as a matter of fact, as regarded the calorific power of solid fuel the relationship between the net and the gross was totally different—the amount to be deducted for the net in solid fuel was very small; and if it could be easily ascertained, it would be desirable to have it stated. If they gave the gross figure for coal, it was an inaccurate figure as to its actual evaporating power; and if they obtained the net figure, they would certainly be giving it more correctly.

Dr. W. B. DAVIDSON (Birmingham) remarked that, in the first place, he should like to say a word about the error of the instrument. It was hardly worth while to trouble about the corrections for humidity and other things, provided the conditions were fairly constant. When using different calorimeters, they found a very slight error indeed in comparing the results. The other day he had occasion to test six instruments of four different types; and the error, in the case of five, was less than 1 in 300. When they had errors of less than $\frac{1}{2}$ per cent., the instrument could be considered perfect. He might say, however, that calorimeters required careful supervision, because they were liable to get out of order. They sometimes found, through leakage or other causes, an error of 4 to 5 per cent., or even more; and where they had only one calorimeter in the laboratory, it was almost impossible to say whether there was an error involved or not. It was really very advisable in a testing-station to have duplicate instruments, and frequently to make duplicate tests. He had known a calorimeter to give too high a value, and had never been able to understand why. In one case, it was consistently 4 per cent. too high.

He thought it must have been the lagging between the two thermometers that had given way. With regard to the question of weighing or measuring the water, he found that the most accurate way (having tried both) was to measure the water, using a 5-litre measure, but graduating the measure so as to give the proper weight—not to accept the graduation of the measure, but to correct it for temperature. This was simpler and more accurate than weighing the water. He was very fond of figures, but could not bear to see them given with over-exactness. He agreed that there was absolutely no necessity for having the thermometer graduated to Fahrenheit degrees representing one-hundredths of a degree. There was also no necessity for reading the barometer to three decimal places, or the temperature of the gas, and all those other figures. The figures should be given showing a degree of accuracy rather greater than the error of the instrument.

Dr. COLMAN said he appeared in a dual capacity; but in so far as he was not Mr. Klumpp, he could not reply to the discussion from his point of view. From his own point of view, however, he practically agreed with everything that had been said except in one point on which he had a little quarrel with Mr. Abady. The latter said that it was the net value which was most affected by variations in the moisture of the air; but he (the speaker) did not agree with this. It was the gross value which was affected by alterations in the moisture. But the amount of water condensed was equally affected; and as they got the net value by the difference between the gross value and the latent heat of the condensed water, this error was eliminated, and so far as errors due to moisture were concerned, a correct net figure was obtained. Nevertheless, he was in full agreement with both Mr. Klumpp and all the speakers that it would be very unfortunate if, for the purpose of defining a gas, they used the net calorific power, and not the gross—that was to say, for all statutory purposes the gross figure ought to be the one adopted. He regretted that in the one statutory restriction already introduced into this country, the net value had been adopted. He did not, however, think it was of much importance, because it was agreed that this was a purely tentative step, which would come up for consideration, and perhaps modification, in a couple of years. But they must be ready, when the time came, if there was going to be any increase in the statutory restrictions as to calorific power, to try and have the gross value adopted. The reasons why this was the proper course were that the gross value really represented the total potential energy of the gas and water, on the whole. The errors of determination of the gross value were less than of the net value. There was considerable difficulty in always ensuring that the water condensed during any test had come from any particular quantity of gas which was burned in that test. Owing to the large surface, there was a tendency sometimes for the water to hang up, and at other times to run down rather more quickly; so that there was always considerable variation possible in this respect. But there was another reason which he might just mention, because he thought it would become of a certain amount of importance. What was the net heating value of the gas? There were two different net heating values being used; and it might be a nice legal point, possibly, if a company were fined for being slightly below the statutory quality, as to what the meaning of net value was. He might perhaps explain this by the use of a table he had put up for another purpose which he should have mentioned first. The question of calculating the calorific power of gas from analysis, as Mr. Holgate had said, was not a thing one wanted to do as a regular practice, because it was much better and more accurate to make direct observations with a calorimeter. But it was very useful, where one had the composition of the gas, to be able to calculate the calorific power from the analysis, and it also formed a useful check on the other work. Unfortunately, the tables that were given of the calorific power of a cubic foot of various gases differed very materially—to the extent of some $7\frac{1}{2}$ per cent.—the reason being that they were not given in the same terms. Some of the tables were given in the terms of B.Th.U. to the cubic foot at 32° Fahr., 30 in. barometer; others, at 60° Fahr., and 30 in. barometer, measured dry. In all actual observations, they gave the calorific result in terms of B.Th.U. per cubic foot at 60° Fahr. and 30 in. barometer, saturated with moisture; and, of course, in calculating, this was the figure one ought to use for obtaining the calorific power. It might be useful if he wrote up the calorific powers of various gases, gross and net, calculated on the basis of 1 cubic foot of gas at 60° Fahr., 30 in. barometer.

*Calorific Power of 1 Cubic Foot of Gases at 60° Fahr., and
30 In. Bar., Moist.*

| | Gross. | Net A. | Net B. |
|--|--------|--------|--------|
| H | 321 | 268 | 275 |
| CO | 321 | 321 | 321 |
| CH ₄ | 1003 | 897 | 911 |
| C ₂ H ₄ | 1578 | 1472 | 1486 |
| C ₂ H ₆ | 2319 | 2160 | 2182 |
| C ₆ H ₆ vapour | 3708 | 3549 | 3570 |

meter, moist. They were calculated mostly from original observations by Thompsen, with the exception of the benzene vapour, in which Thompsen differed from everybody else, and he had taken there a mean figure. He put the gross figures and "Net A"—that was, the net as ordinarily ascertained. In obtaining the "Net A," one deducted from the gross value the latent heat of the steam condensed, *plus* the heat given off by the condensed water in cooling from 100°C. to the ordinary temperature. The question was, Is there any justification for deducting the latter amount of heat when ascertaining the net value? It had been the practice to do it; but it was not done in every case, and he did not think, himself, there was any justification for it. What was the use of net value? What they wanted to know was the amount of heat given off when the gas was burned. As long as the steam remained steam, the latent heat did not come out; and this latent heat was therefore heat which was only heat potentially, which did not take any part in raising the temperature of the flame, nor, in a gas-engine, did it take any part in increasing the pressure of the mixed gases enclosed in the cylinder. But this other portion that they deducted for the net included not only the latent heat, but also the sensible heat of water cooling from 100° to 15°C.; and this was really present as heat in the flame, or was present equally as heat in the cylinder of a gas-engine. Now, the only real justification for the net value was its employment in thermo-dynamic calculations, such as the maximum possible temperature of a flame, or the percentage of energy obtained in, or how near to perfection one got with, a gas-engine. For such thermo-dynamic purposes, there was no justification for deducting the quantity of heat going up by the cooling of the condensed water to atmospheric temperature. One might equally well demand that in the net determination the sensible heat carried away with the waste gases and excess of air, when these were not cooled sufficiently to condense the steam should also be deducted, as the loss of heat in this respect might nearly equal and often exceed the loss due to latent heat. It was not a point of great importance in everyday practice, as the difference between the two "net" figures is only about 1 per cent. with coal gas; but it would certainly come up in connection with the statutory restrictions, if ever the net value was fixed. This was why he raised it. Under the term "Net B" in the table, he had put what the "net" value was if one only deducted the latent heat; the difference between the two net values varying with different gases from 0.6 to 2.5 per cent., and the "Net B" figure represented the true "thermo-dynamic" net value of the gas. The popular supposition that the net value represented the quantity of heat obtainable in practice was untenable. It was simply a value which was of use from thermo-dynamic considerations; and it was of certain special value got out for thermo-dynamic purposes. In ordinary practice, as seen in the Gas-Heating Research Committee's work, the flue gases carried away from 20 to 30 per cent. of heat which could not be utilized, and under ordinary circumstances, one must have this gas going up the flue hot in order to maintain the draught. The only other point he need refer to was with regard to the units. He felt that it did not much matter in making actual calorimeter tests whether they used the Centigrade thermometer or the Fahrenheit, the pound or the kilogramme. It was so easy to convert the one into the other, and the trouble of the calculation was so small, that it did not matter in actual practice whether one adopted the American principle or not. But what he did feel was that the practice which had also arisen in connection with the existing statutory testing, of expressing the results in calories per cubic foot, ought to be distinctly deprecated. If one was going to speak of cubic feet, he ought to speak of British thermal units throughout—not take a hybrid thing like calories per cubic foot. He must, at the same time, point out that the people who started this procedure were individuals who deserved a large amount of blame in this respect. Ten years ago, there was a paper read on "Calorific Power" before the old Institution of Gas Engineers, under the same President as they were sitting under at present; and the writer of the paper gave all his results in calories per cubic

foot. He himself was that guilty person, and he could only say that he stood before them at that moment in sackcloth and ashes; and he must express regret for the error, which was due to thoughtlessness, probably, at the time. He would promise to try not to do it again.

MANAGEMENT OF SMALL GAS UNDERTAKINGS AND WORKS.

By FREDK. J. WARD, of Knowle.

The gas supply to small districts and the management of the undertaking and works frequently present difficulties; and in attempting to examine them the author is only justified by the circumstance that he has spent the greater part of his association with the gas industry in small works. It is not his intention to enter closely into details—a few only will be dealt with (although he may at once say that the success, or otherwise, of undertakings depends to a very large extent upon the manner in which details are considered)—but to view the subject generally, giving a few figures, and particulars of the methods adopted to obtain them, relating to the works and undertaking with which he is now connected.

A glance through any gas directory will show that a very large percentage of the works existing in the United Kingdom are producing less than 20 millions per annum; and it is to such works that the present paper will chiefly apply.

With regard to the position of small undertakings, no exception can be taken to the statement that there are numerous instances where amalgamation of undertakings near each other, linking-up the districts by connecting mains and concentrating the manufacture upon the works most advantageously situated for delivery of coal, sale of residuals, manufacture of sulphate of ammonia, and the general convenience of consumers, would result in such large economies being effected as to ensure to the proprietors an increased dividend on their holdings, and to the consumers a lower price for gas—the latter being a great desideratum. When closely examined, it is somewhat surprising to find the extent to which it would be a financial success to lay connecting mains and link-up districts, and regret must be expressed that more amalgamations are not effected. The author is acquainted with several gas undertakings where amalgamation with others would be beneficial, and are almost absolute necessities. The jealousies of boards of directors, and sometimes of the officials, however, tend to prevent such a course; but possibly in time they may be overcome. The chief difficulty appears to be that close attention cannot be given to the requirements of consumers, owing to the works being situated away from the bulk of them. But it can be surmounted by arranging to have a card or telephone call with response by cycle or car.

With reference to the amalgamation of several undertakings too far apart to be linked-up by mains but which could be all merged into one company and controlled by station or resident managers under the supreme control of a general engineer, manager, and secretary, some such combinations have already been inaugurated, but a large number more might be arranged. This scheme offers great possibilities; in fact, the opportunities for good work appear to be limitless. The combination of, say, six to twelve works all situated within such a geographical area as would permit of most of them being visited during a single day by the chief officer, travelling by motor car, would offer such facilities for supervision as would be sure to produce satisfactory results. The headquarters of the company should, if possible, be situated in the most convenient (for railway and administrative purposes) town or district, and the chief officer should be an experienced engineer, an able accountant, and should also act as secretary. He should be a man thoroughly familiar and versed in all the problems and intricacies of small works, and be able by practical example, if necessary, to keep the resident managers alive to their duties, responsibilities, and interests. The resident managers themselves should be selected men of conscientious principles, thoroughly practical in all the work of gas manufacture, able to carry out all the usual duties connected with distribution, and capable of keeping works' books and rental ledgers, and collecting accounts.

By the system of combining several small undertakings, numerous economies could be effected, such as in the purchase of coal, stores, and materials. The purchase of new plant could be so arranged that the displaced plant, such as purifiers, condensers, washers, and scrubbers, could be re-

moved and fixed at smaller works. Special workmen, such as retort-setters, fitters, &c., could be employed, and sent from works to works as required. In many instances, it is often a serious question as to how any extensions of works or distributing plant can be undertaken; and if the manager has to carry it out in addition to his ordinary duties, the progress of the undertaking oftentimes receives a check, through the work being inefficiently performed owing to being done in a hurry. Special tools and appliances could be kept and used at the various works as required. The point of emulation in results would be one which would be fruitful, as the resident managers would vie with each other in being on the top rung of the ladder of results, each one knowing that his work and results would be always under comparison with others of the same combination. It would be a disadvantage if the number of works or the area covered were too large and unwieldy, as the success of the scheme would rest largely in the constant supervision. The question of salary of the chief officer could be satisfactorily arranged; for even if only six works were combined, the savings produced would far outweigh the amount of the officer's salary and that of an efficient clerk. The salaries of the resident managers should be ample, and, if possible, partly fixed by results.

Passing on to consider self-contained undertakings—i.e., those which through reasons which need not be mentioned here will always be independent of any other undertaking—the views held by the author are somewhat unusual. He is of opinion that the posts of manager of the works and secretary to the undertaking should be combined in the one person—holding this opinion partly because he is firmly convinced that no person should be appointed as manager unless he is an able accountant and well versed in company law and procedure. Some part of management is the study and preparation of statistics, such being of valuable use for comparative purposes. The combination of the two offices does away with the red-tapeism which unfortunately frequently exists when the offices are uncombined, and the close association of the only official with the board of directors is usually productive of harmony. The consumers, too, are always the gainers by the combination, for any communications or requirements can be promptly attended to without the irritating (and frequently unremunerative as far as the undertaking is concerned) reference to the other department. The manager and secretary should also be able to perform all the duties of engineer in the designing and preparation of drawings, &c., relating to extensions or re-construction of works and plant. On this point the author does not wish to be misunderstood. He is fully aware that many able engineers are acting for small undertakings, often with beneficial results; but he seriously holds the opinion that the resident manager should possess all the requisite knowledge and ability for capably carrying out such duties. The presence of an expert on the board of directors is often a great assistance to the manager, such expert being able to strengthen his hands when presenting any new scheme or suggestion before the board, and no one ought to object to him having a seat on the board.

The success of a small undertaking depends in a large measure upon the ability and willingness of the official to perform any hard practical duties. He should be expert in the use of all tools and appliances, and he should love work as a civil engineer loves steel and puddle. But he is not required to ever be in a condition that he cannot meet with any consumer, director, &c., who interviews him at the works; and above all he should always be a gentleman in the best sense of the word.

Dealing briefly with a few points which go to ensure success, the charging of retorts should be accomplished rapidly, the charge laid evenly, and the lid closed quickly. The ascension pipes should be augered with a large auger (this is very important, and is too often sadly neglected), so that scarcely any more pressure exists in the retorts at the commencement of the destructive distillation of a charge than at the finish. The retort-house should be kept clean and tidy. The producer grates should be pricked-up every 2½ to 3 hours, so that the false bars for cleaning purposes should seldom need to be inserted. If properly attended to, cleaning should not be required more frequently than every six months. Mains should never be laid with a less covering than 2 ft.; and if possible they should be covered 2 ft. 6 in. In connecting services with mains, the use of two bends instead of one reduces the strain, and consequently leakage very considerably, and services should be kept covered to

as great an extent as possible. The use of any coating on mains, especially internally, is to be condemned, as the solvent action of the gas quickly causes the joints to leak. The thickness of the charge in the retort is at present the subject of controversy. The author, through being handicapped by having to rely upon hand work, has not been able to experiment much in this direction. He finds that a retort two-thirds full is best suited for his requirements. Small works appear to be severely left alone in the use of retort-house machinery, as no machine has yet been designed to take the place of the stoker and yet be sufficiently low in price to be within the means of small undertakings. The salaries paid to officials is a much debated question, but the author's experience is at variance with the generally expressed opinion that salaries are inadequate.

Dealing now with actual experience the author proposes to point out the results which have followed the application of the foregoing principles to the undertaking at Knowle with which he has been connected for over twelve years.

The Knowle Gas Company was established twenty years ago, when the author was appointed to the triple post of Engineer, Manager, and Secretary, and the result of his first year's work was a make of 2,695,000 cubic feet and a sale and accounted-for of 2,523,650 cubic feet—a difference of 171,350 cubic feet or 6·35 per cent. unaccounted for. From this point onwards, matters have progressed steadily; and for the twelvemonth ended March 31, 1910, the gas made was 9,763,600 cubic feet, and the gas accounted for 9,404,800 cubic feet, the difference being 358,800 cubic feet, or 3·67 per cent. as unaccounted for. This shows an increase in gas sold and accounted for equal to 272·6 per cent. in eleven years—a fairly satisfactory rate of progress. The coal used was 793⁶/₁₀ tons, this giving a make of 12,307 cubic feet per ton, 11,855 cubic feet per ton being satisfactorily accounted for. During the period of eleven years, the mains have been extended about 33½ per cent.; and the increase in the number of inhabitants in the district supplied is about 20 per cent., thus showing that the bulk of the increase has been on the old system of mains. The price of gas has been reduced from 5s. to 3s. 6d. and 3s. 4d. per 1000 cubic feet. The present length of mains is 6¾ miles; and as the unaccounted-for gas is 358,800 cubic feet, this shows the extremely low figures of 53,289 feet per mile of main.

The last financial statement was for the year ended June 30, 1909; and as no further figures are yet available, those for that period are shown, though those for the year shortly to be ended are much better for several reasons—such as cheaper coal, greater sales, increased production per ton of coals carbonized, &c. The amount of capital raised when the author commenced his duties was £4500, being equal to £1707 per million cubic feet of gas sold and accounted for. At present, the amount of capital raised (including premiums) is £8000, this being equal to £819 per million cubic feet sold and accounted for. For the last year of the old régime and the first year of the author's management, no dividend was available for shareholders; but since then matters have so improved that 10 per cent. (free of tax) on the share capital, which is 62½ per cent. of the whole, has been declared for the past six years, and the usual interest on debentures.

The summary of the last accounts is as follows:—

| | |
|---|--------------|
| <i>Manufacture—</i> | |
| Coal (less residuals), purification, salaries and wages, and repairs and maintenance of works . | £520 18 5 |
| <i>Distribution and management—</i> | |
| Rents and rates, repairs and maintenance of distribution plant, salaries and wages, Directors and Auditors, and establishment charges . . . | 229 4 4 |
| Gross cost of gas | £750 2 9 |
| Less meter rents, stove rents, fittings rents, profit on fittings, and miscellaneous receipts . . | 108 10 10 |
| Net cost of gas | 641 11 11 |
| Gross profit | 986 0 11 |
| | £1,627 12 10 |
| By revenue from gas | £1,627 12 10 |

The gross profit was disposed of as follows:

| | |
|---|-----------|
| Manager's percentage of divisible profits and the amount that is added to the depreciation and renewal fund | £158 8 11 |
| Income-tax | 33 6 0 |
| Added to reserve fund | 100 0 0 |
| Balance written off fittings installations . . . | 54 13 9 |
| Debenture interest | 96 0 0 |
| Dividend at 10 per cent. on share capital . . . | 540 0 0 |
| Balance carried forward | 3 12 3 |
| | £986 0 11 |

Attention is called to the fact that—so far as the manager is concerned—profit-sharing is in vogue. The author here simply mentions the fact and does not desire to comment further; he having mixed feelings on the subject.

The accounts show that the cost of gas into the holders was 13.29d. per 1000 cubic feet sold, and that the net cost of gas was 16.37d. per 1000 cubic feet sold. It may be argued that the amount of manager's percentage of profits and the addition to the depreciation fund ought to be added to the net cost, but the author does not favour that view.

Referring to the plant at Knowle, it may at once be said that there is nothing novel in it. The works are of the usual formation, and may be termed in some respects behind the times. In the retort-house the work is all done by hand, the mouthpieces are sealed with luted lids, and no modern inventions—such as anti-dips, tar columns, retort-house governors, &c.—have as yet been adopted, and the dip-pipes are sealed in the condensed liquids as formed. Notwithstanding that the yields per ton may be regarded as good, it is not considered that finality is yet reached, although there is a limit to the capabilities of workmen. The average production per mouthpiece from retorts 21 in. by 15 in. by 8 ft. 3 in. inside, is 8200 cubic feet per diem. The coal used is two-thirds South Yorkshire and one-third North Staffordshire.

The foul main and condensers are large, as they always should be, thus ensuring a very free passage for the gas, with practically no friction. The exhaustor, which is two-bladed, is driven rather fast to prevent the impulses being marked in the hydraulic main; and the motive power is derived from a gas-engine. The cost of driving exhaustors by gas-engines with gas at holder cost, is about one-third that of driving by steam, when steam is raised, as is usually the case in small gas-works, in a vertical unlagged boiler. It is true that steam is occasionally useful for warming purposes; but it can very easily be provided for by having a small vertical portable boiler, such as is in use at Knowle. The use of luted lids may appear to be antiquated; but no other kind will be adopted by the author, for he is convinced that by their use there is less loss of gas, the quality is better, and the retort-house is kept cleaner. They also tend to prevent the charge which is often made, that more is taken out of the retort than is put in it.

It is an interesting fact that, notwithstanding the small amount of unaccounted-for gas, the pressure of gas is always maintained at the full, which is 25.10ths. The author is of opinion that, instead of increasing the leakage, it has the opposite effect; leaks which would otherwise be undetected at lower pressures are detected and stopped when laying mains and services. Moreover, much greater satisfaction can be given to consumers—complaints, owing to lack of pressure, being unknown. The practice of this principle has been prevalent for at least eleven years.

In conclusion, the author holds that there is no royal road to the successful management of small undertakings, but that the "man-in-charge" must be born with a natural aptitude for steady, plodding, and unwearying work and for overcoming difficulties; that he must be continually on the *qui vive* to make the most and the best of everything; that cleanliness, order, and system are absolutely essential; that a good knowledge of chemistry and physics is desirable, but that it must be combined with sound common sense and ability; and that the manager in carrying out his multifarious duties must ever keep in mind all that is conveyed by the term "gentleman" in its fullest sense.

Discussion.

Mr. T. J. REID (Ballina) said that—coming as he did from the Sister Country, where small gas-works were greatly in the majority, and where they, more or less, pursued an active existence—he had looked forward with great pleasure, and with something akin to the sensation of a hungry man anticipating a feast of good things, when he heard that such a paper was to be brought forward. However, he must confess that his feelings now could be compared with those of the aforesaid hungry man, who, instead of enjoying a good, square meal, had been regaled with *hors d'œuvres*. He had hoped to return to his own country laden with information which might be applied to the more successful management of the concern over whose destinies he presided; but he was afraid he must content himself with continuing to use the methods he had considered to be peculiarly his own. It was not his desire to depreciate the writer's efforts in bringing

forward this paper. Valour was an estimable quality, and some degree of courage must have been necessary for the writer, to come and read such a paper before an Institution of this sort. He congratulated him on his success in this respect, and congratulated the Council on their action in accepting such a paper, as evidencing their friendly attitude as a body, and individually, to managers of small gas-works. The title of the paper was "The Management of Small Gas Undertakings and Works;" but he did not think the writer had treated the subject in a manner to justify such a title. Apart from a recapitulation of the highly satisfactory results attained by him in the management of his own works—a fact on which Mr. Ward as well as his Directors were to be heartily congratulated—very little had been said as to the management of small works generally, or as to any particular factor in the management of the Knowle Gas-Works which had led to such magnificent results. It was remarkable that he did not touch upon the one phase of management on which the manager of a small gas-works might be expected to know something more than his brother in larger works. He referred to that which was the principal theme in the President's Address, and which had from time to time been discussed there and elsewhere—namely, the means which must be adopted to further the sales of gas and to ensure to the consumer the full benefit in light, heat, and power of the gas he bought. He was informed that the voice of the Irishman was not unknown in Westminster, and that his vote, or voice, was considered of some little value. Thus encouraged, he would tell his fellow-members what had been done in this respect in some of the small gas-works in Ireland. It must be remembered that there a small gas-works producing under 10 million cubic feet per annum had to cater for an entirely different *clientèle* from that of a similar sized works in England—one that would be probably supplying a village, or perhaps a colliery or manufacturing district, where the consumers were more or less of one class. In Ireland, the small towns, although of a population not exceeding some of the English villages, possessed all the elements of a city, with all the varying grades of society from peer to peasant; and therefore their gas requirements were very varied, and necessitated a knowledge on the part of the manager of every branch of gas distribution and consumption. When the incandescent burner came into use, it was soon evident that, if they were to maintain the position which their good qualities entitled them to, special means must be adopted to prevent the position being prejudiced by weaknesses inherent in the incandescent system. It was considered that they were dealing with an illuminant as different from ordinary gas lighting as electricity itself; and a new illuminant necessitated peculiar treatment. Thus, coincident with the growth of the incandescent light, there had grown up in the towns a system of supervision of every incandescent burner in use which had been extended to other apparatus. This was absolutely free; the cost price for materials only being charged—and even, in some cases, these were not charged for. The condition of affairs was now such that consumers demanded that their burners and fittings should be kept in order free of charge, and full responsibility was presumed by them, and assumed by the gas company. This condition had not been forced on them, but had been fostered and encouraged as being absolutely essential to the conduct of their business. It was strange, then, to hear it gravely propounded on this side of the Channel that something of the sort was necessary. It seemed to him that the importance of the matter had not been fully grasped; that they allowed themselves to be forced into a position which they had better have occupied of their own accord in time. He was not a prophet, or the son of a prophet; but he thought it would better pay some of the larger works to foster and retain such lighting consumption as they had, by supplying incandescent burners and mantles and maintaining them free, than by embarking on schemes of free slot-installation. Even the President, in his address (which he was not going to criticize), conversant as he seemed to be with the importance of the whole matter, disclosed something of the attitude of the gas profession, when he said it was useless to disguise the fact that the profession were becoming shopkeepers, or something to that effect. Why disguise the fact? They should advertise the fact that they were "out for business," and were actually purveyors of light, power, and heat. It would be far better, in his opinion, that consumers should be asked to pay a penny, or even sixpence, per 1000 cubic feet more, if by so doing they obtained a better service. He had simply

described a condition of affairs that had existed in Ireland for many years, but which did not appear to have obtained the same position here. With regard to the paper itself, he had not very much to say. Dealing with the question of amalgamation, something might be said for this, for manufacturing and distributing purposes, for gas-works closely situated; but this condition did not apply in Ireland, where the gas undertakings were separated by many miles. So he would leave it to be discussed by managers who were brought more closely in contact with the actualities of the case. The question of the combination of small gas-works had been discussed frequently in Ireland, where a number were in combination; but perhaps the discussion of this point had better be left to those present who had better information. He believed, however, that such works in combination had been a distinct success, though he could point to others not in combination which were certainly quite as successful. He noted that the writer insisted that the resident managers of the works in a combination should possess qualities, moral and otherwise, of a very high character. He trusted that these qualities were not exceptional in managers of small works in England. At any rate, he could vouch for their possession by the managers of small works in Ireland. The paper showed such remarkable faculty on the part of the writer in giving information which furnished no opportunity of definite criticism, that it reminded one of the conjurer who, having performed a good trick, proceeded to show how it was done, and left the audience more mystified at the end than they were at the beginning. There was really nothing to criticize in such details of the working as the paper had disclosed. But the author was particularly happy in being able to do without cleaning his producer for six months at a time. Getting more than 12,000 cubic feet of gas per ton, and 8200 cubic feet per mouthpiece from retorts of small dimensions, was distinctly good. He trusted Mr. Ward might be able, in his reply, to give some hints as to how this was accomplished; and that he would say what was the life of his retorts and the calorific value and illuminating power of the gas. In conclusion, he again congratulated the author on the excellent results he had obtained. Doubtless the example he had given them would encourage a spirit of emulation which would be productive of good results.

Mr. THOMAS BERRIDGE (Leamington) said he should like to congratulate Mr. Ward on the excellent results he had obtained. If he himself could do the same, it would mean a saving of £3000 a year on coal, and to a near neighbour, it would mean from £30,000 to £40,000 on the coal bill, so that he might congratulate him very heartily. That the quality of Mr. Ward's gas was all right, he could personally testify, because he had tested it. He agreed largely with what the author had said right through; but he did not think it was a good thing to have these amalgamations, if some financier was to step in and take a lot of profit out of it. There was one way in which it could be done, however. Many managers were also chairmen, directors, and consulting engineers of small works. He had some dozen under his own care; and he invariably made contracts for all of them, getting the same results, and the same prices as if the companies were amalgamated. If Mr. Ward would adopt modern improvements, he thought he would soon startle them with the results he obtained at Knowle—if he would have his mains without seals, fix a retort-house governor, admit 1 to 2 per cent. of air in his gas to save purification, and use a Leigh's automatic pressure arrangement. He quite agreed with the last speaker that Mr. Ward did not push his sales quite so much as he might do. He had no show-room. If he had a show-room, and gave more information about slot-installation and free fittings, he thought he would soon double his consumption.

Mr. C. S. ELLERY (Bath) said he should like to ask a question, so as to elicit if possible some information which would be very valuable. It had frequently been a puzzle to him, with regard to small works, as to what was the most economical setting of retorts. With regard to the remarkable results they had heard of at Knowle, he should like to know how many retorts Mr. Ward was using to each furnace. He had given the size of the retorts, but had not told them how many he had in each setting, and whether he had regenerative furnaces. He saw one line in the method in which he disposed of his gross profits, which perhaps might be part of the secret of his success. The one he referred to was "balance written off fittings installations." He thought he saw from this, and from the further statement as to the

capital per million cubic feet of gas, that Mr. Ward seemed to be fully alive to the necessity of letting the revenue account bear its proper burden each year. Small works frequently made the mistake of putting as much to capital as possible. What they saw here seemed to him to show that the author had learnt that the secret of success was to make revenue bear as much of the burden as possible. He congratulated Mr. Ward highly, not only on his interesting paper, but also on the admirable results it indicated.

Mr. R. W. EDWARDS (Aldershot) also congratulated the writer on the results he had obtained, but thought they did not bear out his suggestion that amalgamation was a desirable thing. If small gas-works could obtain such excellent results as he did, there was no need to amalgamate. Following out the question asked by Mr. Ellery, he would like to know the quality of the gas and the burner by which the gas was tested.

Mr. S. O. STEPHENSON (Tipton) said if any great advantage was to be gained by the amalgamation of small neighbouring works, it was more in the concentration of manufacture at one centre rather than in retaining all the small works going. Mr. Ward was to be congratulated on his results; and he agreed with what Mr. Berridge said, that rather than require the manager of one of these small works to have exceptional engineering knowledge, which he did not think was necessary, he would be better occupied in attending to the business side of the undertaking. This was much more important than for a small manager to be able to undertake extensions.

Mr. WARD, in reply, said he was not used to public speaking. If he had such a flow of eloquence as the gentleman from Ireland, he should be perfectly happy; but, unfortunately, he had not. When his paper was first written, it was rather longer than it was now. The Council thought fit to send it back to him to curtail; and he had had to cut out a lot of the matter which the gentleman from Ireland had expressed a desire to see. Consequently, they had a very much abbreviated paper, which was practically a record of what had happened at Knowle. Mr. Reid had asked why he did not take up the subject of the sales of gas. This was the reason—that a good deal of his paper had been cut out. He did look after the gas distribution. He did the whole of the fitting work himself; and, as a matter of fact, they made a profit of £30 last year on distribution. The Company did 95 per cent. of the fitting work at Knowle. Of course, they were close to Birmingham, and the people were largely Birmingham people. This was one reason why they had no show-room. If they had one, the people would not buy from them. What they preferred to do was to go to Birmingham and select the fittings, and then bring them over, and have them fitted up by the Company. In regard to the Irish gas managers, they were somewhat differently fixed there from what he suggested should take place in England. He referred to gas-works not sufficiently close together to be linked up by mains, but sufficiently close to be dealt with by one engineer. With regard to the calorific value of the gas, he might say that the net result averaged about 530 B.Th.U. As to the illuminating power, he took very little notice of this, because they were a non-statutory Company. So far they had not provided themselves with a proper bar apparatus or a table photometer. He worked entirely by the jet; and he was surely not foolish enough to alienate his customers by giving them what they did not want. He gave them something they were contented with, and on these lines he was satisfied to continue. He could tell readily if the calorific value was good or not, because he had a gas-engine which worked directly off the distributing main as it left the holder; and this quickly informed him if the calorific value was not right. As a rule, it seldom varied, because they took very great precautions to watch the pull. When he put in a charge in the retorts, he did not work in the ordinary fashion. It was customary to split the charge up, and keep a man charging all the while. But they did not do this. They put in a full charge, and put the pull on rather heavily at the commencement; and it was gradually decreased during the whole charge. By this means, they maintained the same pull all the way through. He had to work all the gas into a heavy holder, and distribute it out of another for mixing purposes. Mr. Berridge thought he would do better if he put in a retort-house governor. He had quite an open mind about this; but so far he had not seen the necessity, because the gauge on the hydraulic was practically level—there was no oscillation at all. By working the gas-engine fast, they

were able to get a very steady gauge indeed. His retorts were five in a bed. This was a good thing for feeding the producers; but beyond that he did not like it. He should much prefer to have four in a bed, and have them somewhat higher. The bottom retorts did not get so hot as the top ones; and, whenever he had an opportunity, he put the bottom retorts out of action, and only used the top ones. With regard to the gross profits, they went in for fitting installations in small houses. They had altogether about 150; and they had wiped off the total cost of these installations in about three or four years.

REPORT OF CARBONIZATION COMMITTEE.

The Sub-Committee having in hand the investigation of the various methods of carbonization—Messrs. Charles Carpenter (Chairman), Edward Allen, J. Ferguson Bell, A. E. Broadberry, Thomas Glover, W. Langford, John W. Morrison, Alexander Wilson, and S. Y. Shoubridge (Hon. Secretary)—report that they have been disappointed in their endeavours to arrange for a comparative test, made as far as possible under identical conditions, of the three best known systems of vertical retorts, difficulties having arisen which necessitated the abandonment of the project. One of the members of the Committee has, however, furnished the details of an investigation into the working of horizontal retorts with full charges; and this communication will, it is thought, form a valuable supplement to the paper he contributed last year to the Institution's "Proceedings." The particulars of this investigation will be presented at the forthcoming meeting of the Institution.

Investigations with Respect to Carbonizing in Horizontal Retorts.

By J. Ferguson Bell, M.Inst.C.E., of Derby.

The importance of working horizontal retorts to obtain the best results, both in respect to the gaseous, liquid, and solid products obtainable from the coal carbonized, and so as to achieve comparative results, led the author to carry out a week's trial under ordinary working conditions with Derbyshire gas coal of average quality—the fine slack only being removed. Arrangements had previously been made with the colliery for exactly similar coal (Derbyshire Blackshale, an analysis of same being given in Table I.) to be supplied during these trials at the Litchurch Gas-Works, Derby. In No. 1 retort-house, the period of carbonization was twelve hours' duration, and in No. 2 retort-house eight hours.

TABLE I.—Composition of Derbyshire Black Shale Coal Used During Week's Trial.

| Sp. gr., 1·374. | | Per Cent. Wt. | |
|-----------------------|--|---------------|--|
| Carbon | | 72·22 | |
| Hydrogen | | 4·75 | |
| Nitrogen | | 1·35 | |
| Sulphur (volatile) | | 2·31 | |
| Ash | | 7·51 | |
| Moisture | | 4·49 | |
| Oxygen by difference | | 7·36 | |
| | | Per Cent. | |
| Total sulphur in coal | | 2·43 | |
| Volatile matter | | 33·98 | |

Analysis of Coke Produced.

| | | Sp. Gr. | Carbon. | Volatile Matter. | Total Sulphur. | Ash. | Moisture. |
|--------------------|----------------|---------|---------|------------------|----------------|-------|-----------|
| No. 1 retort house | 12 hr. charges | 1·59 | 84·82 | 1·838 | 2·78 | 10·34 | 0·664 |
| No. 2 retort house | 8 " " | 1·63 | 84·05 | 1·021 | 2·415 | 10·11 | 0·629 |

In both houses the tests were carried on simultaneously (March 17 to 24, 1910), and the conditions as far as possible were similar in respect to the method of charging and the heat of the retorts; the only difference being the weight of charge and the period of carbonization.

The gas made (corrected to 30 inches bar., 60° Fahr.), illuminating power ascertained by the No. 2 Metropolitan test-burner, impurities, and calorific value were taken every two hours during the trials; and, in addition, average samples of purified gas were taken for analysis at the rate of $\frac{1}{2}$ cubic foot per hour into a 10 cubic feet capacity test holder—a sample of the mixed gas being drawn therefrom into gas sample tubes to ascertain its composition. The temperatures of the retorts just before charging and in the combustion chambers of the settings were taken periodically by a Féry spiral pyrometer.

In No. 1 retort-house the settings are eights, three tiers, \square section, 22 inches by 16 inches by 18 feet through, heated by Klönne regenerator furnaces with light hydraulic seals on the dip-pipes; and in No. 2 house the retorts are of similar size and section, set in four tiers, Klönne regenerators, with anti-dip pipes. Carpenter's retort-house governors control the suction on the hydraulic mains in both the houses. Care was taken to ensure zero pressure as near as possible on the inside of the retorts during the trial.

The gases from Nos. 1 and 2 retort-houses were kept separate, and purified by oxide only—being previously passed through Livesey tower and rotary washers.

TABLE II.—Summary of Results Obtained from a Seven Days' Trial (March 17 to 24, 1910), of Derbyshire (Blackshale Seam) Gas Coal, Fine Slack only Removed, Carbonized by Charges of Eight and Twelve Hours' Duration.

| | No. 1 House 12 Hour Charges. | No. 2 House 8 Hour Charges. |
|--|---------------------------------|--------------------------------|
| | Cub. Ft. | Cub. Ft. |
| Total quantity of gas made (corrected 30 inch bar. and 60 Fahr.) | 3,585,100 | 8,881,900 |
| Total quantity of coal used | 296 tons 10 cwt. | 751 tons 8 cwt. |
| Average weight of coal per charge | 12 cwt. | 8·21 cwt. |
| " duration of charge | 12 hours | 8 hours |
| Gas made per ton of coal (30 inch bar. and 60 Fahr.) | 12,091 cub. ft. | 11,820 cub. ft. |
| Illuminating power (No. 2 Metropolitan burner) | 15·56 c.p. | 16·29 c.p. |
| Sperm value per ton of coal | 645 lbs. | 660 lbs. |
| Calorific value of gas per cub. ft. gross. | 608·2 B.Th.U. | 586·8 B.Th.U. |
| Do. nett | 554·6 " | 530·4 " |
| CO ₂ in crude gas per 100 cub. ft. | 2·5 per cent. | 2·4 per cent. |
| SH ₂ Do. | 1040 grains | 933 grains |
| CS ₂ Do. | 65·9 " | 57·3 " |
| Total coke sold—large screened | 139 tons 7 cwt. | 334 tons 11 cwt. |
| Do. small | 36 tons 13 cwt. | 111 tons 4 cwt. |
| Do. breeze | 11 tons 13 cwt. | 27 tons 16 cwt. |
| Coke made for sale per ton of coal, large screened | 9·40 cwt. | 8·90 cwt. |
| Coke made for sale per ton of coal, small screened | 2·47 cwt. | 2·96 cwt. |
| Coke made for sale per ton of coal, breeze | 0·78 cwt. | 0·74 cwt. |
| Coke used on furnaces per ton of coal | 1·60 cwt. | 1·65 cwt. |
| Do. 100 lbs. of coal | 8·00 lbs. | 8·25 lbs. |
| Total quantity of tar made | 3579 gallons | 7840 gallons |
| Tar made per ton of coal | 12·07 " | 10·43 " |
| Average sp. gr. of tar (water 1·000) | 1·156 | 1·189 |
| Total quantity of ammoniacal liquor made 5° Tw. | 10,536 gallons | 25,459 gallons |
| Ammoniacal liquor made per ton of coal 5° Tw. | 35·53 " | 33·88 " |
| NH ₃ in lbs. of sulphate of ammonia | 29·89 lbs. | 28 50 lbs. |

* The coke and breeze contained an average of 6·56 per cent. of water, the bulk of which was in the small coke and breeze.

The comparative results given in Table II. conclusively indicate, so far as the residual products—coke, tar, and ammonia—are concerned, that there is a decided improvement in their production, which confirms the results given by the author in the paper read before the Institution in June, 1909.

The coke is somewhat harder, and the proportion of large screened is greater. The colour is improved, being silvery grey. The fracture in the filled retorts is radially from the centre outwards—something similar to that from coke-ovens. Coke analyses of eight and twelve hour charges are given in Table I.

To accurately ascertain the exact quantity of coke made, certain charges were pushed out into a rectangular iron vessel with an air-tight lid. The hot coke was cooled by spraying water on the outside of the vessel. It was found that this method of cooling the coke effected a decided improvement in its appearance, and there was less breeze made than when it was quenched in the ordinary manner.

There is a decided increase in the quantity of tar, which is thinner. Later, the author will probably supplement the figures with distillation tests of the tars produced.

The production of ammonia shows a decided increase—the production being, for twelve-hour charges, nearly 30 lbs. of sulphate per ton of coal carbonized. The nitrogen in the coal used averaged 1·355 per cent. by the Kjeldahl-Gunning method of estimation; so if the whole of the nitrogen could be converted into ammonia (NH₃) the theoretical yield of ammonium sulphate, (NH₄)₂SO₄, would be 143 lbs. per ton of coal carbonized. This is, of course, impossible, as 35 to 40 per cent. or more of total nitrogen in the coal remains behind in the coke, and also part of the free nitrogen in the gas comes from dissociation of the ammonia.

The sperm value is higher than the figures given in the author's paper on this subject last year. It will be noticed that they are almost the same for both the eight and twelve hour tests.

Although the sperm value is slightly lower for the longer charges, yet the calorific value is higher, indicating that the illuminating power and calorific value do not bear a strict relation to each other.

The sulphuretted hydrogen and carbon bisulphide are both somewhat higher in these tests for the heavier and longer charges, which is contrary to that experienced in other similar tests. The carbonic acid, on the other hand, is practically the same in each—being 2·4 and 2·5 per cent. by volume respectively.

TABLE III.—Analysis of Gases—Sample Taken at the Rate of $\frac{1}{2}$ Cubic Foot per Hour into a 10 Cubic Feet Test Holder.

| COMPOSITION OF GAS. | | | |
|---|---|--|----|
| | No. 1 Retort-House. Twelve-Hour Charges. | No. 2 Retort-House. Eight-Hour Charges. | |
| Carbon dioxide | 2'20 | 2'60 | .. |
| Illuminants. | 3'80 | 3'30 | .. |
| Oxygen | 0'30 | 0'30 | .. |
| Carbon monoxide. | 5'60 | 5'20 | .. |
| Methane | 32'90 | 34'00 | .. |
| Hydrogen | 48'60 | 43'50 | .. |
| Nitrogen (by difference) | 6'60 | 11'10 | .. |
| | 100'00 | 100'00 | .. |
| Calculated calorific value from com- position of gases | B.Th.U. 567'6 | B.Th.U. 550'2 | .. |
| Average of tests by Junkers calori- meter made during collection of samples | 566'0 | 515'2 | .. |

In Table III. is given the average composition of the gases obtained. The author was somewhat surprised to find the percentage of nitrogen so much in each, especially as the carbonic acid is quite normal. The nitrogen being obtained by difference may account to some extent for the higher figure.

It is of interest to note that the net calorific value of the gases ascertained by calculation from its composition and that obtained by Junkers calorimeter are—especially in the heavier twelve-hour charges—almost in agreement.

The mean average temperatures of the retorts in both houses taken (just before charging) by a Féry spiral pyrometer, it will be seen are almost identical; being in No. 1 house, 995° C., and in No. 2 house, 986° C., which is moderately high. See Table IV.

TABLE IV.—Temperatures of Retorts and Combustion Chambers Obtained by Féry Spiral Pyrometer.

| Average Retort Temperatures in No. 1 Retort-House. | | | |
|--|----------------------|------------------------|----|
| Twelve-Hour Charges. | | | |
| Retorts. | Degrees C. | No. of Readings Taken. | |
| A) Top row | 970 | 13 | .. |
| B) | 960 | 17 | .. |
| C) | 988 | 14 | .. |
| D) | 1010 | 5 | .. |
| E) Middle row | 1034 | 9 | .. |
| F) | 1026 | 5 | .. |
| G) Bottom row | 995 | 8 | .. |
| H) | 975 | 7 | .. |
| | 8)7958 | 78 | .. |
| | 995 mean average. | — | .. |
| Combustion Chamber. | | | |
| Setting No. 1 | 1230° C. | | |
| " 2 | 1375 " | | |
| " 10 | 1335 " | | |
| " 11 | 1340 " | | |
| " 12 | 1320 " | | |
| " 13 | 1395 " | | |
| | 6)7995 | | |
| | 1332'5 mean average. | | |
| No. 2 Retort-House. | | | |
| Eight-Hour Charges. | | | |
| Retorts. | Degrees C. | No. of Readings Taken. | |
| A) Top row | 1000 | 40 | .. |
| B) | 1041 | 11 | .. |
| C) | 981 | 26 | .. |
| D) Third row | 1004 | 32 | .. |
| E) | 972 | 11 | .. |
| F) Second row | 954 | 85 | .. |
| G) | 976 | 11 | .. |
| H) Bottom row | 961 | 43 | .. |
| | 8)7889 | 259 | .. |
| | 986 mean average. | — | .. |

The following are supplementary notes by Mr. BELL.
It is by the courtesy of the Carbonizing Committee that the results of the recent investigation into the working of horizontal retorts with full charges are placed before the members; and they may perhaps be of interest as a supplement to the paper the author had the privilege of contributing to the Institution last year.

Before the advent of incandescent burners, flame luminosity was of much greater importance than it is to-day; hence the production of gas of high illuminating power was then of primary consideration. To this end, thin charges quickly burnt off were found to give the results desired. However, the conditions regarding the supply of town's gas have during the last few years undergone a considerable change. Flame luminosity is of much less importance; and the problem now is to supply the greatest number of heat units, at the lowest possible cost, in such a form as is most suitable for the requirements of consumers who use in increasing quantities gaseous fuel for light, heat, and power. No doubt one of the essential conditions of efficient carbonization is the production of as large a quantity of gas as possible—due consideration being given to other factors—of a reasonable candle power, nowadays generally found suitable and satisfactory to consumers when it is from 14 to 17 candles, tested by the "Metropolitan" No. 2 burner, and of a calorific value of (say) 500 to 550 B.Th.U. net per cubic foot. This does not mean an attenuated, weak, or diluent mixture containing a high percentage of useless and harmful non-combustible gases.

The investigations carried out by the author strengthen and confirm the belief that, under the changed conditions briefly referred to, many advantages are obtainable by carbonizing in filled retorts with a longer period of distillation. There is a decided increase in the quantity of gas evolved, though the flame luminosity is somewhat lower. But there is a much less proportionate reduction in the calorific value of the gas than in the candle power.

Referring to Table II., which is a summary of the results obtained from a seven days' continuous trial under ordinary working conditions with Derbyshire gas coal (Blackshale seam), there will be seen the make of gas and its illuminating power taken every half hour, and comprising 336 observations and tests. The calorific value and impurities are the average of 84 tests, taken alternately each hour on No. 1 and No. 2 retort-house gas at the Litchurch works. It is of interest to observe that similar coal, with heavier charges and a lengthened period of distillation, gave 12,091 cubic feet of gas of 15·5-candle power, with a calorific value of 554 B.Th.U., whereas with lighter charges and shortened period of distillation, the gas made was 11,820 cubic feet of 16·29-candle power—being approximately three-quarters of a candle power less. But the calorific value is lower; being 530 B.Th.U., compared with 554 B.Th.U. net for the higher quality gas. These results confirm those obtained by others working in the same direction; and they indicate that there is no strict relation between candle power and calorific value, even when the former is ascertained by the "Metropolitan" No. 2 test-burner, which deals fairly with gases of varying candle power.

The author is indebted to Dr. Colman for pointing out, since the issue of the report, that the calculations of calorific values, as ascertained from analyses of the gases, do not agree with those given in Table II.; and that the figures in Table III. appear to be too high by about 7 per cent. A test for aqueous vapour contained in the gas supplied to the town at a temperature of 22° C. gave 1·95 per cent. by volume. Dr. Colman has been good enough to supply the figures from the results of some recent investigations in respect of the calorific values of various gases per cubic foot measured moist at 60° Fahr. and 30 inches of the barometer; these being the conditions to which the gas is corrected in direct estimation by the calorimeter.* From this it would appear that the calculated calorific values from the composition of gases do not quite agree with those actually obtained, and given in Table III., which are the average results of 84 tests by the Junkers calorimeter. The analysis of the composition of the gas obtained from No. 1 and No. 2 retort-houses is the average of three tests of samples taken at the rate of half a cubic foot per hour into the 10 cubic feet test holder on alternate days; the samples being drawn from same into gas sample tubes, which later were analyzed by the Orsat gas apparatus.

* See ante, p. 832.

The sampling and testing of gases, although done by an experienced chemist, are difficult matters; and one need not be surprised if the results are not strictly in agreement. The value of investigation work appears to the author to be to give those actually obtained, while discarding results that are obviously inaccurate. Dr. Colman gave on the preceding day the results of his latest investigations in respect of the calorific value of moist gases at 60° Fahr. and 30 inches barometer.

The complex organic compounds which form coal are broken up by the heat prevailing in the interior of the retorts; and during the first few hours of distillation more active gasification takes place, due to the decomposition of the more volatile hydrocarbon matters into gases more or less stable in accordance with the temperature employed. Generally speaking, the higher the temperature that prevails, within reasonable limits, the more completely will those gaseous products first evolved be converted into permanent gases. The destructive decomposition of coal in a hot retort is most complex, and requires further scientific investigation. The gases evolved, and more especially the hydrocarbon series, are split up, and new combinations are formed. These again vary by mutual affinities and reactions of the products, producing an almost endless variety.

Contact for longer or shorter periods with the highly heated surfaces of the retorts plays a most important part; and it is now recognized that prolonged contact is generally attended with injurious results. There is good reason to believe, so far as the production of ammonia is concerned, that the shorter the period of contact with the heated surface of the retort, the less will this valuable bye-product be decomposed; and with filled retorts there is an increase in the production of ammonia, and also a decided increase in the quantity of tar, which is lighter and more liquid.

As regards impurities, sulphuretted hydrogen is so easily and cheaply eliminated by oxide purification that little importance need be attached to its presence in the crude gas; but it is otherwise in respect to bisulphide of carbon, which is a most troublesome and costly impurity to remove. All desire to send out gas containing as little sulphur impurity as possible; and, from observation, the author is inclined to the belief that high heats with more drastic carbonization do not materially affect its production. But there is no doubt that coal containing a high percentage of sulphur means that the resulting gas will be high in sulphuretted hydrogen and bisulphide of carbon. By using a similar grade and kind of coal, but containing less pyrites, it has been found possible to reduce the bisulphide of carbon by more than half, working otherwise under exactly similar conditions. Much may be done by careful selection of the coal carbonized. Special emphasis should be laid on this—that all coal for gas making should be well cleaned from pyrites and other refuse.

All gas-works should, as far as possible, take the fullest advantage of their geographical position in respect to the coalfields. It has been found that, by carbonizing in filled retorts with a longer period of distillation, inferior grades of coal, which happen to be near, can be profitably used for gas making, which formerly were discarded in consequence of their inferiority in regard to coking properties, as by modifying carbonizing conditions a saleable coke can be produced. There is no doubt that more consideration is now being given to this most important of all bye-products of gas manufacture—the fixed residue of coal distillation that forms so large and valuable a product.

In the quenching of hot coke, an excessive quantity of water should be avoided; otherwise quality is deteriorated. It should be borne in mind that its inflammability depends to some extent on the moisture it contains, as well as its size and shape; and an excess of moisture further reduces its effective calorific value.

An extension of the time of distillation produces a harder and less friable coke. That which is in contact with the walls of the retort is hardest; and it gradually decreases in hardness towards the centre of the charge. The crumbling or friability is contingent on the hardness and closeness and size of the pores. It is always, of course, more or less porous in formation; the pores being the passages through which the volatile products issue.

It may be of interest to note that the temperatures given in Table IV.—average mean retort temperature of 995° C., and the combustion chambers temperature of 1332° C.—are both between 5 and 6 per cent. higher than the mean of the maximum and minimum temperatures given early in the report of the Committee on Refractory Materials.

EXPERIMENTS IN CARBONIZATION ON THE BIRMINGHAM COAL TEST PLANT.

By WILLIAM B. DAVIDSON, D.Sc., of Birmingham.

The coal test plant erected on the Sattley works of the City of Birmingham gas undertaking has now been in operation for five years. The installation was described in the "JOURNAL OF GAS LIGHTING" for June 27, 1905.

BRIEF DESCRIPTION OF THE PLANT.

It may be well, however, to briefly recount the leading features of the plant. The retort-house contains four of Waddell's regenerator settings, each comprising six retorts, set in three tiers. The retorts are of \square section, 21 inches by 15 inches, by 20 feet long, and they carbonize, at the high temperatures now employed, 26 cwt. of coal per 24 hours. Only three beds are kept simultaneously at work; and thus the coal carbonized per day approximates 24 tons. The plant is a complete gas-works in itself, and is provided with all necessary apparatus placed in the following order of sequence: There are 6-inch ascension pipes on both sides of the bench, separate hydraulic main to each bed, fitted with Helps's patent anti-dip, retort-house governor, foul main, annular air condensers, water condensers, two rotary exhausters driven by gas-engines, Livesey washer, Holmes' rotary-brush ammonia washer, four purifiers of Green's luteless type, station meter, holder (capacity 240,000 cubic feet), and district governor.

The hydraulic main is fed with liquor from a tank situate above the retort-bench; and a tar tower is used to regulate the seal. Tar and liquor are stored in two underground wells, and measured for sale in two overhead tanks—one reserved for tar and one for liquor.

The regenerators consist of three rows (instead of the usual four) of Waddell's patent tubes; so that the fuel consumption is comparatively high. On either side of the retort-bench, and on the same level as the charging floor, are eight bins or stores, each capable of holding about 20 tons of coal. Seven of these are used to store separate truck loads of coal, which is elevated to the charging-floor in small tip-waggon by hydraulic lifts. One bin is reserved for coke picked from the clinker. Charging, it should be mentioned, is done by shovel.

DEFECTS OF PLANT AND REMEDIES.

On starting the plant a number of defects became manifest. It may be worth while to mention the more serious of these, and the remedies adopted.

1. The retorts were very imperfectly heated. In particular, the bottom retorts were 300° to 400° Fahr. lower in temperature than the top retorts, even when the charges were graduated to give the lowest tier a better chance of gaining in temperature. The first step taken as a remedy was to cut small ports, about 2 inches long, in the spot course between the middle and bottom retorts, and to cut away some of the silica work. This improved matters considerably, but did not tend towards economy of fuel. Eventually, two years ago, the furnace arches and ash pans were lowered some 6 inches, and the furnace itself was modified, whereby the defect was entirely overcome. At the same time, distinct economy in fuel and greater uniformity of heating were effected.

2. The condensers, washers, and purifiers proved to be of unsuitable size during both the height of summer and the depth of winter. This is a natural difficulty with a small installation. It was particularly bad in winter when the temperatures at the outlet of the air condensers and the outlet of the purifiers on occasions fell as low as 36° Fahr.—thus seriously affecting the tests, while in summer tar was carried forward to the ammonia washer. To secure more uniform temperatures, the condensers and washers were enclosed in wooden sheds fitted with folding shutters. The appliances are thus protected from the extreme cold of winter and from the sun's rays in summer; and the results of tests are now comparable all the year round. A further improvement was brought about by the introduction of closed steam into the purifier boxes; but this was an alteration that mainly affected the efficiency of the oxide.

3. It had been intended to use the holder for collecting a day's make of gas for testing, and then to deliver it to the district. This was an unsatisfactory method of testing, and therefore a small holder of 300 cubic feet capacity was provided for the purpose of collecting samples of the gas made every shift.

4. The pressure in the hydraulic main was subject to considerable fluctuation, and a retort-house governor was accordingly installed.

Many minor additions and alterations were found advantageous; but it would be of little interest at the present time to enumerate these.

It is only fair to state that no serious blame is to be attached to the contractors, who were only too anxious to fulfil their contract, and bring the plant into as perfect a condition as possible.

Considerable delay was experienced in coming to a decision with regard to these alterations, and the plant was further handicapped for the first year of its existence by lack of efficient supervision. It will thus be readily understood that two years elapsed before what might be termed first-class results were obtained in the carbonization of the numerous coals submitted to test.

A comparison of the yields obtained from coals tested in 1906 with those obtained from the same kind of coal in 1910 will serve to indicate the progress that has been made. The figures are averages of two tests in each case.

| Date of Test. | Coal Carbonized per Retort per Day. Cwt. | Retort Temp. | Yield of Gas per Ton. Cub. Ft. | I.P. Candles. | Mul- tiple. | Fuel, Per Cent. |
|-------------------------------------|---|-----------------|---|------------------|-------------------------------|-----------------------|
| Coal A. February and March, 1906 | 22·7 | 1630° F. | 10,350 | 14·97 | 154,900 | 17·0 |
| " " March, 1910 | 26·0 | 1910° " | 11,710 | 15·36 | 179,900 | 18·0 |
| Increase in multiple | = 16 p. ct. | | | | | |
| | | | | | per ton of coal = 13·0 p. ct. | |

| | | | | | | |
|---------------------------------------|------|----------|---|-------|---------|------|
| Coal B. February and May, 1906 | 23°0 | 1630° F. | 10,500 | 14'85 | 155,900 | 18'0 |
| " " Dec., 1909, and February, 1910 | 25'9 | 1900° " | 11,320 | 15'83 | 179,200 | 17'7 |
| Increase in multiple = 15 p. ct. | | | Decrease in carbonizing wages = 11'0 p. ct. | | | |

The improvement is indicated in a general way by the results of the year's working—

| | |
|---|-----------------|
| Gas made per ton reduced to the 16-candle basis, 1905-6 | 10,530 |
| " | 1908-9 . 12,180 |
| Increase | 15½ per cent. |

The net result of the improvement in carbonization, combined with certain other economies of labour, was a saving of over 30 per cent. in the wages per 1000 cubic feet, and this without the addition of any labour-saving machinery.

COMPARATIVE ADVANTAGES AND DISADVANTAGES OF LARGE AND SMALL TEST PLANTS.

For a number of years prior to the inauguration of coal-testing on a manufacturing scale, almost continuous use was made of separate small test plants—one at Saltley and one at Windsor Street works. In one installation, iron retorts were used and clay in the other—taking a charge of 56 lbs. The retort temperature was maintained as nearly as possible at 1620° Fahr.; temperatures much higher than this soon ruined an iron retort. The coke was drawn and weighed in the hot, dry state, when the evolution of gas dwindled down to a rate of less than one cubic foot in five minutes. The gas was collected in a holder of 300 cubic feet capacity, whence it was conveyed to the photometer for testing.

The carbonizing tests were always done in duplicate. If the two results differed by more than 5 per cent. (a by no means uncommon occurrence), a third test had to be made. On the average, the gas multiples thus obtained were in those days considerably higher than works multiples; and, in fact, it was usual to make an allowance of 15 per cent. in favour of the latter.

An unsatisfactory feature was the want of uniformity of the test-plant records. The monthly tests showed very marked variation; and in the light of more recent experience one would be safe in saying that the coal agents were sometimes taken to task for inferior quality when no such deterioration existed. On several occasions, coal sent to the large test plant from the other works of the department, as being much below standard, showed no deterioration in value or even a slight increase.

The following two examples illustrate the degree of variability referred to, the coals compared being the same in both cases:—

| SMALL PLANT. | | LARGE PLANT. | |
|----------------------------|-----------|----------------|-----------|
| Weight carbonized, 56 lbs. | | About 60 tons. | |
| | Multiple. | | Multiple. |
| February, 1904 | 178 | April, 1909 | 206 |
| March .. | 170 | July .. | 206 |
| April .. | 148 | October .. | 206 |
| December .. | 173 | November .. | 204 |
| February, 1905 | 177 | January, 1910 | 195 |
| Average . | 169 | Average . | 203 |

Coal "D."

| | | | |
|-------------------------|-----|-------------------------|-----|
| January, 1906 | 171 | January, 1909 | 197 |
| " " " " " " " " | 181 | February " " " " " " | 197 |
| February " " " " " " | 185 | May " " " " " " | 199 |
| " " " " " " " " | 197 | November " " " " " " | 200 |
| March " " " " " " | 193 | March, 1910 | 195 |
| April " " " " " " | 188 | | |
| | | | |
| Average | 186 | Average | 198 |

(Difference = + 7 per cent.)

It may here be stated that the carbonizing results of more recent tests on the large scale greatly exceed those of the small plant in the majority of cases. A few coals show close agreement, while the small plant is superior in only two or three instances. On the other hand, there is concordance in the determinations of total coke made (dry basis). The following are comparative figures:—

Coal "E."

| SMALL PLANT. | | LARGE PLANT. | |
|----------------|--------------------------------|--------------------------------|--------------------------------|
| | Total Coke (Dry). Per Cent. | | Total Coke (Dry). Per Cent. |
| February, 1904 | 65·5 | April, 1909 | 66·7 |
| March " | 65·5 | July " | 66·0 |
| April " | 66·0 | October " | 66·5 |
| December " | 65·0 | November " | 65·6 |
| February, 1905 | 65·0 | January, 1910 | 66·2 |
| Average | 65·7 | Average | 66·2 |
| | | (Difference = + 0·8 per cent.) | |

Coal "F."

| SMALL PLANT. | | LARGE PLANT. | |
|-----------------------|--------------------------------|--------------------------------|--------------------------------|
| | Total Coke (Dry). Per Cent. | | Total Coke (Dry). Per Cent. |
| January, 1906 | 64·0 | January, 1909 | 64·7 |
| February „ | 64·3 | February „ | 64·7 |
| „ „ | 64·8 | May „ | 65·2 |
| March „ | 63·3 | November „ | 64·2 |
| April „ | 63·8 | March, 1910 | 64·1 |
| Average | 64·0 | Average | 64·6 |
| | | (Difference = + 0·9 per cent.) | |

With regard to liquor and tar, small-scale tests are, for obvious reasons, totally unreliable, and are therefore generally not attempted.

In the third edition of "Analyses of British Coals and Coke: A Guide to the Purchaser of Coal," many extraordinary returns are given. The weight of coal carbonized is carefully omitted (it is in all probability not more than 2.24 lbs.); but the other figures are usually elaborated in a wonderful manner—often to six significant digits or a would-be accuracy of one in 300,000, that is, 0.0003 per cent. And perhaps I may be allowed to take this opportunity of protesting against the indiscriminate use, in tests of this kind, of over-exact figures, which only serve to defeat their own ends and tend to bring the technical analyst into disrepute.

For purposes of comparison, I quote the results of two coal tests from the treatise referred to (after lopping off a few figures that have no significance), and place alongside them the average figures obtained from five tests carried out on a manufacturing scale on a total of over 300 tons of the same coals:—

Coal "G."

| | Make or Gas, | I.P. | Multiple. | Coke (Total). Per Cent. | Liquor Galls. | Tar Galls. |
|-------------|-----------------|-------|-----------|----------------------------|------------------|---------------|
| Test quoted | 12,100 | 21'26 | 257 | 61'9 | 16'4 (3° Tw.) | 15'2 |
| Bulk test | 11,450 | 17'75 | 203 | 66'0 | 33'6 (10 oz.) | 11'7 |

Coal "H."

| | | | | | | |
|--------------|--------|-------|-----|------|---------------|------|
| Test quoted. | 12,020 | 22'24 | 267 | 59'4 | 19'9 (3° Tw.) | 17'5 |
| Bulk test | 11,130 | 17'34 | 193 | 63'2 | 40'2 (10 oz.) | 11'3 |

It seems strange at first sight that laboratory carbonization tests of gas coals should be characterized by so great discrepancy and unreliability. It would not be profitable to discuss at length the causes that lead to inaccuracy; but the following might be mentioned: 1. Defective sampling of both coal and gas. 2. Inadequate means of nicely adjusting the pressure in the retort. 3. Erratic condensation of the tar, and consequent want of control over the illuminating power. 4. Dependence on one test (as a rule) for the candle power of the gas, and hence liability to inaccuracy due to errors of instrument, personal error, and weather conditions. 5. Inability to carbonize the coal at high temperatures. In all these respects the bulk tests on a properly equipped plant have the advantage over laboratory or small-scale tests.

USES OF THE BIRMINGHAM COAL TEST PLANT.

The large test plant was erected to supply complete and reliable information as to the true value of the different coals

that might be offered to the Department from time to time, and thus enable the Gas Committee to purchase to the best advantage. A second purpose was the carrying out of experiments to determine the best methods of carbonizing coals so as to reap the greatest commercial advantage possible. It was also to be used to check the quality of different consignments of coal, in order to ascertain if the standard was being maintained. Incidentally, the test-works forms a most useful training ground for the young gas engineer or gas-works chemist.

The test plant has been employed to standardize the gas multiple for each class of coal used on the five works of the undertaking. The standard multiples supplied are, wherever possible, the averages of the last five tests—each extending over at least three days, or preferably over one week, and are for this purpose calculated on a CO_2 -free basis. The gas multiples obtained each week by the several works are compared with the multiple estimated from the figures supplied by the coal-test plant; and the differences are shown as percentages \pm on a weekly abstract-sheet prepared for the use of the Gas Committee and the Engineers concerned. This system of comparison undoubtedly leads to friendly rivalry among the officers of the Department, and acts as a powerful stimulus to closer retort-house supervision.

The figures for total make of coke are also made use of so as to admit of a more accurate figure for fuel consumption for retorts being recorded on the works' weekly manufacturing report sheet. Formerly the percentage of total coke made was taken as 60 per cent.—a figure that is much too low.

Even under the best conditions, the testing of gas coals does not admit of a high degree of accuracy. This is no doubt due in chief measure to differences in the nature of the coal—such as percentage of moisture, bats, bastard cannel, &c., but also partly to inaccuracies of measurement and testing. Thus it is advisable to use the law of averages to eliminate errors of this kind by repetition of the tests from time to time. Some idea of the accuracy attainable on an illuminating power basis will be conveyed when I state that individual multiples obtained under standard conditions rarely deviate from the average by more than one to two per cent.

We have hitherto had only limited opportunity for purely experimental work in carbonization. Much of the research work is still incomplete, and several of the special tests already undertaken must be repeated before safe conclusions can be arrived at. This paper can, therefore, only deal with certain phases of carbonization, and that only in broad outline.

VALUATION OF GAS COALS.

As judgment must be pronounced on the results, primarily at any rate, on a purely commercial standard, it will be necessary for me to give a brief sketch of the method and basis of testing and valuation.

METHOD OF TESTING.

Coal.—The net weight of coal put into store is ascertained by carefully weighing the railway waggons, full and empty, on a standardized weighing machine. The colliery weights serve as a check, and average slightly under 1 per cent. in excess (partly due to rain). At least 50 tons are required for a test; less than this quantity does not give trustworthy figures for liquor and tar. It is, of course, preferable to carbonize 140 tons—that is, a week's requirements; and this is done wherever possible. The truck-loads are transferred to separate bins in the retort-house. Any residue is re-weighed on small steelyard machines. A certain quantity (about 10 tons) is required for "blowing through" between tests. A description of the physical character of the coal is recorded, and the percentage of bats ascertained.

Coke.—The total yield of coke is determined day by day by weighing the charges for a top, middle, and bottom retort with special care at 10 a.m., and weighing the hot coke drawn from these retorts directly into waggons at 4 p.m. The bulk of the coke drawn from the retorts has a drop of about 12 feet on to the cellar floor, striking a shallow shoot on its way. It is there quenched, and picked up with shovels into small waggons and removed to the railway siding, where it is tipped. It is finally forked into railway trucks with twelve-tined forks ($1\frac{1}{2}$ inches between the prongs). The coke and unscreened breeze are loaded separately into trucks, which are carefully weighed. The percentage of unscreened breeze, which varies from 10 to 20 per cent., and averages about 17, is probably a fair criterion of the hardness of the

coke. Large samples of both coke and breeze are retained for the estimation of moisture, which is carried out in a gas cooker on a sample weighing about 5 lbs.

Coke is fed hot into the furnaces. The coke picked from the clinker is returned to the furnaces and the residual real clinker weighed. The difference between coke and breeze sold (estimated on the dry basis) and the total dry coke made, gives the figure for fuel consumption, which is fairly reliable so long as proper attention is paid to sampling and the determination of moisture. The moisture may vary from 2 to 15 per cent., according to the size of the coke and the method of quenching. Our average is about 4 per cent., and this is the basis used in calculating coke and breeze made for sale from the various coals.

Fuel consumption is one of the most difficult things to correctly gauge in large-scale working, on account of the difficulty of sampling.

When tests are made in a large retort-house, one bed of retorts is usually singled out. In all cases it is essential to maintain the working temperatures without altering the charges. It is an easy matter to get a low figure for fuel by using large charges and high temperatures, especially if no regard is paid to the make of gas per ton, the degree of "burning off" being judged by the eye.

On account of the large quantity of heat stored in the setting, and the consequent lag in the manifestation of the effect of alterations in fuel, charges, &c., the trustworthiness of the figures for fuel is dependent on the test being of sufficient duration.

The quality of the coke made for sale is described as A, B, or C, and the size as I., II., or III. Thus the best and largest coke is designated AI. The bats in a large sample are picked and recorded as a percentage.

Liquor and Tar.—Much difficulty was at first experienced in deriving trustworthy figures from the measurements of the liquor stocks, owing to the irregular shape of the wells, the uncertainty of dipping tests, and the errors introduced in measuring and sampling the contents of washers and other plant. Eventually, the following method was adopted as satisfactory. The various receptacles (including the hydraulic main, tar tower, retort-house tank, and washers) are run off to a well, where the tar and liquor are allowed to separate, and pumped up to the sales tanks to be carefully separated and measured. The receptacles are refilled with water as quickly as possible. Small leakages through cocks, &c., and volatilization losses must be avoided as much as possible; otherwise the yield of liquor is appreciably affected. Continuous quantitative tests are carried out to ascertain the ammonia passing the final washer. This usually amounts to no more than one grain per 100 cubic feet. Any larger amount than this is allowed for. The liquor is estimated on a basis of 10-oz. strength. The amount of tar is estimated under selling conditions—that is, containing 2 to 3 per cent. of liquor.

LABORATORY TESTS.

The collected samples of purified gas (seven hours' duration) are tested for illuminating power, calorific value, and carbon dioxide. A representative sample of the gas made during test is subjected to complete gas analysis and specific gravity test. Organic sulphur is determined continuously throughout the test. The crude gas at the inlet of the purifiers is analyzed daily for sulphuretted hydrogen, carbon dioxide, and oxygen. Cyanogen tests are made at the inlet of the Livesey washer.

Representative 4-cwt. samples of the coal are stored in bins. Small samples prepared therefrom are subjected to the usual laboratory tests for moisture, sulphur, ash, volatile matter, specific gravity, and (occasionally) elementary analysis of carbon, hydrogen, and nitrogen. Coke is analyzed for moisture, sulphur, ash, and calorific value—the last named by means of the calorimetric bomb.

It may be of interest to submit a tabular statement of the maximum, minimum, and average results obtained for the more important tests of a large number of Midland gas coals as delivered to the Birmingham test plant, the coke obtained therefrom, and the liquor, tar, and gas impurities as found at ordinary carbonizing temperatures.

| | | Maximum. | Minimum. | Average. |
|------------------|-------------|----------|----------|----------|
| Coal (unwashed)— | | | | |
| Moisture | per cent. . | 4.7 | 1.2 | 2.8 |
| Sulphur (total) | " " | 7.3 | 0.8 | 3.7 |
| Ash | " " | 8.4 | 2.0 | 4.6 |
| Volatile matter | " " | 43.7 | 26.7 | 31.8 |
| Bats | " " | 6.0 | 0.6 | 1.5 |

| | Maximum. | Minimum. | Average. |
|--|----------|----------|----------|
| Coke— | | | |
| Moisture | 15 | 2 | 4 |
| Sulphur (total) | 10.2 | 1.7 | 3.9 |
| Ash | 13.7 | 3.5 | 7.8 |
| Volatile matter | 8.6 | 1.6 | 4.4 |
| Bats | 6.4 | 0.7 | 2.1 |
| Make | 71 | 57 | 65.5 |
| Clinker | 8.4 | 1.7 | 3.7 |
| Calorific value B.Th.U. per lb. | 11,500 | 14,000 | 13,000 |
| Liquor— | | | |
| Per ton of coal, galls., 10 oz. | 40.0 | 23.0 | 33.5 |
| Tar— | | | |
| Per ton of coal, galls. | 15.8 | 9.8 | 11.8 |
| Gaseous impurities— | | | |
| Sulphur, grains per 100 cubic feet | 75 | 19 | 35 |
| H ₂ S per cent. by vol. | 2.60 | 0.95 | 1.50 |
| CO ₂ | 3.55 | 1.20 | 2.00 |
| HCN lbs. prussiate of soda per 10,000 cubic feet | 7.0 | 3.0 | 5.0 |

BASIS OF VALUATION.

The relative commercial values of gas coals are readily ascertained from a knowledge of the make and quality of the gas, the weight of coke made for sale, and the yield of liquor and tar, without considering too nicely the results of laboratory analyses of impurities. The following might be considered a fair basis of valuation per ton of coal, at any rate so far as Birmingham is concerned.

Gas.—The product of the yield per ton and the candle power, generally called the multiple, is the criterion of gas production. For a given coal the multiple is constant, or nearly so, within certain limits. Quantity and quality may vary somewhat, but the product should remain approximately the same. In Birmingham the quality supplied is about 16 candles. The make is therefore reduced to a basis of 16-candle gas, by dividing the multiple by 16, and rated at 12.5d. per 1000 cubic feet, a price arrived at by deducting from the average selling price the sum of manufacturing, wages, salaries, wear and tear, and distribution charges, and then reducing the remainder by the percentage of unaccounted-for gas. For each 1000 cubic feet of gas made above or below 11,000, the further sum of 2.5d. is added or subtracted as wages allowance. There is deducted 1d. as the cost of purification for each unit per cent. of sulphuretted hydrogen per 10,000 cubic feet. The weight carbonized per retort per day is usually constant; any appreciable difference is allowed for at the rate of 1.4d. per cwt. per day.

Coke.—The weights of coke and unscreened breeze sold are in the first place calculated on the dry basis. Then 4 per cent. is added for moisture. Coke is rated at 12s., and breeze at 7s. 6d. per ton. Seeing that the smaller and softer cokes find a ready sale for household purposes, differential prices for first and second class are not employed.

Liquor and Tar.—The price of liquor of 10-oz. strength is taken at 0.67d., and tar at 1.33d. per gallon; these being the actual average selling prices over a certain period.

The sum of the values for gas, coke, liquor, and tar is ascertained to the nearest penny. A cheap common coal is selected as a standard of cost price, and the gross values of the other coals are reduced to the terms of this figure to the nearest halfpenny. An example will serve to make the method clear.

Products per Ton.

| Coal. | Make Cu. Ft. | I.P. Candles. | Multiple on I.P. Basis. | Make Cu. Ft. 16 Candle Basis. | Coke Sold. | | Liquor Galls. 10 oz. | Tar Galls. | H ₂ S |
|-------------------|--------------|---------------|-------------------------|-------------------------------|------------|---------|----------------------|------------|------------------|
| | | | | | Coke. | Breeze. | | | |
| No. I. (Standard) | 11,700 | 16.55 | 194 | 12,125 | 7.69 | 1.53 | 36.1 | 11.9 | 1.56 |
| No. II. | 12,050 | 16.55 | 200 | 12,500 | 9.50 | 1.26 | 33.0 | 11.6 | 1.48 |

Values.

| Coal. | Gas. | Coke and Breeze. | Liquor. | Tar. | Deduction for Purification. | Gross Value. | Relative Value. |
|---------|----------|------------------|---------|---------|-----------------------------|---------------|-----------------|
| No. I. | d. 154.4 | d. 62.3 | d. 24.2 | d. 15.8 | d. 1.8 | £ s. d. 1 1 3 | s. d. 10 0 |
| No. II. | d. 160.1 | d. 74.1 | d. 22.1 | d. 15.4 | d. 1.8 | £ s. d. 1 2 6 | s. d. 10 7 |

Coal No. 2 is worth 7d. per ton more than No. 1. Its actual extra cost, it may be mentioned, was 18d.

A comparison made on lines similar to the above is of great assistance in the purchase of coal. It is hardly necessary to say, however, that it is not conclusive in every case.

Certain coals do not run well in inclined retorts, and others again may yield gas containing too high a percentage of sulphuretted hydrogen for limited purifying capacity, or an objectionable amount of organic sulphur. The quality of the coke is also an important consideration.

QUESTION OF STANDARD OF QUALITY OF GAS.

In Birmingham we are still labouring under the disability of the No. 1 argand test burner. Many of our coals have been tested under the conditions of the No. 2 "Metropolitan" burner for purposes of comparison, and having regard to the possible adoption of the new burner at some future date.

A few coals have been found to yield gas of over 17 candles with No. 1 burner, even at the highest temperatures, when working with level gauge.

It would be unfair to impose a multiple standard obtained in this way on a works using a coal of this kind without admixture of poorer coals; and, therefore, care is taken to reduce the pressure in the retorts so as to bring the candle power down below 16½ where necessary. This, as will be shown, lowers the multiple.

Carbonization tests on the large scale indicate a much greater uniformity in the calorific value multiple than is possible on a basis of illuminating power.

When the legal standard of candle power of town gas is reduced to 12 or 14 candles with the No. 2 burner, coals may be valued, so far as the yield of gas is concerned, on a basis of calorific value with (say) 500 B.Th.U. net as standard. Meanwhile the relation of calorific value to illuminating power is a vexed question. It is well known that the latter alters more rapidly than the former; in other words, a given percentage decrease in candle power is accompanied by a much smaller percentage decrease in heating value.

By considering the results of two years' testing of gas obtained from a large number of different coals, and taking the average, on the one hand, of all the tests ranging between 16.5 and 17.5 candles, and, on the other, of all the tests between 14.5 and 15.5 candles, together with their respective calorific values, I find that a decrease of 1 per cent. in the calorific value corresponds to a decrease of practically 2 per cent. in the illuminating power. This is the case with both No. 1 and No. 2 burners.

In this connection it is interesting to consider the effect of each of the main constituents of coal gas on both the illuminating power and the calorific value. On this subject, the information available in technical literature is both incomplete and incorrect, and I have therefore undertaken a series of laboratory experiments with the object of ascertaining the effect on candle power of admixtures of small quantities of different gaseous constituents. The effect on calorific value is already known. The approximate results are given in the following table, and apply alike to No. 2 and No. 1 argand burners used with full flame.

Effect of One per Cent. of Different Constituents on the Calorific Value and Illuminating Power of Coal Gas on a Basis of 540 B.Th.U. and 16 Candles.

| Constituent. | Calorific Value, Per Cent. | Illuminating Power, Per Cent. | Ratio. |
|--|----------------------------|-------------------------------|---|
| CO ₂ | - 1.0 | - 3.5 | 1 to 3.5 decrease. |
| O | - 1.0 | - 3.0 | 1 to 3.0 " |
| N | - 1.0 | - 2.6 | 1 to 2.6 " |
| Air | - 1.0 | - 2.7 | 1 to 2.7 " |
| CO | - 0.4 | - 0.9 | 1 to 2.3 " |
| H | - 0.5 | - 0.5 | 1 to 1.0 " |
| CH ₄ | + 0.8 | - 0.4 | Increase in calorific value = twice the decrease in illuminating power. |
| C ₂ H ₄ | + 1.8 | + 10.9 | |
| C ₆ H ₆ | + 6.0 | + 18.0 | |
| C ₁₀ H ₈ | + 10.5 | + 125 | |

NOTE.—Gas saturated with naphthalene vapour at 60° F. contains only 0.0085 per cent. by volume of this constituent. The increase in candle power due to this small amount is only 0.16 or 1 per cent.

The figures for carbon dioxide, oxygen, and nitrogen have been confirmed by experiments with the large test plant. It calls for remark, however, that in short trials the effect of the admission of air was not nearly so drastic as was indicated by laboratory tests. This was doubtless due mainly to the fact that the iron oxide underwent a large rise in temperature and threw off certain hydrocarbons—chiefly benzene—with which the water in the material had become saturated. In one instance, the admission of 3 per cent. of air appeared to effect no reduction at all on the multiple.

In experimenting with air it is, therefore, necessary to allow the plant to attain equilibrium before starting the test, and to prolong the trial.

It will be observed that the effect of an admixture of 1 per cent. of nitrogen reduces the candle power by about 2·6 per cent. As it is this ingredient that varies most of all in the composition of coal gas as manufactured in this country, and seeing that the effects of carbon dioxide, oxygen, carbon monoxide, and benzene have all nearly the same ratio, it follows from theoretical considerations that 2 per cent. reduction of illuminating power for 1 per cent. reduction of calorific value the result previously indicated is approximately what we should expect to find.

If the reduction in quality is due to the abandonment of lime purification, the ratio of fall in heating value to fall in candle power will be 1 : 3½. In varying the temperature of carbonization, the ratio will depend mainly on the alteration in the volumes of methane and hydrogen, and will be uncertain.

In the case of carburetted water gas, where the oil (and hence ethylene) and carbon dioxide are the most variable factors, we should expect to find a higher ratio. As a matter of fact, it is approximately 1 : 5.

GAS MANUFACTURED WITH VERTICAL RETORTS AT HIGH TEMPERATURE COMPARED WITH THE PRODUCT OF HORIZONTALS USING THE SAME COAL.

The divergence between the illuminating power and the calorific value standard is brought out in a marked degree when samples of coal gas yielded by two widely different systems of carbonization—such as horizontal retorts on the

one hand and vertical retorts on the other—are compared, as under—

Comparison of Gas from Vertical and Horizontal Retorts.

| | Verticals. | Horizontals. |
|---|------------|--------------|
| Illuminating power (with No. 2 burner) | 15·7 | 15·9 |
| Calorific value | 524 | 506 |
| Complete gas analysis—CO ₂ | 2·50 | 2·40 |
| O | 0·44 | 0·48 |
| C ₁₁ H ₂₂ n | 3·26 | 3·32 |
| CO | 11·80 | 10·50 |
| H | 51·5 | 46·3 |
| CH ₄ | 26·6 | 28·3 |
| N (by difference) | 3·9 | 8·7 |
| Temperature of bunsen flame (calculated from above) | 2185° C. | 2095° C. |

The difference in the respective percentages of methane, hydrogen, and nitrogen are noteworthy. One would be inclined to expect a large difference in candle power in favour of the gas from the vertical retorts, on account of the large diminution in nitrogen (4·8 per cent.). This would seem to be counteracted, in part, by the increase in hydrogen and decrease in methane; but it is probably largely accounted for by a deficiency in the benzene content.

EFFECT OF ALTERING PRESSURE IN THE RETORTS.

Nearly all the coals tested for valuation purposes have been carbonized at level-gauge. When this is done, it is found that, for the first two hours after charging, the pressure in the retort is positive, and varies from 0·1 inch to 0·2 inch. During the last two hours, the pressure varies from – 0·1 inch to – 0·2 inch, while it is only during the middle period that there is neither pressure nor vacuum. When retorts are in good condition, any considerable alteration of “pull”—say from level gauge to – 0·2 inch—effects

Effect of Alteration of Pressure in Retort.

| Coal. | Pressure in Retorts. | Make Cubic Feet per Ton. | I.P. | Multiple on I.P. Basis. | Difference + or – Per Cent. | C.V. B.Th.U. Nett. | Multiple on C.V. Basis. | Difference + or – Per Cent. | Gas Analysis. | | | |
|-------|----------------------|--------------------------|-------|-------------------------|-----------------------------|--------------------|-------------------------|-----------------------------|-------------------|-------------------|-----------|-----------|
| | | | | | | | | | H ₂ S. | CO ₂ . | O. | N. |
| | | | | | | | | | Per Cent. | Per Cent. | Per Cent. | Per Cent. |
| K | Level gauge | 11,610 | 14·80 | 172 | .. | .. | .. | .. | .. | .. | .. | .. |
| .. | + 0·1 in. | 11,370 | 14·80 | 168 | –2·3 | .. | .. | .. | .. | .. | .. | .. |
| L | Level gauge | 11,160 | 17·43 | 195 | .. | .. | .. | .. | 2·50 | 2·03 | 0·20 | 8·5 |
| .. | – 0·05 in. | 11,810 | 15·84 | 187 | –4·1 | .. | .. | .. | 1·98 | 2·45 | 0·50 | 11·0 |
| M | Level gauge | 11,130 | 16·35 | 182 | .. | 550 | 6120 | .. | 2·22 | 2·13 | 0·90 | 7·4 |
| .. | – 0·20 in. | 12,400 | 13·75 | 171 | –6·0 | 500 | 6210 | +1·5 | 2·48 | 3·02 | 1·58 | 13·2 |
| N | Level gauge | 12,290 | 15·31 | 188 | .. | 529 | 6500 | .. | 1·66 | 2·22 | 0·73 | 8·8 |
| .. | – 0·05 in. | 12,940 | 13·10 | 182 | –3·2 | 505 | 6540 | +0·6 | 1·50 | 2·67 | 0·75 | 11·9 |

only a slight increase in the yield of gas. When the retorts are leaky 2·10ths of “pull” may increase the make by 8 or 10 per cent. through the introduction of furnace gases. “Over-pulling” has also the effect of burning-out and loosening the retort carbon formed in the joints of the retorts, rendering them leaky, and causing the carbonizing system to be over-sensitive to alterations in pressure.

For the reason that they have fewer joints, moulded retorts are, in my opinion, to be preferred to segmented retorts, so long as the quality is up to standard.

Some results of the alteration in “pull” are shown in the above table.

Though the illuminating power multiple rapidly diminishes (the effect of increasing the proportions of nitrogen and carbon dioxide), the calorific value multiple, as might be expected, has a tendency to increase owing to lessening the risk of leakage of coal gas into the furnace setting and increasing the speed with which the gas comes off.

LOW-GRADE GAS.

Further experiments have been performed with the object of imitating the low-grade gas obtained from vertical retorts, with the results shown below.

Low-Grade Gas.

(Same coal throughout tests.)

| Make. | I.P. | | Multiple on I.P. Basis. | | C.V. | Multiple on C.V. Basis. | Gas Analysis. | | | | | | | |
|--------|---------------|---------------|-------------------------|---------------|------|-------------------------|---------------|-------------------|-------------------|------|----------------------------------|------|------|-------------------|
| | No. 1 Burner. | No. 2 Burner. | No. 1 Burner. | No. 2 Burner. | | | Crude Gas. | Purified Gas. | | | | | | |
| | | | | | | | | H ₂ S. | CO ₂ . | O. | C _n H _{2n} . | CO. | H. | CH ₄ . |
| 12,590 | 14'50 | 15'85 | 183 | 200 | 523 | 6590 | 1'87 | 2'42 | 0'74 | 3'29 | 10'05 | 45'3 | 26'8 | 11'40 |
| 12,940 | 13'10 | 14'35 | 170 | 186 | 505 | 6540 | 1'50 | 2'67 | 0'75 | 3'13 | 9'48 | 46'0 | 26'0 | 11'97 |
| 12,290 | 15'31 | 17'87 | 188 | 220 | 529 | 6500 | 1'66 | 2'22 | 0'73 | 3'33 | 9'69 | 45'0 | 31'0 | 8'03 |

EFFECT OF RETORT-HOUSE GOVERNOR WITH SEAL AND ANTI-DIP.

To ascertain the best method of working, different combinations of anti-dip, seal, and retort-house governor were tried, with the effects indicated on next page.

A light liquor seal of about half-an-inch gives us thus a distinct advantage over the anti-dip. This, no doubt, comes as a surprise to many. I believe most gas engineers are inclined to favour a dry main or anti-dip. I attribute the

loss caused by the type of anti-dip experimented with almost entirely to the circumstance that during the period of discharging and charging a retort (in our case nearly ten minutes every hour) the gas in all the remaining retorts in the bed is subjected to a pressure of at least ½-inch water gauge. The fault lies in the mechanical arrangements, which are such that sealing pressure can only be applied to the bed as a whole and not to single retorts, as in other types of anti-dip.

The gain in working with a governor and liquor seal is

Anti-Dip, with and without Retort-House Governor.

| | | Make. | I.P. No. 1 Argand. | Multiple. | Diff. + or - Per Cent. | C.V. | C.V. Multiple. | Diff. + or - Per Cent. |
|------------------|---------------|--------|--------------------------|-----------|------------------------------|------|-------------------|------------------------------|
| Coal O | With governor | 12,000 | 16.20 | 194,400 | | 543 | 6520 | |
| " " | Without " | 12,310 | 15.10 | 185,900 | + 4.6 | 526 | 6480 | + 0.6 |
| " P | With " | 12,030 | 14.89 | 179,100 | | 512 | 6160 | |
| " " | Without " | 11,810 | 14.89 | 175,900 | + 1.8 | 517 | 6100 | + 1.0 |
| " Q | With " | 11,500 | 15.63 | 179,700 | | 544 | 6250 | |
| " " | Without " | 11,610 | 14.89 | 172,900 | + 3.9 | 529 | 6140 | + 1.8 |
| " R | With " | 11,630 | 17.00 | 197,700 | | 558 | 6490 | |
| " " | Without " | 12,070 | 15.63 | 188,600 | + 4.8 | 528 | 6370 | + 1.9 |
| Average of tests | | | | | + 3.8 | | | + 1.3 |

Seal, with and without Retort-House Governor.

| — | | Make. | I.P. No. 1 Argand. | Multiple. | Diff. + or — Per Cent. | C.V. | C.V. Multiple. | Diff. + or — Per Cent. |
|----------------------------|---------------|--------|--------------------------|-----------|------------------------------|------|-------------------|------------------------------|
| Coal S | With governor | 11,730 | 16·86 | 197,800 | | 551 | 6470 | |
| " | Without " | 11,910 | 16·23 | 193,300 | + 2·3 | 541 | 6440 | + 0·5 |
| " T | With " | 11,350 | 17·45 | 198,100 | | 568 | 6450 | |
| " | Without " | 11,680 | 16·79 | 196,100 | + 1·0 | 556 | 6490 | — 0·6 |
| " U | With " | 12,230 | 16·74 | 204,700 | | 544 | 6650 | |
| " | Without " | 12,330 | 15·99 | 197,200 | + 3·8 | 539 | 6650 | + 0·0 |
| " V | With " | 11,030 | 16·91 | 186,500 | | 567 | 6250 | |
| " | Without " | 10,760 | 16·92 | 182,000 | + 2·5 | 570 | 6140 | + 1·8 |
| " W | With " | 11,200 | 16·99 | 190,300 | | 564 | 6320 | |
| " " | Without " | 11,310 | 16·65 | 188,300 | + 1·1 | 560 | 6330 | — 0·2 |
| Average of tests | | | | | + 2·1 | | | + 0·3 |

Retort-House Governor, with and without Seal.

| — | | Make. | I.P. No. 1 Argand. | Multiple. | Diff. + or - Per Cent | C.V. | C.V. Multiple. | Diff. + or - Per Cent |
|----------------------------|-----------|--------|--------------------------|-----------|-----------------------------|------|-------------------|-----------------------------|
| Coal <i>a</i> | With seal | 10,710 | 16'83 | 180,200 | | 560 | 6000 | |
| " " | Without " | 10,910 | 16'24 | 177,200 | + 1'1 | 549 | 5990 | + 0'2 |
| " <i>b</i> | With " | 11,530 | 16'92 | 195,100 | | | | |
| " " | Without " | 11,970 | 15'76 | 188,600 | + 3'4 | | | |
| " <i>c</i> | With " | 12,120 | 16'15 | 195,800 | | 554 | 6720 | |
| " " | Without " | 12,060 | 16'00 | 193,000 | + 1'5 | 543 | 6550 | + 2'6 |
| " <i>d</i> | With " | 11,350 | 17'45 | 198,100 | | 568 | 6450 | |
| " " | Without " | 11,630 | 17'00 | 197,700 | + 0'2 | 558 | 6490 | - 0'6 |
| " <i>e</i> | With " | 12,040 | 16'69 | 200,900 | | 546 | 6570 | |
| " " | Without " | 11,920 | 16'65 | 198,500 | + 1'2 | 551 | 6570 | + 0'0 |
| " <i>f</i> | With " | 12,230 | 16'74 | 204,700 | | 544 | 6650 | |
| " " | Without " | 11,880 | 16'80 | 199,600 | + 2'6 | 516 | 6490 | + 2'5 |
| Average of tests | | | | | + 1'7 | | | + 0'9 |

Effect of Temperature with Constant Weight and Duration of Charge, 6 cwt. in 6 hours. Coal "g."

| Temp F. | Charge per Retort, Cwt. (Aver- age). | Duration. | Gas. | | | | | Coke (Dry). | | | | Tar. | Gas Analysis. | | | | | | | | Sul- phur Grains per 100 Cubic Feet. | H.C.N. lbs. Prus- siate Soda per 10,000 C. Ft. |
|------------|---|-----------|----------------------------|-----------------------|----------------------------------|-----------------------------|----------------------------------|--------------|--------------|--------------|-----------------|-------|---------------|-------------------|-------------------|--------------------------|--------------|--------------|-------------------------|-----------------|--|---|
| | | | Make. C. Ft. p. Ton. | I.P. Cand- les. | Mul- tiple. I.P. Basis. | C.V. B. Th.U. Net. | Mul- tiple. C.V. Basis. | Total. | Sales. | Fuel. | Liquor | | Crude Gas. | Purified Gas. | | | | | | | | |
| | | | | | | | | | | | | | | H ₂ S. | CO ₂ . | Cn. H ₂ n. | O. | CO. | H. | CH ₄ | | |
| | | H. M. | | | | | | Per Cent. | Per Cent. | Per Cent. | Gals. 10-oz. | Gals. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. (Diff.) | | | |
| 1630° | 5'99 | 6 0 | 9,480 | 17'80 | 169 | 591 | 5610 | 62'5 | 49'9 | 12'6 | 43'1 | 12'7 | 1'64 | 2'71 | 4'78 | 0'48 | 8'05 | 40'2 | 34'1 | 9'68 | 16'0 | .. |
| 1700° | 5'98 | 6 0 | 10,550 | 17'10 | 180 | 572 | 6030 | 61'9 | 45'8 | 16'1 | 42'8 | 12'4 | 1'58 | 2'80 | 5'20 | 0'50 | 9'40 | 43'3 | 33'7 | 5'10 | 28'0 | .. |
| 1775° | 6'01 | 6 0 | 10,960 | 16'40 | 180 | 558 | 6120 | 61'8 | 44'3 | 17'5 | 40'4 | 12'1 | 1'77 | 3'00 | 4'00 | 0'50 | 10'10 | 42'7 | 34'5 | 5'20 | 34'9 | .. |
| 1855° | 6'01 | 6 0 | 11,390 | 16'10 | 184 | 545 | 6210 | 61'1 | 42'8 | 18'3 | 41'8 | 11'6 | 1'83 | 2'95 | 3'96 | 0'85 | 10'08 | 41'5 | 31'4 | 9'26 | 39 6 | .. |

Coal "h" with Variable Charge.

| | | | | | | | | | | | | | | | | | | | | | | |
|------|------|-----|--------|-------|-----|-----|------|------|------|------|------|------|------|------|------|------|------|----|----|----|------|------|
| 1560 | 4'99 | 6 0 | 8,610 | 15'62 | 135 | 575 | 4950 | 68'9 | 60'2 | 8'7 | 33'8 | 12'6 | 2'03 | 2'78 | 3'25 | 0'27 | 7'27 | .. | .. | .. | 50'3 | 3'70 |
| 1650 | 5 64 | 6 0 | 8,820 | 17'08 | 151 | 607 | 5350 | 69'2 | 56'2 | 13'0 | .. | .. | 2'53 | 2'22 | 3'19 | 0'56 | 7'39 | .. | .. | .. | 52'9 | 5'29 |
| 1800 | 6'06 | 6 0 | 11,250 | 15'49 | 174 | 567 | 6380 | 67'0 | 48'9 | 18'1 | 34'0 | 13'0 | 2'50 | 1'25 | 3'29 | 0'51 | 7'34 | .. | .. | .. | 58'2 | 5'91 |

Effect of Temperature and Value of Products.

| Coal. | Temp. | Weight. Car- bonized per 24 Hours. | Gas. | | | | | | | Coke. | | | | | Liquor. Galls. | Tar. Galls. | H ₂ S. P. Ct. in Gas. | Value. | | |
|-------|-------|--|--------|-------|-------------------------------|-------|------|-------------------------------|--------|--------|--------|-------|-------------------------------|---------|-------------------|----------------|--|--------|---|---|
| | | | Make. | I.P. | Multiple on I.P. Basis. | Diff. | C.V. | Multiple on C.V. Basis. | Diff. | Dry. | | | Sales + 4 P. Ct. Moisture. | | | | | | | |
| | | | | | | | | | | Total. | Sales. | Fuel. | Coke. | Breeze. | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| F. | Cwt. | | | | Per Cent. | | | Per Cent. | P. Ct. | P. Ct. | P. Ct. | Cwt. | Cwt. | 10-oz. | | £ | s. | d. | | |
| k. | 1920 | 26·0 | 11,850 | 15·55 | 184 | | | | | 64·4 | 47·0 | 17·6 | 8·33 | 1·45 | 35·4 | 10·5 | 1·61 | 1 | 0 | 0 |
| l. | 1795 | 23·7 | 11,816 | 15·11 | 178 | + 3·4 | 527 | 6250 | - 0·2 | 64·1 | 46·2 | 17·9 | 8·25 | 1·36 | 36·5 | 11·2 | 1·51 | 1 | 0 | 1 |
| m. | 1795 | 25·6 | 11,650 | 17·20 | 200 | | 530 | 6260 | | 65·4 | 50·0 | 15·4 | 8·91 | 1·49 | 35·5 | 14·0 | 2·15 | 1 | 2 | 0 |
| n. | 1795 | 24·2 | 11,300 | 17·07 | 193 | + 3·6 | 570 | 6430 | + 1·1 | 64·3 | 49·0 | 15·3 | 8·75 | 1·44 | 32·2 | 13·0 | 1·81 | 1 | 1 | 7 |
| o. | 1740 | 25·6 | 12,050 | 16·55 | 200 | | 553 | 6660 | | 68·0 | 51·7 | 16·3 | 9·50 | 1·26 | 30·6 | 12·1 | 1·89 | 1 | 2 | 5 |
| p. | 1735 | 23·7 | 12,060 | 15·82 | 191 | + 4·7 | 545 | 6570 | + 1·4 | 68·0 | 49·8 | 18·2 | 8·87 | 1·49 | 28·9 | 11·7 | 1·47 | 1 | 1 | 3 |

thus seen to be about 5½ per cent. over the original method of working the plant with an anti-dip but without a retort-house governor. The anti-dip is, therefore, now discarded, and the governor is in almost continuous action.

INFLUENCE OF RETORT TEMPERATURE.

The short history of the coal-test plant is conclusive evidence of the great advantages to be derived from high temperature carbonization. The danger limit of retort and combustion chamber temperature which we set ourselves, has been raised from time to time, with continued improvement in the results taken as a whole. With the refractory material at present in use, it is not advisable to exceed an average retort temperature of 2100° Fahr., or a combustion chamber temperature of 2600°. A carbonizing temperature of about 2000°, as determined after the coke is drawn, and a charge of from 6½ to 7 cwt. of six hours' duration, best suits the purpose of making 16-candle gas under the present conditions of the coal-test plant—that is, with oxide purification only. With really first-class fireclay material, it ought to be possible to exceed these limits of temperature and charge, and reap still further advantage. No doubt under ordinary circumstances the costs of maintenance will tend to increase when higher temperatures are used. No such increase has been observed on the Birmingham test plant; but this is probably due to the use of better refractory material.

If the weight carbonized in a given time is small, the yield of gas is increased, and the illuminating power diminished ;

but there is a gain in multiple. The larger fuel consumption and increased carbonizing wages may, however, render the method unprofitable. It is possible to obtain first-class carbonizing results with direct-fired settings carrying retort temperatures of about 1600°; but the charges must be reduced to 70 or 75 per cent. of normal, with corresponding increase in cost of manufacture, &c.

The internal area of the retort may be taken as a rough guide to its carbonizing capacity, where the section is similar to standard pattern. The gas engineer, it seems to me, has to aim at carbonizing the full quantity per retort per day as set by some standard, and to endeavour to use temperatures high enough to distil the coal to the best advantage.

The following tables contain results of tests carried out at different retort temperatures with and without altering the weight of the charge. The information they contain is of general interest, and needs no further comment.

ALTERATION IN WEIGHT AND DURATION OF CHARGE.

The experiments conducted with a view to ascertaining the effect of using very heavy charges without altering the retort temperatures to any great extent, indicate a slight commercial advantage for the heavy charge, even when the carbonizing wages are reckoned on a basis of weight per retort per 24 hours, as they are below. The advantage is naturally enhanced with machinery that can deal with increased charges without prejudice to cost.

Effect of Alteration in Weight and Duration of Charge.

(Same coal throughout tests.)

| Charge. | Duration. | Weight Carbon- ized per Retort per 24 Hours. | Retort Temp. | Gas. | | | | | Coke. | | | | Liquor, Gallons. | Tar, Gallons. | H ₂ S. | Gross Value. |
|---------|-----------|---|-------------------|----------|-------|-------------------|------|-------------------|-----------|-----------|--------|---------|---------------------|------------------|-------------------|--------------|
| | | | | Make. | I.P. | I.P. Multiple. | C.V. | C.V. Multiple. | Dry. | | Sales. | | | | | |
| | | | | | | | | | Total. | Fuel. | Coke. | Breeze. | | | | |
| Cwt. | H. M. | Cwt. | F. | Cub. Ft. | | | | | Per Cent. | Per Cent. | Cwt. | Cwt. | 10-oz. | | Per Cent. | £ s. d. |
| 5'49 | 6 0 | 22'0 | 1915 ^o | 12,250 | 16'61 | 204 | 542 | 6640 | 63'4 | 22'0 | 6'76 | 1'52 | 38'9 | 12'1 | 1'60 | 1 1 3 |
| 6'48 | 6 0 | 25'9 | 1955 ^o | 11,960 | 16'51 | 197 | 535 | 6400 | 63'5 | 18'5 | 7'38 | 1'54 | 38'3 | 12'5 | 1'93 | 1 1 7 |
| 9'59 | 8 0 | 28'8 | 1980 ^o | 11,460 | 17'01 | 195 | 552 | 6320 | 63'5 | 16'8 | 7'32 | 2'02 | 38'0 | 12'6 | 1'50 | 1 1 9 |

A difficulty was experienced in introducing charges of over 10 cwt.; and additional labour had to be requisitioned to get 13 cwt. into the retorts. In the latter case, the tests have so far not been satisfactory, probably owing to the lengthened period occupied in charging the retort. With heavy charges the coke is larger and denser; but the difficulty in drawing it by hand leads to its receiving rougher usage than is usual with normal charges, and thus the percentage of breeze is not reduced or may even be increased.

EFFECT OF CRUSHING THE COAL.

Ordinarily the coal coming to the test plant does not go through the crushers. It was suggested that crushing the coal might have some effect on the products of distillation. Tests on three different coals were carried out to settle this point. The results are given below, and show practically no alteration in the products.

Effect of Crushing Coal.

| Coal. | Make Cubic Feet per Ton. | I.P. | Multiple on I.P. Basis. | C.V. | Multiple on C.V. Basis. | — |
|-------|--------------------------|-------|-------------------------|------|-------------------------|-----------|
| " | 11,130 | 16'35 | 182 | 550 | 6120 | crushed |
| " | 10,950 | 16'65 | 182 | 561 | 6140 | uncrushed |
| " | 11,720 | 16'76 | 106 | 562 | 6590 | crushed |
| " | 11,720 | 16'68 | 195 | 563 | 6600 | uncrushed |
| " | 11,930 | 15'61 | 186 | 530 | 6320 | crushed |
| " | 11,850 | 15'55 | 184 | 527 | 6250 | uncrushed |

STACK COAL.

Several valuations have been undertaken of coals that had been stacked and, six months to two years afterwards, picked up. After making allowance for the excess of moisture present in the coal, the gas multiples were in every case slightly lower than the standard. Our tests do not definitely indicate the percentage loss per annum. It would appear to be no more than 2 per cent. It may be mentioned that while the gas value decreased, the yield of liquor increased very appreciably—no doubt the result of the action of water. The coke markedly depreciated.

STOPPED PIPES.

Notwithstanding the employment of high carbonizing temperatures, we have experienced little trouble with stopped pipes on the coal-test plant. Two or three coals out of the large number tested exhibited a peculiar tendency to block the ascension pipes; and trouble is also experienced with cannell. Serious difficulty is almost entirely avoided by thoroughly clearing each ascension pipe daily with a long auger. The troubles that arise in some retort-houses are due to over-condensation. When there are two pipes, there is at times a tendency for all the gas to go up one side of the bed. This phenomenon has probably something to do with the blockages, and accordingly the closing of one of the gas-ways has afforded relief in certain cases. It was thought that this expedient might have an adverse effect on the quality of the gas, which has thus a longer travel over the coke. Experiments arranged for the purpose of ascertaining the amount of depreciation failed to detect any.

Comparison of Results When Using One Ascension Pipe.

(Average results obtained from two coals.)

| Temp. ° F. | Make Cub. Ft. per Ton. | I.P. | Multiple on I.P. Basis. | C.V. | Multiple on C.V. Basis. | Liquor. Gallons 10-oz. per Ton. | Tar. Gallons per Ton. |
|-----------------------------|------------------------|-------|-------------------------|------|-------------------------|---------------------------------|-----------------------|
| One pipe used— 1805° . | 11,200 | 15'11 | 181 | 5540 | 621 | 36'6 | 11'1 |
| Both pipes used— 1815° . | 11,160 | 16'10 | 180 | 5490 | 613 | 36'9 | 11'7 |

COKE.

It is improbable that gas coke will ever be sold in quantity on a guarantee of calorific value or purity. Size, colour, hardness, or density are the qualities usually considered. But some cokes are poor in appearance and classified as "C III.;" and yet they are, to use common parlance, "A I" for household purposes on account of their ease of ignition and freedom of burning. Their calorific value may be quite satisfactory; but owing to their liability to form

breeze and dust, they are not in favour with the gas engineer. It is tolerably certain that the introduction on a large scale of a new system of retorting, by which a very large and dense coke is made, would not prove an unmixed blessing, as it would tend to spoil the sale of household coke.

The volatile matter remaining in the coke varies according to the retort temperature and the weight of coal carbonized in a given time. This has also an important bearing on the gas production, which varies directly with the amount of volatile matter driven off from the coal, or in-

versely with the amount left in the coke. The higher the volatile matter, the greater the freedom of burning. Having regard to the desirability of supplying a smokeless fuel which will ignite more readily and burn more freely than ordinary gas coke, it was considered advisable to determine the yields of the various products obtainable from coal carbonized at very low temperature. The data of a large-scale test are set out below, where they are compared with the quantities recovered from the same coal used at ordinary carbonizing temperatures.

Low Temperature Coke.

| Retort Temperature F. | Charge. | Duration. | Gas. | | | | | Coke. | Liquor. Gallons. 10 oz. | Tar. Gallons. | H ₂ S. | Sulphur in Gas. | Analysis of Coke. | |
|-----------------------|----------|-----------------|----------------|-------|----------------|------|----------------|----------|-------------------------|---------------|-------------------|-----------------|-------------------|------------------|
| | | | Make. | I.P. | I.P. Multiple. | C.V. | C.V. Multiple. | Sales. | | | | | Volatile Matter. | Calorific Value. |
| | | | | | | | | Per Cent | | | | | | |
| 1920° | Cwt. 6·5 | H. M. 6 0 about | Cub. Ft 11,850 | 15·55 | 184 | 527 | 6250 | 47·0 | 35·4 | 10·5 | Per Cent 1·61 | 34 | Per Cent. 3 | B.Th.U. 13,150 |
| 1250° | 5·7 | 10 0 | 5,370 | 20·37 | 109 | 607 | 3260 | 55·0 | 24·8 | 16·4 | 1·69 | 31 | 16·8 | 13,720 |

Valuing gas, liquor, and tar at prices already stated, un-screened coke at 11s. per ton (dry) and leaving carbonizing wages out of account, we get the following comparative values :—

| | High Temperature. | | | | Low Temperature. | | |
|------------------|-------------------|----|------|----|------------------|----|-----|
| | £ | s. | d. | | £ | s. | d. |
| Gas | 0 | 11 | 11·8 | .. | 0 | 7 | 1·5 |
| Coke | 0 | 5 | 2·0 | .. | 0 | 6 | 0·5 |
| Liquor | 0 | 1 | 11·7 | .. | 0 | 1 | 4·5 |
| Tar | 0 | 1 | 2·0 | .. | 0 | 1 | 9·9 |
| Total | £1 | 0 | 4 | .. | £0 | 16 | 4 |

There is thus the large deficiency of 4s. per ton of coal carbonized, to make up which it would be necessary to have a net revenue of 18s. 3d. per ton for the special coke—an almost impossible figure under present conditions—before the process could be as profitable as high temperature carbonization. The material is, however, an excellent fuel for open grates, especially if prepared from a coal low in ash. Though it is only about 5 per cent. higher in calorific value than ordinary gas coke produced by the same coal, it has the advantages of kindling more readily and making a more cheerful fire.

Oxidizing agents—such as potassium nitrate and chlorate—have been recommended as additions to the coal for the purpose of improving the quality of both coke and gas. The small quantity suggested for use (2 lbs. per ton of coal) has not been proved by our experiments to have any material influence on any of the products. Theoretical considerations did not lead one to expect much; but we live in the days of the discovery of radium and other scientific marvels, and one must therefore not be too sceptical. The following were the figures obtained :—

| Without Chemicals. | | | | | | | | | |
|--------------------|----------|----------------|--------|----------------|---------|---------|----------------------------------|-------------------------------------|--|
| Make. | I.P. | I.P. Multiple. | C.V. | C.V. Multiple. | Liquor. | Tar. | Total Sulphur in Coke. Per Cent. | Volatile Arsenic in Coke. Per Cent. | |
| 10,940 .. | 16·67 .. | 182 .. | 561 .. | 6170 .. | 37·2 .. | 12·0 .. | 5·8 .. | 0·0002 | |
| With Chemicals. | | | | | | | | | |
| 11,040 .. | 16·28 .. | 180 .. | 552 .. | 6090 .. | 38·1 .. | 12·1 .. | 5·6 .. | 0·0002 | |

In a second trial, double quantities were used with another coal. The results of the coke analysis were as follows :—

| | Total Sulphur. Per Cent. | Volatile Arsenic. Per Cent. |
|-----------------------------|--------------------------|-----------------------------|
| Without chemicals | 2·8 | 0·005 |
| With chemicals | 2·9 | 0·005 |

The author desires, in conclusion, to thank the City of Birmingham Gas Committee for permission to publish this paper; and he expresses the hope that it may afford useful information to members of the Institution even though the names of the coals experimented with are not disclosed.

Discussion.

The PRESIDENT said they were much obliged to Dr. Davidson for his paper, which he knew had been prepared at some inconvenience—the time not being quite so opportune as it would have been later, while it was only recently that he had been asked to prepare it. Their thanks were also due to the Gas Committee of the Corporation of Birmingham for allowing the results to be published; and they would look forward with a great deal of hopeful anticipation to the further experiments to be made there.

Mr. S. Y. SHOUBRIDGE (Lower Sydenham) said he did

not propose to say anything with regard to the report of the Carbonization Committee. He would leave this to Mr. Carpenter. But as an old Saltley man, he should like to congratulate Dr. Davidson on his first contribution to the proceedings of the Institution, and to thank him for his interesting paper. The test apparatus he had was probably the largest, if not the most complete, in the world. He had to prepare the drawings for the first test apparatus at Saltley, which had been referred to, and to supervise the erection and the early working of it, which was found to be exceedingly satisfactory, and to be all that was necessary for the valuation of coal and for checking that which came in under contract. It was a $\frac{1}{2}$ cwt. plant, with a cast-iron retort, with which, of course, it was not possible to work at the high temperatures now in vogue; but the temperatures employed were comparable with those in use at that time. He was not at all sure that the newer plant was not too large for the purpose merely of the analysis of gas coal. It must be somewhat expensive to work, if it were needed only for that. But for the more important purpose of research work, such as had been described, it was admirably suited; and it was to be hoped that the Birmingham Corporation would allow Dr. Davidson to pursue his investigation into the many subjects which required it, and which could only be investigated with such a plant as this. It had been the desire of the Carbonization Committee to carry out experiments very much on the lines on which Dr. Davidson had gone; but they had been unable to do so for want of suitable plant. There were numerous points upon which he should like to say something; but, as there would no doubt be many anxious to take part in the discussion, and the time was limited, he proposed only to deal with one point which was rather important. Dr. Davidson said that, when the legal standard of candle power of town gas was reduced to 12 or 14 candles with the No. 2 burner, coals might be valued, so far as the yield of gas was concerned, on a basis of calorific value with (say) 500 B.Th.U., net, as standard. He thought this statement might get to outsiders, and act in a way that might be detrimental to the gas industry, if it went forth that a standard of 500 B.Th.U. was right for 12 to 14 candle gas. At the South Suburban Gas-Works, they had been making 14-candle gas for some time past; and daily tests of the calorific and the illuminating powers were made. He would not trouble the meeting with many figures, but would give the average results of each month for the last six months, which were as follows :—

| Date. | Tests. | Average Illuminating Power. | Average Net Calorific Value. | Highest Calorific Value. | Lowest Calorific Value. |
|--------------------|--------|-----------------------------|------------------------------|--------------------------|-------------------------|
| December, 1909 . . | 26 .. | 14·62 .. | 496·2 .. | 520·9 .. | 466·1 |
| January, 1910 . . | 26 .. | 14·43 .. | 505·5 .. | 526·1 .. | 465·7 |
| February „ . . | 24 .. | 14·54 .. | 479·8 .. | 493·1 .. | 461·7 |
| March „ . . | 25 .. | 14·22 .. | 481·1 .. | 497·8 .. | 467·7 |
| April „ . . | 26 .. | 14·20 .. | 489·2 .. | 503·0 .. | 466·9 |
| May „ . . | 25 .. | 14·20 .. | 499·4 .. | 514·9 .. | 485·5 |

All the illuminating tests were taken with a No. 2 “Metropolitan” test-burner. It would be seen, therefore, that a standard of 500 net units would be quite impossible to work to under penalties; and 450 was high enough. It was as well this should be pointed out. The gas was coal gas only—showing that with various coals and various conditions, it did not do to accept too high a standard.

Mr. CHARLES CARPENTER (London) said he must apologize for the limited character of the work the Carbonization Committee had been able to undertake; but fortunately one member of the Committee, Mr. Bell, who had read an admirable paper that morning, was able to make some amends for the deficiencies of the Committee. With regard to the work of the Committee, he did not think they set too high a standard in their endeavours; and possibly they might be more successful if their appointment were continued for another year. Before dealing with the work of the Committee, he should like to say a word in praise of Dr. Davidson for the very admirable paper he had read. He commenced by apologizing for lack of interesting matter; but they would all agree that there was not a page which did not contain a great deal of useful and valuable information. It might not accord with all their individual experience, because he had explained how difficult it was to make experiments under comparable conditions. In fact, all experimenters had long learnt to look with more suspicion on records that agreed than on those which did not. The South Metropolitan Gas Company had been in the habit for many years past of using a works making 1,000,000 cubic feet a day in the summer and 2,000,000 feet in the winter as an experimental works. This had gone on for the last thirty years. But, with the advent of inclined retorts, they found a large proportion of the coal could not be tested in the experimental works at all. It was absolutely impossible to test many Durham coals in inclined retorts; so that the works were not as useful now as was originally intended. They had been endeavouring to correct this deficiency by the erection of experimental works. It had been decided to have one setting of tens, such as were in use all over the country, 20 feet long. But there had been a change in the conditions under which coal was now carbonized; and the result of this he thought would put experiments made with horizontals more on an equality with those made on vertical retorts. He alluded to the method which was brought forward by Mr. Bell last year, of completely filling the retorts, instead of leaving a more or less considerable space above the charge. The author had made some experiments with regard to longer and shorter charges; and the defect had been the one to which he drew attention—namely, the difficulty in complying with the requisite conditions when using hand labour. He imagined these retort-settings were regularly charged and drawn by hand. When they had ordinary six-hour charges, hand working was carried out in a very satisfactory way; but with charges of longer duration and full retorts, though it could be done by hand, it could not be done in the accurate scientific manner which was necessary if they were going to base conclusions on the results obtained. They must not be quite led away by the author's experience with regard to charges of long duration, because he did not think he had been able to carry out the experiments under the best conditions. He might be asked what was his authority for saying this (since it was only necessary to read the paper to appreciate the care and accuracy with which Dr. Davidson made all his investigations), and why he set his opinion against the results thus obtained. He did so because they had already carbonized over 1,000,000 tons in full retorts; and there was no doubt a considerable increase in the volume of gas per ton of coal compared with the old method of working—it might be 500, 750, or 1000 feet per ton. There was this considerable increase; and therefore much as he disliked it, he was bound to set his experience against the result of the careful investigation that Dr. Davidson had made. There might be also other advantages which were touched upon; but there was a defect which Dr. Davidson, in his usual accurate manner, had put his finger upon. There was the question of fuel. In considering this, one had to remember that the old method of building retort-settings was designed for six-hour working; and the object of many carbonizers (dating from the time of Mr. West, of Maidstone, when he advocated short charges of four hours or a little more) in those days was to get the coal in and get the gas out as quickly as possible. The trouble with regard to fuel was one which could, of course, be remedied without any great difficulty, and was very largely a question of jacketing the retort-benches. They had lately made an investigation in an ordinary retort-house, to see how much heat was lost by going out of the windows, how much went out in steam, and so on. A large portion of it was lost owing to the fact that due regard had not been paid to the fact that the retort-bench was a construction in which heat was generated, and

that it should be the object of engineers to utilize this heat with the greatest possible economy. A great deal depended upon the proper jacketing of the bench. The paper was packed full of interesting information; and a specially valuable part was where Dr. Davidson dealt with the effect of different constituents on the calorific value. His Company had been engaged for a long time in making investigations on this point; but he regretted to say that the information they had, though very full, had not been tabulated. He had hoped to bring the figures with him, but was not able to do so. He again expressed his regret that the Carbonization Committee were not able to do more than they had. But they had done more than appeared in the report; and if it were only for the report which Mr. Bell had made, they would agree that their labour had not been in vain. With regard to Dr. Davidson's paper, when he read the "JOURNAL" on Tuesday night, he had in his mind some idea that one of the fundamental functions of an engineer was in danger of being overlooked. The American definition of an engineer was well known—a man who could do with a dollar what others took two in doing. But there was another way in which they could put it. In his work, he had raw material given to him—it might be steel, or it might be, in the case of a civil engineer, concrete or brickwork—and he had practically to turn it into gold. In the case of the gas engineer, his raw material was coal; and he would be best judged to be an able engineer who was able to get from his raw material the largest proportion of gold. They could only hope to do this by careful and accurate research made in the manner in which Dr. Davidson had conducted affairs for the Birmingham Corporation. As long as the Institution could depend on men coming there and reading papers of this kind, giving the results of their experience and the way they had worked, they need have no fear as to the future of the Institution or of the industry.

Mr. JOHN WEST (Manchester) said he had been much pleased with the further researches of Mr. Bell; and he must congratulate him very much on the work he had been carrying out and the results he had obtained. There were some points, however, which he could not quite understand. In Table III., he did not entirely follow his analyses; and he should like to know if he could give any reason for some of the differences between the eight-hour and the twelve-hour charges in the analyses of the gases. He referred particularly to methane and nitrogen. In the nitrogen, the difference was very great—in the twelve-hour charge, it was 6.60 per cent., and in the eight-hour charge 11.10 per cent. He did not know how this considerable difference was to be accounted for. There was also a slight difference in the methane. As vertical retorts had been referred to by Dr. Davidson, he might say that they did not have these difficulties with them. They got a very small percentage of nitrogen—only 3.9; and he thought, if this question were looked into more carefully, it would account to a great extent for some of the large volumes of gas per ton of coal which were talked about by some engineers at some works. Dr. Davidson referred to low-grade gas being made from vertical retorts; but this was not essential. He could make whatever gas he was asked for. The question was, What did they want? Since he last spoke on this subject, he had made more practical experiments probably than most men in the room; and he had been endeavouring to see what could be done. They had varied illuminating power with different coals and cannels, from 13-candle to 20-candle gas, tested sometimes with the No. 2 burner and sometimes with others. He merely desired to know what they wanted. He had a word to say on the question of illuminating power, which was a very important public question. They had now a No. 1 burner and a No. 2 burner; and he did not know how many burners he had been asked to test, and to bring the gas down to, or up to. In his view, all gas should be tested by one burner; and then people could draw their own conclusions and deductions. One gentleman said to him: "That looks all right; but I am under restrictions, and my restriction is not like yours. My gas has to be tested by a No. 2 burner, or a D burner, or an F burner." He was asked the other day to test gas with an F burner. He looked about him, and at last he communicated with a friend or two, and asked what was the F burner. He remembered it in the olden days; and he found it was a burner for testing the Preston 20-candle gas. Of course, this was not suited for testing gas as generally made from horizontal retorts. What he himself advocated was that they should have gas of reasonable illuminating power, and of fair

calorific value. He did not want to be bothered with all these various burners; he had been more bothered with them than with anything else. They were made of various kinds to meet conditions in various localities; but why should there be all this trouble? There were the same kind of people in all the different towns; and there ought to be one rule among them—one kind of instrument to test everything that was supplied. He suggested that they should do away with this burner altogether, and give up all the modes of testing with different kinds of burners, and take the calorific value. This would overcome the personal element. They could not agree in testing very often to a $\frac{1}{4}$ candle; and some people could not even agree within 2 or 3 candles. Where there were different burners in use, they could not agree at all. But with the calorific instrument, there were no optics involved—no personal element. If the instruments were all right, they could test continuously, minute by minute, or hour by hour, throughout the day. He wanted it to go forth that gas engineers, supplying the public to the best of their ability, did not want any longer to be hampered with these rigid restrictions. They were advancing as they went on. Mr. Carpenter had reminded him that at one time he was a "thin" man, and that he went in for thin charges. He had now grown stouter as he grew older, and he went in for thick charges. Now they had them very thick. A man like himself, trying to please many people, would like to fit himself to keep up with the demands. To-day they were going in for thick charges—it did not matter whether it was in horizontal retorts or in vertical retorts—but he did want this wretched burner question got rid of. As regarded Dr. Davidson's paper, it was most valuable. They were all endeavouring to do their best to arrive at the truth; and he believed as they went on they would get somewhat near to it, though they never would attain finality. Some of the ideas being carried out in Birmingham were, no doubt, very good. They had advanced as time went on; and they had now an apparatus which he very much believed in. They worked continuously day by day trying to get as near as possible to actual working conditions. He understood Dr. Davidson to say that they got within 3 or 4 per cent. of what was done in ordinary works. This was a very great thing. It was of much assistance to the practical men who had to carry out the daily routine in a large retort-house. In his experimental works, he said he was somewhat afraid as to the liability of the retorts to give way. But why should he be bothered with this sort of thing? Have better retorts, so that they could apply some heat to them. Have the best retorts they could get, paying a reasonable price for them—for they would not get a good retort cheap. With those they were using in vertical settings, they took care that they would bear the strain of any heat which could be placed upon them. All the material he used was burnt off in ovens at 2800°. This was more than could be applied in settings; so that they need not trouble about burning them out with any heats in ordinary working. He thought that if they applied these special experiments which had been carried out by Dr. Davidson to ordinary working, they would gradually go on progressing.

Mr. GEORGE HELPS (Nuneaton) said the matter he wished to speak upon was the question of the anti-dip, the dry main, and the retort-house governor. Six years ago, when in that very room, two or three gentlemen then present ventured to suggest that 12,000 cubic feet per ton could be produced, there were some who jeered. But since then enormous strides had been made, and probably in every works represented there the makes had increased by 800 or 1000 feet per ton. His authority for these figures was the published returns of those works which appeared in the various analyses in the Technical Press; and Mr. Brearley only last week pointed out that the make per ton was not of large importance. Most of them had doubtless looked into this. Mr. Brearley suggested that some of them should endeavour to find a factor which would govern all the complex issues with regard to the carbonization of coal, and arrive at a value for it. Dr. Davidson had done him (the speaker) the honour to mention in his paper the hydraulic main with which he had something to do. He could only thank Dr. Davidson for the very fair, honest, and honourable manner in which he had put this aspect of the case before the meeting. When he first looked into the question, he was struck by the results obtained by Mr. Paterson, of Cheltenham, whose absence that day all must regret. For a number of years, he had been making 11,500 to 11,800 cubic feet of

gas per ton of coal, and doing this with a dry main. Then he looked into the matter for himself. He thought, if Mr. Paterson was making 11,800 cubic feet, why should not he; and he came to the conclusion that the dry main was the thing. Then he set out to discover whether in his own case he could not fix up something which would give a similar result to a dry main without using several valves. The result was the anti-dip which Dr. Davidson spoke of. Dr. Davidson said that he had done away with the anti-dip because he had discovered that with the retort-house governor he got 5 per cent. better results. He need hardly say that no personal interest of his had anything to do with what he said on this matter. They would all of them give him credit for endeavouring to be honest, whether he was or not. He cared nothing for any monetary consideration which he might receive for hydraulic mains or anything else. What he cared most for was their good opinion. He need not apologize for dealing with this question of the anti-dip. Dr. Davidson had placed it before the meeting as fairly as he could have done it himself. Apart from his (the speaker's) own personal interest in the matter, he might say there were other big works using this anti-dip. For instance, at Sheffield they had been experimenting with it for some time; and they were now setting out to adopt it throughout their works. He did not know how many million cubic feet they made. If they asked Mr. Berridge, of Leamington, to show them his pocket-book, they would see a jump up of some 800 or 1000 cubic feet when he adopted the system. This result might not be brought about by his dry main. It might just as well be secured by a retort-house governor or the dry main in some other form. But Dr. Davidson said there was a lot of oscillation. He might have done away with that. They knew that if there was oscillation in a main, they were not getting as good a make as they could without it. He also said that he used a $\frac{1}{2}$ -inch seal while they were charging the retorts. This $\frac{1}{2}$ -inch seal need not have been put on. He need only have put on the seal which he put on with the retort-house governor, and then he would have found there was a better result than he had shown. Again, the anti-dip arrangement could be set or made to seal each ascension-pipe; there was no question about that. Dr. Davidson did not tell them what was the make per ton per annum in Birmingham. There were a lot of works where good makes were got; and perhaps his reason for not mentioning it was that they had not yet any part of their plant built on the lines on which he would now build it after the experiments he had made. He thought he might therefore justly ask them not to consider the question whether the anti-dip was a good thing or not, but to consider whether the case was so far proved.

Mr. ARTHUR VALON (London) said that he was inclined to think they were back again in the Victorian era, and that the intervening ten years were forgotten. He found that the Birmingham Corporation were working to multiples founded on the make of gas multiplied by the illuminating power; and it was an illuminating power of 16 candles measured by the No. 1 "London" argand. If only a big corporation like Birmingham would take the lead in obtaining a calorific standard in place of the old illuminating standard, he believed they would do more for the industry than probably any other action they could take. A corporation could do it much more easily than a gas company, because they were free from opposition in their own borders. But they not only still worked to an obsolete standard, but apparently they made it a matter of competition between the engineers in different works. This might be all very well; but he did hope the example would not spread. It might be all right if corporation committees were composed of technically qualified persons. He did not know anything about the Birmingham Gas Committee; but as a general rule this was not so, and consequently they could not make the proper allowances which could, and must, be made if engineers were going to be judged by such a thing as a multiple figure composed of the make and the illuminating power of the gas. Dr. Davidson showed himself that the standard was quite illusory. He said that, in a case of using coal which gave a gas of 17 candles, care was taken to reduce the pressure in the retort so as to bring the candle power down to below 16 $\frac{1}{2}$ where necessary. Apart from the question of whether this was a wise way of reducing the illuminating power, the engineer, if using a particular kind of coal, was bound to lower his multiple for the sake of the economical result of his working; but he would still show badly in the returns

in comparison with other people. He was glad to see Dr. Davidson had discovered that 12 cwt. of coke was lower than the average amount made. It was a very common figure; but there were few coals which did not give more. This figure was probably responsible for the many somewhat miraculous fuel accounts which one heard of. Dr. Davidson gave a method by which they ascertained the relative value of coals in Birmingham. The figure as it stood seemed fairly correct, and he presumed it was correct; but it had this drawback—it would appear that if they had two coals and the value of one was higher than the other, the one with the higher value would be the better one to use if the prices were the same. But this did not follow necessarily. They did not work to a definite number of tons of coal carbonized. The number of tons of coal carbonized was limited by the quantity of gas they had to make; and it was quite possible to get a coal which would show a higher value on that system, because of the increased yield of gas, but, owing to the fact that under these circumstances they would use a less number of tons, the result might be that the total profit—owing to the small amount of residuals—would be less than if they used a coal which showed a lower value. It seemed to him that the proper way to deal with value was to take it per 1000 cubic feet of gas sold, which was, after all, what they had to look at. If this were done, deducting from it the returns for residuals, they would get an absolutely comparable figure.

Mr. W. B. RANDALL (Waltham) wished to add his meed of thanks to Dr. Davidson for his admirable paper. Unlike him, he could not profess to be a gas chemist; but he did think that in a small place, such as he had the honour to serve, they could make the works, if not an absolutely experimental works, very much like them. For this reason—that in a small works they could devote a great deal of time and attention to the everyday practice of the retort-house especially; and they could have the pleasure and the benefit of following such a remarkably good paper as that given by Mr. Bell last year, which undoubtedly had caused a great revolution in carbonizing throughout the country. He was not able to be present at that meeting; but when he read the paper, he thought to himself, here was something better in store than he had been able to get so far. For several years, they had been working with six-hour charges; and when he found that Mr. Bell said they could get 13,000 cubic feet per ton, he wanted to know why he should not also get it. Mr. Bell was very kind in answering several inquiries he made of him, which he was afraid must have been a great tax on his time, and possibly on his temper. But he must say that, having tried first eight, then nine, then ten, and then twelve hour charges, he was pleased to be able to tell them that, as the result of several months' working with twelve-hour charges, Mr. Bell's prophecies were fully verified. They were able to make over 13,000 cubic feet per ton of coal, and to sell about 12,500 cubic feet; and with this they had a far less number of complaints from consumers than they had previously. The reason for this was that they were able, to a great extent, to free themselves from the bugbear of naphthalene, owing to the twelve-hour charges. If only on this account alone, he thought they would find that the method of filling-up the retorts as far as possible was undoubtedly a good one, and would give them the very best results; and he would remind them that they were the stewards of every ton of coal they had to handle. Reference had been made that morning to an article in the Technical Press relating somewhat to "The Top of the Tree;" but he would like to point out that if that were carefully scanned through, they would find that the way the author took it was purely a matter of geography. If they were able to buy coals at 10s. a ton, and to sell the residuals at 7s., it was not a very difficult task. They must not for a moment be led away by figures of selling prices. Where they in the South had to pay on Yorkshire coal 8s. to 8s. 2d. or more per ton for freightage, they could not afford to use slack, and pay such an enormous cost of carriage. Therefore it was not right to get out a table showing a cost of 10s. a ton, and compare it with other people who had to pay 20s., as shown in the diagram. With regard to the question of high makes, undoubtedly they had to look forward to a much greater yield per ton than they ever did before; and in the "JOURNAL OF GAS LIGHTING" on the previous day, he noticed it mentioned that, whereas 8000 cubic feet per ton was the usual figure in "Field's Analysis" of the London Gas Companies when first started, it had now gone to 11,000 feet per ton. If they could only imagine the thousands and thousands of pounds which this

meant financially to the gas companies, Mr. Bell would feel that all the time and labour he expended on his paper, in pointing out a method by which they would be able to fight all opponents and keep themselves and their companies quite at the top of the tree, had been well spent. Dr. Davidson also mentioned that there was an art in selling coke; and there was not the least doubt about this. With these heavy charges, they produced a coke which was far superior to that produced with six-hour charges. He had some coke from Norwich, which was a magnificent sample; and there was no question that coke users would give 6d. to 1s. a ton more for such splendid, close grained and hard, dense coke as could be obtained with heavy charges. Again, they were met in their district with trainloads of furnace coke from Yorkshire and Derbyshire, which was being sold now at practically the same rate as they were able to get for ordinary gas coke. It was a good coke, for he had had truck-loads of it and analyzed it. It contained only 6 per cent. of moisture. It was a first-class coke; and unless they produced a good coke, they could not possibly fight it. They must therefore alter the system of carbonizing so as to produce a good coke, in order to compete with this furnace coke. Mention was made about high yields being due to anti-dips, dry mains, retort-house governors, &c. They had these adjuncts in the retort-house, and he gave them credit for all they were possibly worth; but he thought they were rather inclined to be overrated. If the temperature went down, the make went down; and a retort-house governor, anti-dip, dry main, or anything else, would not bring the make per ton up again. They must keep the temperature high; and, as one of the benefits from the carrying out of the investigation with regard to refractory materials, he might mention that the Fery pyrometer had helped him very considerably to find out how it was they got a much better make. He had no hesitation in saying that what was wanted was high makes. They wanted a temperature of 2000° in the retorts when they were drawn and ready for charging. They could get it in the retort immediately over the producers. It was the lowest retorts that broke them down. But if they could get them to 2000° all round, and heavy charges, there was not the least reason why they should not rise to 13,000 or 14,000 cubic feet per ton of coal carbonized.

Dr. HAROLD G. COLMAN (London) said he wished shortly to express his hearty thanks to Mr. Bell and Dr. Davidson for the very valuable papers they had given. With regard to Dr. Davidson in particular, he thought they would be only able to fully appreciate his paper when they had time to study it. He had read it through two or three times; but the tables wanted more study than one could give them in that busy week. The special point which came out in Mr. Bell's paper was that the illuminating power multiple, as represented by the sperm value, was 2.3 per cent. better in the case of eight-hour charges than with twelve hour; while with regard to the calorific power multiple, there was nearly 6 per cent. advantage with twelve-hour charges. This was, of course, a matter of the utmost importance at the present time, when they were really in a transition stage, and did not know whether they had to work to calorific power or to illuminating power. At present, they had, unfortunately, owing to statutory restrictions, to confine themselves entirely to illuminating power, or at any rate, to give their main attention to this, though they knew they would be doing better if they devoted their chief attention to the calorific power. The question he wanted to deal with was, How was it they got these differences with the full retort? And what he was saying applied equally to all forms of retort, whether fully charged or nearly fully charged, horizontal or inclined retorts, or vertical charged intermittently or continuously. It was the fact that in almost all cases one got an increased yield of gas combined with an increased yield of tar. This increased weight of gas and increased weight of tar must have come from somewhere; and the point was, Where could they have come from? They knew that in most cases they had not come through a larger amount of furnace gases being pulled in, because both with full charges and with the vertical retort the gas produced contained far less nitrogen. It must therefore have come in some way from the coal. Either there must be less weight of coke produced or there must be less water formed and condensed from the coal. Very unfortunately, these two points—the amount of coke produced and the amount of water formed—were the most difficult to obtain accurate figures for on a large-scale or even a small-scale working. But he was

convinced that in all these cases the improved results obtained from the points of view of gas and tar came largely from the fact that the steam which was formed from the coal was decomposed to a greater extent when the retort was fully charged than was the case when there was a large free space over the coal. Why this was so, he was not prepared to say; but he thought the increased yield of gas was more due to this source than that which Dr. Davidson mentioned. He quite admitted that a considerable amount of hydrogen was given off from the coal by further heating; but this would not account in any way for the increased production of tar, because the gas given off at this stage from the coal gave practically no tar at all. This was one point which required investigation. They wanted to know what part the steam took in the carbonization. He was not referring merely to the steam given off from the coal which was originally present in it as free moisture, because probably this went off for the most part at a fairly early stage. He referred to that which was produced and carried away through the whole period of carbonization by the decomposition of the coal substance, which always contained a large percentage of oxygen. Taking the coal analysis Mr. Bell gave in Table I. of his paper, they would find the oxygen, part from moisture, was 7.3 per cent. If all this oxygen could be converted into gas (which was theoretically impossible), they would get from the coal a yield of 20,000 cubic feet per ton—though not of high calorific power. At present, under ordinary circumstances, they converted roughly only about one-fourth of the oxygen into gas; the other three-fourths came away as virgin liquor. Therefore, there was a considerable volume which they could probably obtain as a result of the interaction of this steam with the other vapours. They were apt to look on steam as an inert substance like nitrogen when it was mixed with gas. It was so at a low temperature; but at a high temperature, it was a very active agent. And undoubtedly there were changes going on—not merely the action of the steam on the coke producing the water gas with which they were familiar, but there must be an action going on between the steam and the other gases, including the tar vapours, which were present in the retort. They seemed at the present time to be in a complete ignorance of what was happening in this respect. If they could, by the investigation of any forms of carbonization, get further information in this respect it would be a very material help in getting at what they were all aiming at—the greatest number of thermal units present in different coals into the gas obtained from that coal. There was one point in Dr. Davidson's paper which at first sight seemed to contradict what he had just said. Mr. Carpenter had referred to it already, and it was that in the test plant at Birmingham, so far as they had gone at present, the heavy charges had not given the same results as had been obtained in other places. This was probably largely due to the conditions. But it seemed to them, looking at the figures, that one reason was that the period of carbonization was not sufficiently long, in the case of the $9\frac{1}{2}$ cwt. charge, to carbonize the coal to the same extent that it was carbonized in the $6\frac{1}{2}$ or $5\frac{1}{2}$ cwt. charges. Contrary to experience in most cases, with the increased time of charge there was nevertheless a great deal more coal carbonized per retort in the 24 hours; whereas, if they took Mr. Bell's figures, the make per mouthpiece came out much about the same or a little higher in eight-hour charges. He thought probably this accounted for the difference; and, in addition, there was the point Mr. Carpenter raised, that the end charging with these heavy charges did not give quite comparable results with those obtained by machine charges when using 9 cwt. or more.

Mr. CHARLES HUNT (London) said Dr. Colman had raised one or two interesting points. It always appeared to him that the increased yield resulting from heavy charges in full retorts had been due, not to the rise of temperature within the retort, but to the reverse. His experience was that, with moderate heats, they got more gas and more tar than with high heats, as they were called. If they filled a retort with coal, the retort must be at the commencement somewhat higher in temperature than would ordinarily be the case; but the bulk of the gas coming from the coal met with a lower temperature, and was consequently not decomposed to the same extent as it was when there was a large free space above it which it had to go through. This, he thought, accounted for the increase of the tar at the same time as there was an increase of gas. Dr. Colman appeared to think that a great deal depended on the decomposition of the steam,

if he understood him rightly; but, in fact, he (the speaker) understood that with a filled-up retort they obtained a larger quantity of virgin liquor than with a partially filled retort. If this were so, it rather disposed of the question which Dr. Colman raised. The papers were admirable contributions to the subject of carbonization; and their thanks were due to both authors for the excellent manner in which they had been prepared.

Mr. SAMUEL GLOVER (St. Helens) said Mr. Hunt had touched on a matter which was of considerable importance in this connection; and he should like Dr. Colman to take a note of this point in Mr. Hunt's remarks, which he was quite sure from his experience of carbonizing coal in different ways was a very important one. He would suggest that considerable difference in the value of coals carbonized scientifically was obtained by the fact that there was less breaking-down of the hydrocarbons than in the ordinary method of carbonizing with partially filled retorts. The method of working either horizontal or inclined retorts which was being followed at the present day, imitated as nearly as possible the practice which obtained in vertical retorts; and the improvement was partially due to the fact that there was less breaking-down, and therefore less loss, of the hydrocarbons originally contained in the coal. The carbon on the retort was very much less in vertical than in the old-fashioned horizontal or sloping retorts. There was also very much less stoppage of pipes, and no pitched-up hydraulic mains. These were the places where some of the differences would be found. It had often been explained that "muck" was only matter in the wrong place, and the pitch in the hydraulic main and amorphous carbon or pitch in the ascension pipes, and a large production of retort carbon in the retort, was only muck, because it was matter in the wrong place. They got a very much better result from vertical retorts—especially those worked continuously—because the conditions were such as helped to bring those results about in the very best scientific manner.

Mr. J. P. LEATHER (Burnley) said he hardly thought of taking part in this discussion; but one or two points had been raised by Dr. Colman and Mr. Hunt which tempted him to say something. He did not think he could say anything at present in the way of narrating his experience of the work he had in hand; but he promised that as soon as he had anything worth bringing before them he would endeavour to do so. Dr. Colman told them that by the modern methods of carbonization they were getting more gas per ton and more tar; and Mr. Hunt said also they were getting more liquor. He (Mr. Leather) did not know whether they were getting more coke per ton; but somehow or other, if all these things were found to be true, they must be getting more than 2240 lbs. from a ton. He thought there was considerable weight in the hint just thrown out by Mr. Glover with regard to the carbon on the retorts. He did not know that he had seen much said anywhere, either in contribution to the proceedings of the Institution or in any of the Technical Journals, as to the amount they really lost by carbon on the retorts; and it was rather difficult to say what this actually amounted to. If they liked, they could all find out how much retort carbon they sold per ton of coal in the year; but this did not represent the real loss by carbon deposited on the retort—particularly on a retort which was frequently open to the air—and consequently a fair proportion of the carbon deposited upon it was burned away, and did not come into money in the way of selling retort carbon. An amount of only 2 or 3 lbs. of carbon (and he had not the slightest doubt that in many cases they did have a deposit on the retort of more than this amount), meant a good deal when put into the form of gas. If they calculated it out as marsh gas, the quantity did not need much hydrogen added to it to make a considerable volume of marsh gas. If in vertical retorts, for instance, they got considerably less carbon deposited, or in fully charged retorts, horizontal or inclined, there was not so much deposited, this would account for some portion of the gain. The point thrown out by Dr. Colman with reference to oxygen was certainly worthy of investigation; and he was very thankful to him for the hint. It was a point which he would endeavour to investigate in the work that he hoped to carry out on the vertical retorts which he had now in use in his works.

Mr. P. C. HOLMES HUNT (Melbourne) said this subject was one with regard to which he had come from the other end of the earth in search of information for his Board, in order to recommend to them what installation should be put

up in the new retort-house they were going to erect at an early date. In looking over the work which had come before the meeting, he felt that nothing was of more importance than that brought forward this morning; and if he expressed some slight regret at not finding more information from the Carbonization Committee, perhaps the explanation of his mission there would be taken as a sufficient excuse. He must say that he had looked forward to something more with regard to vertical retorts and full charges than had been produced. On the latter point, he could only say the experiments and work which they had carried out in Melbourne confirmed, to a very great extent, the very excellent work Mr. Bell had brought before the meeting. They had in Melbourne to deal with classes of coal which varied considerably; and unfortunately they found that one class which swelled considerably in the retorts did not yield such good results, under what he ventured to term prolonged carbonization, as the coal which did not swell. For this reason, he had been forced to regard the old section of retorts, 21 in. by 15 in., or thereabouts, as a "back number;" and he could not, from what he had done, see how anything but a very large section of horizontal retort could be used in future to get good all-round results. He would like to ask Mr. Bell what was really meant by "full charges." He took it the system of working which he had brought forward, of 12 cwt. in an 18-foot retort, was a charge right up to the roof of the retort, though there might be a gas passage left at the top of the charge sufficient to act as a duct to convey the gas to the ascension-pipe. In Melbourne, they had found that, when they attempted to work with a full retort, jamming the coal right in, and packing it, they got undue pressure in the retort. To relieve this, a second ascension-pipe might be put in. In their new installation of 160 retorts, they had single ascension-pipes on the charging side of the bench. If they did not attempt to cram the retort right up to the roof, but left a little passage over the charge for the gas to get away, they did not get this pressure, and obtained a result very far in excess of that secured from eight-hour working. With a good coal, they got at least 500 cubic feet per ton more under this system than with the eight-hour working. It appeared to him it was a point on which they would like some more elucidation, as to whether the horizontal retort was better worked packed full or with a gas passage left on the top of the charge. To him it appeared that there was one great advantage in working with a single ascension-pipe; and, though he was open to conviction, he should require a great deal of proof that a second ascension-pipe was essential to the working of horizontal retorts. Having only one simplified the labour and cheapened it; and in his part of the world this was a great consideration.

The PRESIDENT said there had been a most interesting discussion on these papers; and attention had been drawn to several important points. When Dr. Davidson was speaking of the Birmingham testing plant, he could not help thinking what a pity it was that this plant did not belong to the industry generally. That was something he looked forward to, and still hoped to see some day. It seemed hardly fair and just that one broad-minded Corporation should put down a plant of this description, presumably to test their coal for the purpose of purchase, but really to carry out researches which were available for the industry generally, but to which the industry did not contribute anything in the way of financial assistance.

Mr. BELL, having thanked the members for the reception given to the Committee's report, said the paper he had read was rather a supplement to that report; and he was indebted to them for allowing it to be brought forward. One gentleman had referred to him as the pioneer of heavy charges; but he really thought the Chairman of the South Metropolitan Gas Company, Mr. Carpenter, was the actual pioneer. He believed he started filling up the retort before they did at Derby; and the only thing was that he (Mr. Bell) happened to bring forward the first results. It was only proper, however, to recognize the part Mr. Carpenter had taken in this matter. In regard to the question raised by Mr. West as to the large quantity of nitrogen in the gas (as given in Table III.), it seemed to him that probably this arose from some disassociation of the ammonia. In No. 2 retort-house, he had anti-dip valves on the dip-pipes; and it might be that during the last two or three hours of the charge, when there was little gas coming off from the coal, there was a slight vacuum on the retort, which would bring in a little nitrogen. Since this investigation had been carried

out (and it proved the advantage one got from carrying out these investigations), during the last three hours they closed the anti-dip valves, so as to keep a pressure of about $\frac{1}{2}$ in. on the retort. He congratulated Mr. Randall on being able to get 13,000 cubic feet per ton; and he thanked him for his testimony. What brought to his mind the advantage of these heavy charges was that those who were near the coalfields could use lower grades of coal which formerly they discarded; but those further away, who naturally had to pay a higher rate, used higher and better grades. With regard to Mr. Leather's remarks on the carbon on the retorts, his own experience, though he did not like to dogmatize on these matters, was that there was less carbon in the retorts. Also with reference to the sulphur and the naphthalene, he did not know what Mr. Carpenter would say about that; but he was inclined to think they did produce less sulphur, less naphthalene, and less carbon with full charges. He was glad to see Mr. Hunt, from Melbourne, and he might inform him that, with 12 cwt. charges, there was a slight passage on the top of the retort. If they filled the retort full, he believed that it was necessary to have an ascension-pipe at each end; and he was altering some of the settings and putting an ascension-pipe at each end of the bench, so that they could fill the retorts solid.

Dr. DAVIDSON said that the actual cost of working of the Birmingham experimental plant was not so much as might have been anticipated, on account of the good results they obtained. If they reckoned the cost of gas into the holder, it was only a matter of 2d., at the most, more than in one of the large works—not the best works; and it only cost a few hundreds a year on the gas made. So that he thought the Birmingham Gas Committee were well advised in putting down even this large plant for the purpose of testing coal. Mr. Shoubridge had made some reference to the standard for valuing coal, and objected to his taking the standard of 12 to 14 candles with a No. 2 burner and 5 B.Th.U. net. He (the speaker) made no reference to legal standard, but simply alluded to a standard of valuation; and 500 was a round figure. He had put the illuminating power low enough, so that it did not matter. They could hardly make gas of less illuminating power than 500 candles. Their own figures corroborated Mr. Shoubridge. He was in agreement with the remarks made about a legal standard—that it ought to be a calorific one, and that the illuminating power should be quite subsidiary. But he did not think it should be discarded altogether, because with the progress which was being made, and with the gas produced in some of the new installations, it was necessary to have some sort of illuminating power standard; otherwise a consumer using a flat-flame burner might some day find that he got no light at all. With regard to filling the retort, they certainly had the disadvantage referred to by Mr. Carpenter, that it was hand-work; and it was not easy to fill the retort so as to leave a uniform passage over the coal. They had employed charges of 12 and 13 cwt., with a duration of twelve hours; and he proposed to give one of the tests, even though it was not altogether satisfactory, and point out that they got, as Mr. Bell had, a depreciation of the 12-cwt. charge of about $2\frac{1}{2}$ per cent. on the illuminating power basis. But, very strange to say, they also found depreciation in the calorific value, while Mr. Bell had an increase of $6\frac{1}{2}$ per cent. As far as their experiments had gone, they did not find any advantage in the 12 and 13 cwt. charges; but the experiments were not altogether satisfactory, as had been pointed out. Still, he wished to say that they obtained the same result as Mr. Bell, approximately on the illuminating power basis. He was in agreement with all that Mr. West had said about burners; but it was not sufficient to simply make gas without any reference to its quality. What they would have to consider in the future was the number of heat units obtainable per ton of coal. He was rather diffident in publishing figures with regard to Mr. Helps's anti-dip; and he quite appreciated his remarks. No doubt they got an unduly adverse figure, owing to the fact that they had no machine charging, and their retort took about 8 minutes to discharge and charge. If they were charging with 6 cwt. of coal, it took about 3 minutes to charge; and with 12 cwt., about 8 minutes. He agreed with the remarks that had been made about the dry main at the retort-house governor, which the experiments certainly seemed to prove possessed a slight advantage. Mr. Vane spoke about the competition as between works and works, and the lowering of the multiple when it was necessary to alter the pressure in the retorts. This reduction

in the multiple was very seldom necessary to resort to; and when it was resorted to, it only affected the gas multiple, and by not more than 2 per cent. In the matter of valuation, he thought that if Mr. Valon would carefully read through the paper he would find that he (the speaker) had attempted to make an allowance for the increased yield per ton in carbonizing wages. It was certainly the case, as Mr. Randall had mentioned, that in all small gas-works close supervision was a profitable matter; and it was the great advantage in small works that they could keep every retort in good condition. He did not quite agree with Dr. Colman as to the difficulty in estimating accurately the weight of coke produced. They could do this with a high degree of accuracy by weighing the hot coke, except perhaps when they filled the retorts with 12-cwt. charges, when it was more difficult. With regard to the volume of gas given off and the percentage of hydrogen, it was a well-known fact that with vertical retorts at the end of the charge almost pure hydrogen was given off from the coke. Dr. Bueb had drawn his attention to this fact; and a recording calorimeter would show it when the retorts were burning off.

DE BROUWER STOKING MACHINERY AND COKE-HANDLING PLANT.

By S. Y. SHOUBRIDGE, of Lower Sydenham.

In the year 1899, the first De Brouwer coke-conveyors used in this country were installed at the South Suburban Gas-Works at Lower Sydenham. These serve a retort-house containing eighteen beds of eight retorts worked by West's compressed air machinery. There is a conveyor on either side of the bench running the full length of the house, both delivering the coke on to a transverse elevator conveyor which takes it to a series of overhead hoppers, whence it is discharged into railway trucks beneath.

These conveyors proved so satisfactory and economical that when, in 1902, another retort-house was remodelled and enlarged, it was decided to equip it with the same type of conveyor; and as by this time the De Brouwer-Jenkins stoking machinery had just been brought out, this also was adopted. The house, which is 324 feet long, contains twenty-six beds of ten retorts each; and the conveyor extends the whole length and for a distance of 63 feet outside, rising from the level of the charging floor at the end of the house to a height of 16 feet. The coke discharged at this point falls on to an inclined screen having rocking bars for removing the breeze and dust, and thence on to another horizontal conveyor 200 feet long, which distributes it on to the storage heap through numerous openings.

There is a pushing machine and a charging machine of the usual De Brouwer-Jenkins type, driven by electric power. This house has been at work almost continuously since it was started; and the cost of carbonizing, including everything from the unloading of the coal into the breakers to the delivery of the coke on to the heap, amounts to 8½d. per ton.

In another retort-house, containing eighteen beds of seven retorts and six beds of ten retorts, the drawing and charging had, until the present year, been done by compressed air driven machines of the usual type; the coke being removed in tipping trucks drawn along rails to a raised gantry by means of a wire rope on either side of the bench, as shown on Drawing No. 1. This arrangement required men to quench the coke as it fell into the trucks, and others on the gantry to tip the trucks and discharge the coke on to the heap. As the coke had a fall of 10 feet from the lower retorts and 18 feet from the upper ones into the trucks, and another fall from the gantry to the storage heap, much of it was broken into breeze. The drawing and charging of the retorts involved the use of two drawing and two charging machines, with their attendants, and it was impossible, therefore, to work so economically in this house as in the other; the cost per ton being 18½d., against 8½d. in the other.

It was decided, therefore, to instal the De Brouwer-Jenkins machinery, utilizing, as far as possible, the framework and engines of the existing machines, and to work it with compressed air supplied by the existing compressing plant. This has recently been accomplished. The coke trollies were discarded, and the gantry altered to suit the De Brouwer conveyors. A De Brouwer conveyor, 2 ft. 6 in. wide, is placed at the level of the charging floor, and, running the full length of the house, is carried beyond the end of it for a distance of 55 feet, rising at an angle of 30 degrees

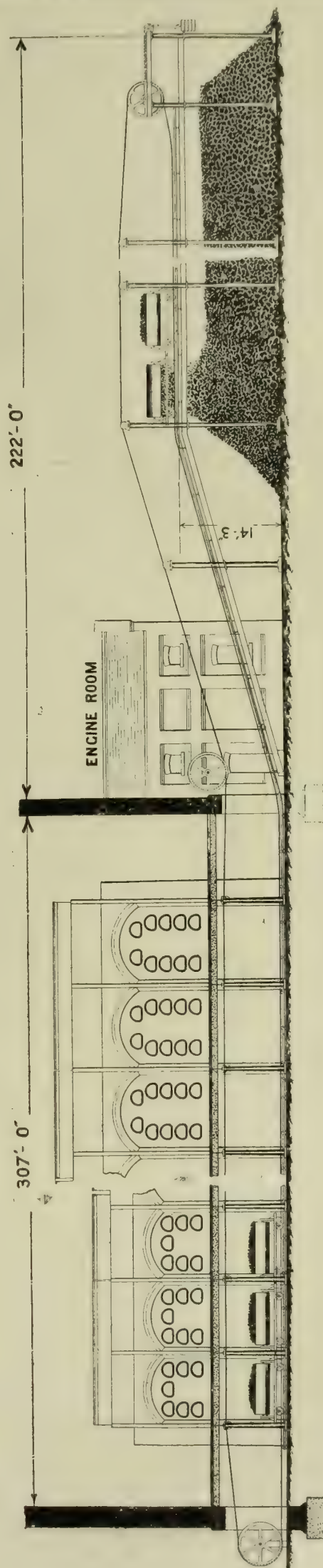


Fig. 1.—Wire-Rope and Trolley Coke Conveyor.

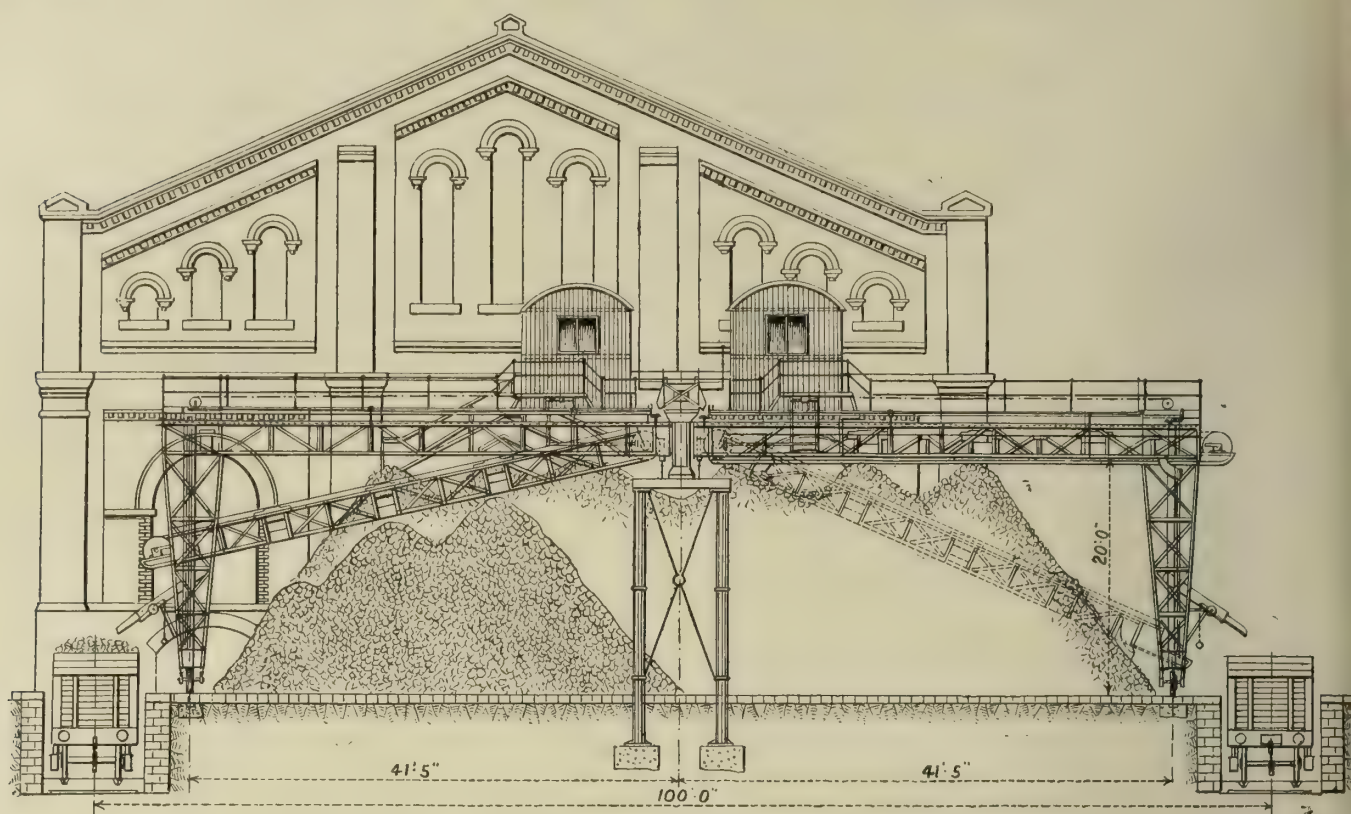


Fig. 2.—Latest Installation of De Brouwer Stoking Machinery and Coke-Handling Plant.

to a height of 27 feet, where it delivers the coke, over a screen with moving bars, into the trough of the yard conveyor. This is also of the De Brouwer type, and 205 feet in length.

On each side of the yard conveyor, a travelling and lowering conveyor is provided for stacking the coke in the yard without breaking it, and for loading it direct into railway trucks. These conveyors each consist of a trough and De Brouwer chain 2 ft. 6 in. wide by 40 feet long, carried in a steel gantry fitted with travelling wheels running on rails as shown in fig. 2. One end of the conveyor is suspended by chains, and the other is hinged so that it can be raised and lowered as shown, and thus avoid dropping the coke from any considerable height on to the heap. When loading the coke into railway waggons, the conveyor is brought into line with the waggon and raised so as to deliver the coke over a shoot fixed to the frame as shown and into the truck. The transverse conveyors are electrically driven by motors of $7\frac{1}{2}$ H.P. working at 310 revolutions per minute, and have all necessary electrical equipment, including trolley poles of the "tramway" type. These collect the current from overhead bare copper conductors extending the full length of the yard conveyor.

The retort-house and yard conveyors are driven by the gas-engine used for the old conveyor, which is of 29 H.P.; and the electric current for the transverse conveyors is generated by a compound wound continuous current dynamo of 13 Kw. capacity, running at 750 revolutions per minute, driven by a 35 H.P. gas-engine.

CHARGING MACHINE.

The framework of the old machine, together with the operating platforms, travelling wheels and axles, travelling and hoisting gear remain much as before; but the old charger, hanging frame, and hopper were removed, and a new hopper with double rotary feeder and a De Brouwer projector have taken their place.

In the older type of De Brouwer charger, some difficulty has been experienced in getting fine coal, when wet, to leave the hopper regularly; and this causes delay in working, and irregularity in the thickness of the charge. To obviate this, the latest machine is fitted with two cast-iron drums having serrated faces at the bottom of the hopper. These drums are made to revolve at a suitable speed by means of a belt from the compressed air motor which drives the projector. An adjustable sliding baffle-plate is placed over and in front of the rollers, for regulating the flow of coal to the projector. The projector is of the usual type, and consists of an endless india-rubber band, 15 inches wide, carried round three pulleys and driven by the one nearest the front of the machine. The band also passes round a

grooved pulley, 15 inches wide and about 3 ft. 3 in. diameter, a deep and wide groove in which is turned of such a size as to allow of the free passage of the coal from the hopper above.

The projector and feeder are driven by a compressed air motor with 4 in. diameter cylinders controlled by a spring governor, arranged to give a variable speed by means of a rotary hand lever with pointer and indicator face plate, of similar design to the rheostats on the electrically driven De Brouwer machines. The machine is constructed to charge five tiers of retorts; one portion of the house being already fitted with five-tier settings and the remainder ultimately will be. A telescopic shoot is provided to direct the coal on to the band when charging the four lower tiers of retorts.

DISCHARGING MACHINE.

The frame of the other old charging machine, together with the travelling and hoisting gear, wheels, axles, and motor, have been used for this machine. The old hanging frame and charger were removed and replaced by a telescopic ram with hanging frame and driving gear of the Jenkins type. The telescopic ram is in two parts. The first or inner length consists of a strong steel rack having a hooded plate at the pushing end to hold the coke and prevent it from crushing up, and an articulated tail at the other. At the back end of the rack, slide blocks are fixed to slide inside the outer part or second length of the ram. These engage with suitable stops in the outer length, so that the first length, when at its extreme outward stroke, has a rigid bearing on the blocks inside the second length. The two lengths are thus connected, and the second length is in turn pushed out after the first. At the front end of the machine is a shaft carrying a sprocket wheel; and this is connected by suitable gearing with a compressed air motor, fitted with $4\frac{1}{2}$ -inch by 4-inch cylinders. The sprocket wheel engages with the teeth of the rack of the ram, and so pushes the ram forwards and backwards as required. The motor works at a pressure of 60 lbs. per square inch.

COKE-CONVEYOR.

This is made with cast-iron side plates bolted to a $\frac{3}{8}$ -inch wrought-iron bottom plate, jointed to make a perfectly watertight trough. The trough is fitted with cast-iron renewable bottom plates, kept in position by renewable cast-iron angle paths; the whole being held down by renewable runners made of $3\frac{1}{2}$ -in. by 3-in. by $\frac{1}{2}$ -in. steel angles, bolted to the side of the trough. The inclined portion of the conveyor outside the house is covered in with tongued and grooved match boarding, in order that the steam generated by the hot coke may assist in the quenching. The water for quenching is supplied through adjustable cast-iron sprays

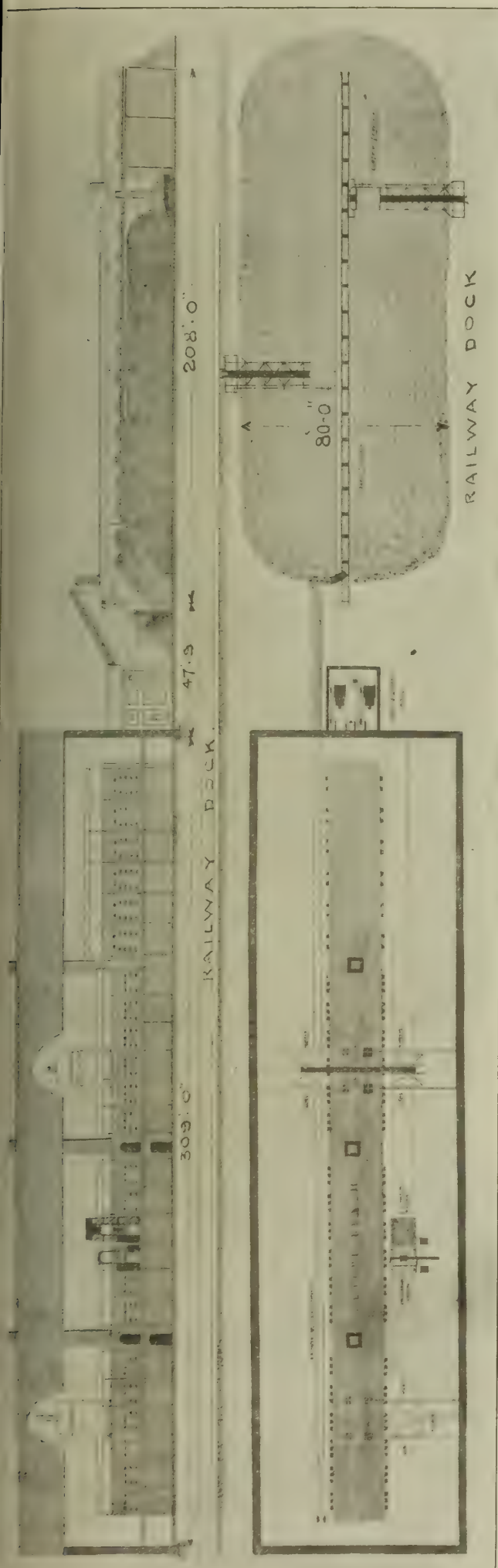


Fig. 3.—The Coke Handling Plant at the South Suburban Gas-Works.

fixed on the top of the trough. Underneath the trough, at the bottom of the inclined portion, a draining grid and water chamber, with adjustable overflow, are provided to remove any excess of water that might get into the conveyor. The chain is made of steel stampings.

Underneath the head of the inclined conveyor two screens are fitted so as to remove the dust and breeze from the coke before it passes on to the yard conveyor. The driving gear is so arranged that the conveyor may be worked by either of the two gas-engines if necessary.

The yard conveyor is fixed at a height of 25 feet above the yard level, and is substantially the same in construction as the retort-house conveyor.

The machinery in this installation has only just been completed; and it is therefore impossible to give any figures from actual work. From our experience in the other retort-houses, however, a very close estimate can be made, and there is no doubt the cost of carbonizing will not exceed 10³/₄d. per ton.

Under the old arrangement, the coke was loaded from the heap into the railway waggons by hand at a cost of 5¹/₂d. per ton; but this will now be done by the conveyor for less than 1d. per ton for labour—a saving which will give a very handsome return on the cost of the traversing conveyors. Our experience with De Brouwer conveyors shows that the life of a chain, in tons of coke moved, averages, for the retort-house conveyor, 58,600 tons, and the cost per ton per 100 feet traverse 0.59d., and for the yard conveyor 54,600 tons, at a cost of 0.54d. The life of the renewable bottom plates is about 3¹/₂ years, equal to 150,000 tons of coke carried. The protecting angles at the sides of the conveyors have proved very beneficial in reducing wear and tear of the chain.

The india-rubber belt of the charging-machine is the most vulnerable part of the machinery; and its life depends very largely upon the quality of the rubber used in its manufacture, and somewhat upon the character of the coal used. Large lumps of coal should not be employed with these belts. The average life of the belts has been 13,300 tons; and the cost per ton, ¹/₄d.

| | Per Ton of Coke Carried. | | Total. |
|---------------------------|--------------------------|--------|--------|
| | (1) | (2) | |
| Rope and trolley conveyor | 7.55d. | .95d. | 8.50d. |
| De Brouwer conveyor | 1.17d. | 2.68d. | 3.85d. |

(1) Cost of labour in operating conveyors.

(2) Cost of labour and materials used in repairs.

The rope and trolley arrangement is very economical to maintain; but it requires so many men in attendance while working as not only to nullify its advantage in this respect, but to make the total cost of working and repairs more than twice that of the De Brouwer conveyor.

As the arrangement of machinery described differs in several important respects from anything of the kind elsewhere, it is hoped that this description of it has not proved uninteresting.

Discussion.

Mr. J. FERGUSON BELL (Derby) said that he had used the De Brouwer conveyor a number of years, and therefore took the opportunity of saying how much he appreciated the paper. Mr. Shoubridge was the pioneer in this country in introducing the machine; and it was eminently successful. He believed it was the most successful hot-coke conveyor yet invented. They often heard remarks about the breakage of coke by conveyors; but, in his opinion, it was not the conveyor which broke the coke so much as the treatment it received afterwards by falling long distances. The arrangement Mr. Shoubridge had brought forward, enabling them to drop coke a short distance only, was a very admirable one. He said that the life of his chain was 58,600 tons; but he (Mr. Bell) had only been able to deal with about 45,000 tons. With regard to the width of the trough, in a new installation he was putting in he was increasing the width to 3 feet, and covering it over with a plate—something of the same kind as was done in Germany—to make it safer. If they used stoking machinery, it was absolutely necessary to have some efficient means for removing the coke; and Mr. Shoubridge had shown them how to deal with large quantities in an economical manner.

Mr. EDWARD ALLEN (Liverpool) said he could assure Mr. Shoubridge that his remark in the closing words of his paper was thoroughly realized, for the paper was very interesting, and would be valuable for future reference. The question of dealing with full charges of coal brought up that of the handling of the resultant coke; and for those who



A Perspective View along the New Yard Conveyor, showing the Travelling Storage and Truck-Feeding Conveyors at Different Angles.



The Coke-Storage Ground, showing the Large Area over which Coke can be Stacked by the Travelling Transverse Conveyors.



Illustrating the Use of the Side Travelling Conveyors for Feeding Railway Trucks.

were attempting to put in 10 cwt. to 11 cwt. charges, as they were in Liverpool, something better than the old style of the man with the barrow was required. It was interesting to notice the low cost of carbonizing which was obtained in this large installation; for 8½d. was a figure which, some years ago, would have been a matter of great surprise. It was due undoubtedly to the magnificent installation which Mr. Shoubridge had to deal with. With machinery and large weights of coal, the cost came down nicely; and it appeared as if there was not much more improvement to be effected in respect to the costs, when they came down to 8½d. Those having vertical installations, and those who were looking forward to them, were doing so in the expectation of the cost being brought very low; and no doubt this would be so. But after all, when it was reduced to 8½d. there was not much margin left. He took it this included everything—from the coal in the breakers to the coke, after being screened, into stock.

Mr. SHOUBRIDGE: Yes.

Mr. ALLEN (continuing) said he had tried to find out what it cost to carbonize, apart from handling the coke; and he took as a figure 1.17d. per ton of coke, and multiplied this by 2, assuming 10 cwt. of coke would be the result from each ton of coal for sale. This, deducted from the 8½d., left something like 6d. as the cost of dealing with the coal in the retort-house. It was only fair to say that he spoke of the stoking machinery he was familiar with; and with such an installation, he would have no hesitation in saying that the cost might be brought down to about 5d. He did not say that this could be done with one particular machine; but he was sure there were many stoking machines now on the market which would show, with a large installation, a very low figure of cost. With respect to maintenance, Mr. Shoubridge had not given them much detailed information as to the De Brouwer conveyor, except the points referring to the life of the belt, and so on. He did not know whether he could give a figure per ton of coal as representing the cost of maintenance; but, with respect to coke-conveyors, there were many who were looking out anxiously for an inexpensive means of conveying, screening, breaking, and delivering coke to their customers. While the figure was very low in working, the cost for maintenance they looked upon with some hesitation. Again, changing the figure from the ton of coke to the ton of coal, it gave them 2.34d. for operating, and 5.36d. for maintenance—the total being 7.7d. Having had some few years' experience with another form of coke-conveyor—the Temperley transporter—he had the cost carefully worked out as to maintenance per year, and found it ran to something under 1d. a ton, which included renewing certain coke-conveying skips which they had to use in connection with it. The cost of handling was a very low figure. All that was required in that case, in addition to the coke being wheeled out of the retort-house, was one man who operated the transporter; so it brought the cost down very low. It would, however, be hardly fair to say that this represented the cost of handling the coke, because the man in the retort-house must bring the coke from the mouthpiece to the quenching place, and then outside. With reference to the quenching of coke, it appeared to him that somebody should endeavour to provide better means of cooling coke. He was quite satisfied that the present method of putting water upon it was not a scientific one, and injured the coke considerably. He had had an opportunity lately of testing some coke which had been smothered (from the Riddings District Gas Company's Engineer), and found that it kindled easily, burned freely, and left very little in the grate but fine ash. It was very satisfactory. He had made some experiments with their own coke, trying in one case that which had been smothered, and in the other that which had been quenched; and the difference in the behaviour of the resultant cokes was very great. In the smothered coke, there was an absence of all cracking. It was simple to kindle; and it was a very free-burning coke; whereas coke quenched was cracking and spitting when it was put on the fire, and did not burn as freely. It appeared to him that there was an opening here for somebody, by means of closing the coke up in a perfectly air-tight vessel, or possibly putting it into a vessel and passing in carbonic acid or waste gases from the flues, or in some way taking the heat out of the coke without damaging it by quenching with water.

Mr. SHOUBRIDGE asked how it was smothered.

Mr. ALLEN said it was spread on the yard and covered with coke-dust. It was a long process, and took about 48 hours; so that the cost of handling the coke was exces-

sive. He did not suggest that it was a successful practical method; but he did suggest that there was an opening for somebody to discover a cheap and efficient way of handling coke on this system.

Mr. D. IRVING (Bristol) wished to heartily congratulate Mr. Shoubridge on the very excellent carbonizing costs he had submitted in the particular retort-house he referred to, where the cost worked out at a total of 8½d. a ton. But he should like to be perfectly clear as to what was included in this 8½d. Did it include the foreman? Probably it did not.

Mr. SHOUBRIDGE: It included everything.

Mr. IRVING (continuing) said that he had his own figures, which he had taken out; and they did not include the foreman, because there was no particular foreman allocated to the special house, nor did it include the cost of exhausting, because the exhausters were worked for a number of retort-houses, and therefore it was very difficult to allocate the proper proportion due to one house. With these two exceptions, they had had in Bristol, in one of their works, a retort-house very similar to the one described by Mr. Shoubridge; and the cost there worked out in detail as follows: Unloading the coal, 0.9d. per ton; breaking, elevating, and conveying in overhead hoppers, 0.62d.; actual cost of carbonizing (*i.e.*, of discharging and charging the retorts, including attendance, cleaning mouthpieces, and sweepers), 5.17d.; working the furnaces (and there were 24 settings of nines), 1.45d.; labour costs of their conveyors (and they had a complete set of coke-conveyors), 0.64d.; labour, attending to the engines for driving the entire installation, also 0.64d.—making a total of 9.4d. per ton of coal carbonized, from the time the truck of coal was received at the railway siding until the coke was screened and stacked in the yard. With regard to coke-conveyors, he thought they were helpful and necessary for the economical working of a large carbonizing plant, but the coke-conveyor was not to be estimated simply by the life of the chain, upon which point the author placed considerable importance. In addition to this, there certainly was the cost of power, and there was the cost of maintenance of the structure, and the trough, and the appliances for the working of the conveyor. With regard to the life of the chain, they had at Bristol a number of years' experience in the working of De Brouwer and similar conveyors; and he was glad to say they had secured an even better life than Mr. Shoubridge mentioned. At one of their works, where they had 1500 feet of De Brouwer conveyor working, the best result they had attained was 71,000 tons for the life of one particular chain, which was excellent—especially having regard to the length of the conveyor, about 180 feet of actual work. The most important thing with regard to this class of conveyor was, not only the length of it, but the angle and the height at which it was intended to convey the coke into the yard. At their Stapleton works, where they had had working for over four years a conveyor of practically the De Brouwer type, but made a little heavier, working twelve settings of nines, and where the lift at the angle at the end was only about 3 feet, in order to deliver it on to the conveyor, they had a life of 95,000 tons of coke, which he considered fairly good. Apart from the question of the life of the conveyor, he had taken out the actual cost of repairs and renewals upon the works for seven years, during the time they had employed conveyors and mechanical appliances, and compared it with the seven years previous; and he was pleased to say that the total cost of repairs and renewals was considerably less during the later period. It was very difficult to give exact figures; but it might be accepted as fairly conclusive that, when they took the entire cost of the work, with no arranging or manipulating of the figures, the latter seven years showed a considerably less cost for repairs and renewals than when the work was done by hand. It might safely be taken that the cost of maintaining the plant was not excessive. But apart from the cost, a well-designed coke-conveyor was essential to economical working with modern methods of carbonizing. The results would have been very much better, were they not in this particular house hampered by the size of the retorts. As had been mentioned, it was essential to have good-sized retorts; but here they had the old-fashioned stereotyped size of 20 in. by 15 in. If, instead, the retorts had been 24 in. by 16 in., the costs would have been greatly reduced, both for carbonizing and otherwise. Unfortunately, with these conveyors there was a great amount of friction. In other words, the chain conveyor was not economical for the power expended. In their Avon Street works, there were over 1500 feet of conveyor working; and, to drive this

plant, when light, required 25 H.P., and when loaded it only needed 28 H.P. So that the real efficiency of this class of plant was just a little over 10 per cent.

Mr. A. C. HOVEY said he would confine his remarks more particularly to the coke-conveying machinery. He had had the honour of laying some particulars before one of the local Associations on two occasions with regard to a coke-conveyor such as had been put before them that morning. The length of the conveyor had since been increased, and the figures which were published at the time—namely, in 1903 and 1904—he had no doubt had now been considerably improved upon, not only because of the increased length of the conveyor reducing the working costs by giving it more work to do, but because, during the intervening time, the design of the chain had been much improved. There was no doubt a great deal of friction on chain conveyors, but they were a considerable improvement in this respect over the ordinary plate-carrying conveyor, which he thought was obsolete so far as coke conveying was concerned. What required considering more than any other point was the formation of breeze. He had had experience of places where the price of coke was so high that if they made 2 per cent. of breeze above what would be produced by ordinary hand labour, or some other method, they would do away entirely with the value of the machinery adopted. What they wanted to consider was that coke was a fragile material, and must be dealt with in a very gentle manner. The upward curve of the conveyor was undoubtedly the place where a great deal of this breeze was formed. If they could have a horizontal conveyor, and deliver the coke gently into some other receptacle by which it was conveyed and deposited in the position required, it would be a considerable improvement on the upward curve. Mr. Shoubridge had not given any particulars with regard to the percentage of breeze he made. If there was even a slight drop of 2 feet when the coke came on a moving mechanical arrangement such as a chain, they got the coke falling over itself, and so being ground up to a certain extent. During this evolution of design, it seemed to him they were gradually coming to the telpher system, by which the coke was received almost without a drop at the mouth of the retort, and gradually carried and deposited in the position where it was required. In Mr. Shoubridge's installation, it appeared to him that the storage was extremely small. It might be suitable at a works where they could dispose of the coke immediately it was made; but in cases where they had to store the equivalent of three to four months' make (as was necessary in some instances), it would require a coke conveyor of much greater length. He believed there were some gentlemen present who could make some remarks on the telpher system, which he considered would be more generally adopted in gas-works in future.

Mr. ALLEN said they had the telpher system at one of their works; but it had not been long enough in operation to afford any definite figures in regard to maintenance. It was, however, working admirably. The coke was not disturbed from the time it left the retort until it was put into the hoppers or screens as the case might be.

Mr. E. A. HARMAN (Huddersfield) thought this was one of the most valuable papers ever presented, because it was a record of actual experience; and this was the information they desired to obtain. There were many points he should like to speak on about conveyors; but it seemed that the discussion ought to be confined to this installation on the De Brouwer system, and was not concerned with any other machinery. He would not, therefore, now attempt to make comparisons, but would suggest that contributions which members might like to make on the subject should be submitted to the Council for inclusion in the "Proceedings." When figures were given in a hurried manner they were not capable of being carefully considered. One wanted to know the actual wages paid. The difference between the wages in the North and the South was considerable, and to simply quote a rate per ton did not allow of any real comparison. A gentleman recently told him that he paid his stokers 3½d. per hour. They were thankful in Huddersfield to get them at 8d.; and in London they probably had higher wages than that to pay, considering the machinery they used.

The PRESIDENT had had many some considerable experience with different forms of conveyors, and a good deal with the De Brouwer; and those who went to Croydon the next day would have an opportunity of seeing a plant which was not a telpher, but which aimed at carrying out something on the same system. The coke was dropped on to a

conveyor running along in front of the retorts; then into skips holding about 1 ton each, and afterwards taken up by means, not of a telpher, but of an electric crane running on the top of a gantry, and then put straight into the hoppers. From the hoppers, it dropped out at the bottom on to a "Marcus" conveyor, which, without shaking it as the ordinary conveyor did, carried it straight to the waggons, where it was loaded for sending away. Though he was sorry to say the whole of the plant was not in operation—the retorts not being in use—he would be able to show the general working of it, and also the "Marcus" conveyor, carrying coke and screening it on the way to the trucks.

Mr. SHOUBRIDGE, in reply, said he did not attempt to make his paper a very elaborate one. In fact, it was simply a stop-gap, which he had prepared in consequence of another member at the last moment unfortunately not being able to give the one he had promised. He thanked Mr. Bell for his remarks. It was quite right to say that he was the first to introduce the De Brouwer into this country; and he was glad to state that he was as great a believer in it as ever. He also agreed that the breakage of coke was not due to the conveyor. He should think there was less breeze formed in this way than in almost any other, because the coke did not move after it fell on to the trough of the conveyor, but remained perfectly still, and was carried along without rolling upon itself at all. There were arrangements in some conveyors by which the coke fell from one conveyor to another, in changing the direction; and it was in these falls that the breeze was principally made. He noticed that Mr. Bell was introducing a somewhat wider conveyor; and possibly he would find this an improvement. But he (the speaker) acted on the advice of Mr. Jenkins, who had had the greatest experience in this matter; and they could see that if they could get the coke along a 2 ft. 6 in. conveyor, the dead-weight of the chain must be less than with a wider one. They had a 2 ft. 6 in. conveyor at work at present; and though the pusher pushed out the coke very rapidly, and in great bulk, so that some of it sometimes fell on the floor, still there was no great difficulty in trimming it back into the conveyor. He quite agreed that with the full charges now used, and the pushing out of the coke especially, the conveyor was an absolute necessity. No means of hand conveyance was at all possible with the large charges which were pushed out with such great rapidity. A continuous conveyor was wanted; and this was why he thought the telpher was not quite the best form of dealing with such charges of coke. There would be a difficulty in getting the buckets one behind the other. A very large number would be required; otherwise the work would be delayed. He was quite familiar with the installation Mr. Allen had put in at Liverpool, and an admirable one it was; but he was not sure whether it was applied to a large number of retorts worked by stoking machinery. If not, there would be ample time to get the telpher buckets backwards and forwards. But, with machinery working in a very large retort-house, it was practically continuous all day. In their own big retort-house, there was no cessation throughout the twenty-four hours. There was a relief set of men; and it was kept working the whole time. In fact, there was a continuous stream of coke to be dealt with; and he could not quite see how this could be managed with the telpher arrangement. Mr. Allen also called attention to the quenching of coke; and he agreed with him entirely that a better system was desirable. But from experiments he had made with coke smothered-out with breeze, he was quite satisfied that this system was absolutely impossible. One could imagine what would happen in putting an immense quantity of breeze on to a stream of hot coke, in order to quench it. He was astonished that the idea ever entered anyone's head. There might be some mode of quenching coke they did not yet know of; and this was one of the problems Dr. Davidson might very well tackle with his test-plant. He was glad to hear from Mr. Irving that his figures could confirm those he had given with regard to the cost of carbonizing, and that Mr. Irving had obtained even a longer life with his conveyor chain than he had. As that gentleman had pointed out, the life of the chain was largely affected by the angle at which the coke was taken up. The wear and tear increased very much where this angle was increased. He agreed with him that the cost of repairs, when worked out, would be considerably less than of working by hand. He also agreed that coke-conveyors were absolutely essential for modern methods of working. This must be obvious to everyone who had had

experience. It was true the friction of the chain was considerable, and formed a good part of the working cost; but this form of chain was almost the lightest in existence. All other forms had additions which, of course, added to dead-weight and wear and tear. Some form of chain was absolutely necessary for dealing with large quantities of coke continuously. He was glad to hear that the results obtained since Mr. Hovey read his last paper, in 1904, had been improved. They were very good then; but he was not at all surprised that better had been achieved, because, in the matter of coke conveying, as years went on the chains and other parts were improved and simplified. They had not reached finality by any means; and no doubt they would get cheaper and cheaper. He could not agree with him that 2 per cent. of breeze above the amount obtained by hand labour did away with the advantage of the coke-conveyor.

Mr. HOVEY pointed out that it was a special instance he referred to on the Continent, where coke was at the time selling at 40s. per ton.

Mr. SHOUBRIDGE said that in this country 2 per cent. of breeze was not a great matter; while the advantages of so handling huge quantities of coke were undeniable. It was true he had not given any quantities of breeze, because he had not had time to go fully into the details, and did not want to draw comparisons with other forms of conveyor, but simply to show what they themselves had done. With regard to the storage space, considering the size of the retort-house, it was not very large; but they did not reckon to store the coke long. They mostly sold it as fast as it was made.

REPORT OF

REFRACTORY MATERIALS COMMITTEE.

The Committee, consisting of Messrs. James W. Helps (President), E. Allen, John Bond, A. E. Broadberry, H. G. Colman, W. Doig Gibb, Thomas Glover, Thomas Goulden, D. H. Helps, W. R. Herring, Edward Jones, James Pater-son, S. Y. Shoubridge, Alex. Wilson, Harold W. Woodall, and F. J. Bywater (Hon. Secretary), present the following report on the work done during the year.

It was thought essential, before giving any consideration to the question of the quality of retort and firebrick material generally, to have authoritative information with regard to the results obtained from material now available, the temperatures at which various parts of retort and water-gas plants are worked, &c.; and for this purpose enquiry-forms were sent out to a number of representative gas-works in Great Britain and Ireland. At the same time the opportunity was taken to enquire the views of engineers of those works, as to the desirability of preparing standard specifications for the manufacture and testing of the various kinds of refractory material employed on gas-works; the possibility of standardizing some of the patterns of retorts; the institution of an independent testing laboratory; and other questions bearing on the subject.

It was recommended that the various temperatures should be taken by the same pyrometer, so that the information might be as comparable as possible.

A very satisfactory number of replies were received; both small and large undertakings being included in the returns.

The information sent in has been summarized, and is given below.

| | |
|---|-----------------------|
| Number of undertakings sending returns. | 31 |
| Number of works | 48 |
| Total make of coal gas represented. . . . | 270 million per diem. |
| Total make of water gas represented . . . | 49 " " |

Coal Gas.

| | |
|--|--------------------------|
| Number of beds of retorts represented . . | 2059 |
| (of these 1748 are horizontals, 310 are inclines, 1 vertical). | |
| Pyrometers used—Féry, 35; others, 8; not mentioned, 5. | |
| Kind of retorts used—Moulded, 33 works; segmental, 12 works; not given, 3 works. | |
| Life of retorts—Without patching, average 797 days. | |
| With patching, " 1257 " | |
| Life of combustion chambers—Average 1321 " | |
| Temperatures—Retorts. | Average maximum 1909° F. |
| | minimum 1558° F.* |
| Combustion chambers " | maximum 2397° F. |
| | minimum 2212° F. |
| Producers | maximum 1966° F. |
| | minimum 1766° F. |
| Regenerators | maximum 1622° F. |
| | minimum 1220° F. |

* The minimum temperature on the bottom of retorts is much less than this immediately after charging, and a special investigation of the subject has been made by means of an electric recording pyrometer, for the purpose of obtaining the greatest variation of temperatures which the material has to withstand. Records as low as 800° F. have been obtained at this point.

Water Gas.

| | |
|---|--|
| Number of sets represented—63. | |
| Temperatures—Generator | Average maximum 1811° Fahr. |
| | minimum 1489° |
| Carburettor | maximum 1381° |
| | minimum 1014° |
| Superheater | maximum 1291° |
| | minimum 1142° |
| Average life of generator lining (without repairs)—187 days. | Repairs usually required consist of replacing the lining about 4 feet up from the bars. |
| Total life of generator—This varies in the returns from 1½ to 17 years. | When the repairs above mentioned have been executed, the life of generator linings in the majority of cases appears to be about 8 to 10 years. |
| Life of carburettor (without repairs)—Lining. | Very few repairs required. Returns vary from 4 to 13 years. Many original linings still untouched. |
| Chequer work. | Considerable repairs appear to be required to a portion of the material. Some plants require repair half yearly, others yearly—the latter being in the majority. |
| Total life of carburettor—Lining. | See note above. |
| Chequer work. | Varies considerably. Average of returns about 700 days. |
| Life of superheater (without repairs)—Lining. | Very little repairs required. Original lining still remaining in many plants. |
| Chequer work. | Average 415 days. |
| Total life of superheater—Lining. | See note above. |
| Chequer work. | Varies very considerably according to the extent of the repairs executed annually. |

List of Questions Appended to the Enquiry, and Replies Thereto.

- 1.—Remarks and criticisms on material now available.
 - 3 are satisfied.
 - 5 fairly satisfied.
 - 15 dissatisfied, or say room for improvement.
 - 2 dissatisfied, but say that gas committees and companies are partly to blame for making cheapness the first consideration.
 - 9 give no answer.
- 2.—Sizes of ordinary bricks employed.

Almost without exception the ordinary bricks used are 9" × 4½" × 3", or 9" × 4½" × 2½".
- 3.—Size of retorts.

| | |
|---------------------------------|------------|
| 23 installations of horizontals | 22" × 16". |
| 12 " " " | 21" × 15". |
| 6 " " inclines | 24" × 16". |
| | 21" " |
| 19 " " irregular sizes. | |
- 4.—Adoption of a standard pattern for retorts.
 - 24 object, or would only adopt in case of new work.
 - 6 have no objection.
 - 2 doubtful.
 - 2 do not answer question.
- 5.—Preparation of standard specification.
 - 26 in favour.
 - 2 doubt practicability.
 - 2 against.
 - 4 do not answer question.
- 6.—Method of testing refractory material.
 - 7 perform no tests.
 - 17 put bricks into combustion chambers or settings
 - 3 have testing furnaces.
 - 3 make practical tests of all new material.
 - 4 do not answer question.
- 7.—Foundation of independent testing laboratory.
 - 16 favourable without reservation.
 - 6 favourable with some reservation. Generally as to locality, expense of maintenance, &c.
 - 2 doubtful.
 - 5 against.
 - 5 do not answer question.

The opinions expressed in replying to the above questions will very materially assist the Committee in arriving at a decision on the various points raised; and several engineers make valuable suggestions when replying to Question 1.

The subject of standardizing ordinary bricks has been sometimes raised; but it would appear that no interference with present custom is called for.

The standardization of retorts has also been recommended at intervals ever since retorts have been used, but has always been complicated and rendered almost impossible by engineers having their own ideas on the matter of the most suitable cross sections to be employed.

The replies to Queries 3 and 4 indicate the difficulties of the question.

A close examination of the cross sections of the large number of 22-inch by 16-inch retorts now used, however, reveals the fact that there are not serious differences between many of the patterns; and this is being looked into further, with a view to attempting, if possible, standardization in this size of retort.

The replies to Questions 5 and 7, relating to the preparation of standard specifications, and to the foundation of an independent testing laboratory, indicate that these will be welcomed if some obvious difficulties can be overcome. There will, of course, have to be several specifications according to the requirements of the material.

It will thus be seen that we have a very comprehensive statement of the opinions of engineers on this subject, and of the temperatures at which retort and water-gas plants are worked, and the "life" obtained from material employed.

It is considered that this will be of great assistance to manufacturers, whom it will guide in the selection of their clays for making material to be used in various parts of plant, and will enable them to reserve their best clay for those which have to withstand the highest temperatures and severest working conditions.

The statements of temperature cannot, of course, be considered final or exact for all conditions, but a suitable allowance above the average figures given can be made, and will provide a safe maximum temperature to be resisted.

After the conclusion of the enquiry, it was decided to hold a conference with the makers of refractory material, for the purpose of discussing the best ways and means of carrying into effect the objects which the Committee have in view. It was thought that the readiest method of reaching the manufacturers as a body would be to invite the Retort and Fire-Brick Section of the Society of British Gas Industries to assist the Committee in this matter. Unfortunately, the Chairman of the Section, Mr. W. P. Gibbons was abroad at the time; but in his absence the Secretary of the Society was asked to act for him, and arrange for the election of a deputation—stress being laid on the desirability of its being representative, not merely of the Retort and Fire-Brick Section of the Society, but of the whole body of manufacturers. The following is a list of the gentlemen who attended, and the firms they represent:—

| | |
|-----------------------|---------------------------------|
| Mr. A. Cliff . . . | Messrs. Williamson, Cliff, Ltd. |
| Mr. W. Barrett . . | Leeds Fireclay Company. |
| Mr. A. H. Pearson . . | Harris and Pearson, Ltd. |
| Mr. J. Morton . . . | Joseph Morton, Ltd. |
| Mr. G. H. Perry . . | Mobberley and Perry, Ltd. |
| Mr. C. W. Thomas . . | E. J. and J. Pearson, Ltd. |
| Mr. G. H. Timmis . . | Timmis and Co. |

And Mr. A. L. Griffiths, Secretary of the Society of British Gas Industries.

The deputation were informed of the work which the Committee had already carried out, and the results of the enquiry; and the whole subject of the supply of refractory material was thoroughly discussed. The manufacturers expressed their satisfaction at having placed at their disposal the useful information in regard to the temperatures which the material they supplied had to withstand, and signified readiness to do everything they could to make the quality of their material equal to the required standards.

Ultimately, it was unanimously decided that the first thing to do was to draw up standard specifications for the manufacture and testing of the various kinds of refractory material; and a Joint Sub-Committee was elected for this purpose. It was also arranged that they should have the advice of a professional clay expert to assist them in this work.

The Committee informed the deputation that it was their wish for the specification to be at first as simple as possible, and that it should be amplified from time to time as necessity proved was desirable.

As indicated in the annual general report of the Institution, these specifications will probably be ready before next season's requirements of retorts and fire-bricks have to be ordered; and it is hoped engineers will avail themselves of them when making their contracts for this material.

Discussion.

Mr. J. W. MORRISON (Sheffield) congratulated the Committee, and especially Mr. Bywater, on the work they had done, and was quite in favour of the suggestion that a Committee, consisting of manufacturers and themselves, should be formed to draw up a specification. It would considerably strengthen the hands of engineers connected with corporation departments if the specification which was drawn up was such as would probably eliminate the manufacturer who gave them any sort of material he liked. They knew that when tenders were received, it was as a rule left to the engineer to make the best he could of the material purchased for him, which was very often the cheapest. He was not at all sure that analysis alone would show the right material to select, because he remembered making some analyses of a German material, which he should have put on one side as quite unsatisfactory, but it was brought to his notice by a large steel manufacturer of Sheffield as being exceptionally good, very durable, and capable of standing a large amount of wear and tear. Analysis would not give all they wanted—especially from the silica point of view.

Mr. W. P. GIBBONS (Dudley) said he came, as Chairman of the Fire-Brick Section of the Society of British Gas Industries, on purpose to thank them for the kindly way in which they had been approached, and also to congratulate the Committee on their excellent report. There was more information in it for fire-brick makers than they had been able themselves to obtain after years of investigation. He could assure them, on behalf of the fire-brick makers, that they would gladly do all they could to meet the wishes of the Committee.

Mr. C. W. THOMAS (Stourbridge) desired to associate himself with the remarks of Mr. Gibbons. Personally, he thought the report would be most helpful to all manufacturers, for hitherto the information they had been able to obtain was rather scanty. Engineers did not care to give information themselves; but this report would enable manufacturers to deal with any problems that came before them from a much better standpoint.

Mr. SAMUEL GLOVER (St. Helens) said when he first received the report he was much surprised to find that the Committee had had to deal with replies from only 31 undertakings; but they had certainly made good use of the information they obtained. He thought they must have done it under a feeling of disappointment that, after all the trouble they had taken to formulate these questions, only 31 out of the large number of undertakings represented by the Institution had replied to the inquiries. If, however, their hearts failed them on this account, he thought they might well take courage from the consideration that from such a small number of replies they had been able to elicit so much valuable information. If they had only given the information as to the maximum and minimum temperature of retorts, combustion chambers, producers, and regenerators, they would have done very good work for the industry. This work was emphasized, and made much more valuable to gas engineers in the construction and use of retorts and refractory material generally, by the note appended to the table of temperatures. The qualities required were shown much more by the amount of variation, than by the extreme temperature which the retort at its best had to stand. His attention had been called to this subject by the experience of the coke-oven people, who explained that to get the best material for standing the attrition of pushing out a charge from coke-ovens, and also the heat and the great change of temperature, they had to go to Belgium for the bricks to line the ovens. He felt that this was a great reflection on British manufacturers of refractory material; but he believed their dignity was going to be recovered, if it was ever lost—or retained, if it had not been—by this investigation. It suggested to the users of horizontal or any other sort of retorts, the extraordinary strain they were putting on the retort by lowering the temperature so enormously every time it was charged—the amount of expansion and contraction which must be brought about by these changes—had never been realized in the carbonizing of coals so fully as it could be now. If the temperature was much less at the bottom of the retorts immediately after charging, it must be substantially less throughout a considerable period of the burning-off of the charge. It had hardly been realized that the coal was carbonized at a very much less temperature than that which they found when it was drawn. The point the Committee were now striving after, with reference to standardizing, was being gradually

brought about, and they could not hope to expedite it much. They would all be glad if the Committee persevered in bringing out a standard specification, and they would best show their gratitude by having patience with them when they wanted to change the wording of it—especially if it tended to its improvement. He was rather surprised that the Committee did not take the opportunity of emphasizing the use the Leeds University might be in doing the work which it was asked should be done in regard to the foundation of an independent testing laboratory. Surely, if the Leeds University was to be of any use at all, the Committee might have pointed to the fact that there they had a place where any such work could be done.

The PRESIDENT said he did not know why Mr. Glover assumed that they had not the Leeds University in their minds in making this suggestion. He found nothing at all to warrant him in coming to this conclusion.

Mr. F. J. BYWATER (Birmingham), in reply, said there

was a great question among engineers and others studying this matter as to whether the test in a laboratory was of any use at all; and that was the reason for asking engineers what their ideas about it were; and whether there should be a laboratory at all. Having got some idea what their opinion was, they intended to act upon it. The locality of the laboratory was open at present; but, in his opinion, there could not be a better place than Leeds. Some other suggestions had, however, been made—for instance, that the National Physical Testing Laboratory might be approached—but, generally speaking, Leeds University was most favoured. He should like to say that the number of works which sent replies by no means represented the whole industry. They could not send out the inquiry forms to all works; but a list was drawn up of such as were considered to fairly represent the industry generally, including large and small concerns. Over 50 per cent. of those sent to replied.

JOINT CONFERENCE OF COMMERCIAL SECTIONS OF THE UNITED KINGDOM.

On the afternoon of last Tuesday (which was, of course, the opening day of the annual meeting of the Institution of Gas Engineers), there was held at the Institution of Mechanical Engineers, Storey's Gate, S.W., a Joint Conference of the Commercial Sections of the United Kingdom, which was on the same lines as the gathering that took place, it will be remembered, at the same time last year. The meeting, to which all members of the Institution were invited, was well attended.

Mr. S. MEUNIER (Stockport), who occupied the chair during the formal part of the proceedings, said he was very pleased to tell those present that Mr. J. W. Helps (Croydon), the President of the Institution of Gas Engineers, would preside over the gathering when the preliminary business had been completed.

The HON. SECRETARY (Mr. H. Kendrick, of Stretford) then read the minutes of the previous meeting, the resolutions passed at delegates' meetings, and some correspondence.

On the proposition of Mr. CHARLES WOOD (Bradford), seconded by Mr. J. H. TROUGHTON (Newmarket), a hearty vote of thanks was accorded to the Institution of Mechanical Engineers for the use of the hall, and to Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers, for arranging the meeting.

Mr. HELPS then said it gave him great pleasure to accede to the request of Mr. Meunier and Mr. Kendrick to take the chair, though he could scarcely understand why he was asked to do so, as Mr. Meunier, he was sure, was doing the work very well. Perhaps, however, the reason was that it would allow more liberty to Mr. Meunier himself to take part in the discussion. At any rate, he (Mr. Helps) certainly did not intend to interfere in the discussion, but meant simply to act in a judicial capacity.

The HON. SECRETARY then read the following

REPORT OF THE JOINT COMMERCIAL SECTIONS.

To the Members of the Institution of Gas Engineers.

GENTLEMEN,—The necessity for combination and organization in the commercial work of the gas industry was fully discussed at the quarterly meeting of the Manchester District Institution of Gas Engineers in September, 1902, when the establishment of Commercial Sections was strongly advocated by Mr. S. Meunier (Stockport) and others. The importance and value of an interchange of opinions and experiences in relation to the many matters directly affecting the commercial work of a gas undertaking was emphasized, particularly the production and disposal of residuals and the prevention of dumping, under which circumstances the railway companies' traffic receipts are benefited at the expense of the gas undertakings.

The fixing of prices could never be a part of the work; the sole object being the discussion, tabulation, and publication of information *re* market conditions and prospects, a thorough knowledge of which will enable all engineers and managers to avoid isolated and often precipitate action. The knowledge gained by the interchange of opinions among a small group of managers during the previous few years had strengthened their convictions that such a scheme would be of great value to the industry.

The scheme was approved, and sections were formed in Lancashire and Yorkshire; the first meetings being held in January, 1903. Since then other sections have been formed in the Eastern Counties, Scotland, and the Southern District; another is in process of formation in the North of England; and similar institutions have been working for some time past in Cornwall and the South-Western Counties.

The need for union, collaboration, and co-ordination of the work led to the joint meeting of all sections in London on June 15, 1909; and it is felt that a greater influence can be brought to bear upon the industry if this union is made permanent, and the

approval and influence of the Institution of Gas Engineers is extended to the work.

The main features of the work carried out and discussed at the Commercial Section meetings are: Tabulation of coke stocks and prices (local and national); development of local sales; disposal of surplus coke; advice on markets open; coal market prospects; residuals market prospects; and labour questions and rates. These questions are more or less debated at every general meeting. Stocks and ruling prices are reported upon and market conditions discussed; and the opportunity of thus keeping in touch with the latest information is a decided advantage in directing the policy of the various undertakings represented, and must have a steadying effect generally.

Among the many topics brought before the sections are the following, which indicate the variety of subjects considered:—

Telegraph Acts, 1863, &c.
Charges for reinstating roadways.
Stand-by supplies.
Advertising.
Card systems.
Standard conditions for coal tenders.
Workmen's compensation.
Effect of Miners' Eight Hours Act.
Rating of gas-works.

Maintenance of incandescent burners.
Standard regulations for gas-fitters.
Income-tax allowances.
Responsibility for leakages.
Repayment of Local Government Board loans.
Railway Companies' Charges.

The demand for the standard regulations for gas-fitters drafted by the Lancashire Section proves the need of such a compilation; and the interest evinced in the negotiations by the same Section and the Lancashire Gas Coal Association for the settlement of the standard conditions for coal tenders and contracts shows the necessity of such conditions. These latter have been considered by the joint sections, and are hereby submitted for approval to the members of the Institution.

Many questions—most of them important—are also introduced impromptu; the variety of experiences expressed being of immense value to all the members.

The results accruing from the discussions, the undoubted success of the commercial movement, the keen interest displayed by individual members, and the establishment of sections throughout the country, all prove the necessity for commercial organization, and fully justify the action of the Manchester and District Institution in 1902. With the enthusiasm and loyalty of all which is absolutely necessary for the well-being of the sections, the future should see them united; and with the recognition and support of the Institution of Gas Engineers, and with the organization perfected, the sections should be in a still stronger position for effective work, to the benefit not only of the gas engineer and his particular undertaking, but the industry as a whole.

On behalf of the Committee,
S. MEUNIER, *Convener*.
H. KENDRICK, *Hon. Sec.*

Gas-Works, Stretford, May 7, 1910.

Mr. R. G. SHADBOLT (Grantham), in moving the adoption of the report, said it needed no remarks from him. It carried its own recommendation.

Mr. S. O. STEPHENSON (Tipton) seconded the motion; and it was unanimously carried.

The conference then proceeded with the agenda; but the discussion on the next item proved so long, that at its conclusion,

Mr. SHADBOLT moved that the remainder of the business be adjourned until the next joint meeting.

Mr. Wood seconded this; and it was agreed to.

On the recent occasion of the installation of the Duke of Devonshire as Chancellor of the University of Leeds, in succession to the late Marquis of Ripon, Professor Smithells, the Dean of the Faculty of Science, presented Lord Rayleigh for the degree of Doctor of Science. He referred to his Lordship as one who, "joining to noble birth the highest rank in the aristocracy of science," stood in a line of men of whom England is justly proud. Lord Rayleigh is Chief Gas Examiner for the Metropolis.

ELECTRICITY SUPPLY MEMORANDA.

Excusing Themselves to the Public—Living in the Past—How it is Worked—Charges—Electric Motors and Gas Compressors.

THE Westminster lighting contract refuses to leave us, through the continued irritation in electrical circles. Electricians have talked vigorously over it, and around it, privately and in the electrical press. The contract has been minutely dissected, with the view of finding out weak points; and it has all ended in the exposure of a terrible mass of electrical ignorance. The talk has been transferred from the electrical technical papers to the public press. Such a defeat of electricity must be excused, by hook or by crook, in the public eyes. Something has been said on the matter in "The Times;" and the "Pall Mall Gazette" has published the representations of the Secretary and General Manager of one of the Electricity Supply Companies. This gentleman makes as foolish a mess of the explanation as the electricians and the electrical journalists have done who have preceded him. As a matter of fact, he says nothing—except one ludicrous thing—that has not been said before. It seems to be a serious grievance against the Gaslight and Coke Company that they have mains in every street, whereas the Electricity Companies have not. Whether the idea is that the Gas Company ought not in tendering to have taken advantage of their condition in this respect, we cannot say; but there is the grievance right enough in black and white. Then it is said that the Gas Company have undertaken to supply gas at an absurdly low rate. They have not undertaken to supply gas at all. What they and the Electricity Companies were asked to tender for was illumination. But as to the absurdly low price the Company are believed to be charging for the gas to be consumed, the estimates of electricians have ranged from 5d. up to (in the "Pall Mall Gazette" article) 10½d. per 1000 cubic feet; whereas in the same article the net cost of production is stated to "appear" to be 1s. 10d. per 1000 cubic feet. This is carefully non-committal; and a good thing, too, because it is foolish if the figure is supposed to represent the net cost in the holder. Last year (according to the recognized authority, "Field's Analysis") the net cost per 1000 cubic feet of the Company's gas in the holders, less residuals, and including coal, salaries, wages, purifying, and wear and tear, amounted to 11'88d.; and no less than 3'87d. of this is charged for wear and tear. However, the Company are, in this respect, doing something that is little short of heinous in the eyes of this Electrical Secretary and General Manager. It would be most interesting to know if his Company are one of those with consumers connected to their cables who are taking current at 1d. or a fraction of 1d. per unit, while others are paying perhaps 4d., 5d., or even 6d.

Then there is a very comical statement, over which we are not going to spend time puzzling ourselves—this being Institution week. Speaking of the 3000-candle power lamps, the critic says: "Reckoning the average of ten hours per night, at the rate of 300 feet consumption *per hour*, the loss to the Company will be about 2s. 6d. per lamp." Dear critic, regarding this consumption, these are not big raging gas-furnaces, but inverted gas-burners; and the gas-lamps are not intended for heating London streets, but for illuminating them. It is curious, but it is true, these electrical critics have suddenly dropped into a greater knowledge of high-pressure incandescent gas lighting than gas companies themselves possess. This one points out that there is the very difficult problem of keeping a high standard of light with the fragile mantles. The inverted mantles are quite different things from the upright form in regard to their durability. But why do the electricians worry over these matters? It is the Gas Company who have to face the penal clauses—not the Electricity Companies. The same fount of gas knowledge informed the "Pall Mall Gazette" that he did not think it possible to obtain 3000 or 4000 candle power with gas. References in opposition: Aldwych, and *ante*, p. 691. But there are the poor shareholders of the Gaslight and Coke Company. Over them, the electricians are sympathetically lachrymose. How grateful the shareholders ought to feel. The strange thing is there has not been a slump in the Company's shares through the agitation of shareholders frightened over the Company securing this Westminster lighting business. But, there, the greatest absurdity is the display of affectation on the part of electricians. Keeping the matter alive, by indulging in so much assumption, shows how severe the blow has been, and how hard it is to forget it.

The "Electrical Review" has published an article headed "Street Lighting: Electricity *v.* Gas." There is nothing new about it. But there is in it a reversion to the long-since published intelligence as to the action of the Corporation of Berlin in having resolved to convert the street lighting arrangements, by a fixed annual expenditure, to high-pressure and low-pressure inverted gas-lamps. A large part of this work has already been done. The matter was referred to in the report of the City of London deputation nearly twelve months since; and the "Electrical Review" has just bestirred itself into making inquiry into the matter. But it seems that our contemporary has confined inquiry to electrical engineers, and has not been sufficiently inquisitive to go to quarters from which definite information could have been obtained. The electrical engineers, however, concur in saying that "they have no knowledge of any such intention on the part of the City Council; but they would not be surprised to hear of it at any time, because the gas-works belong to the City and the electric

works to a Company." The same old tale. Now let us give the "Review" a few facts as to the truth of which they may inquire of their electrical engineering friends who would not be surprised, &c., or of more reliable sources of information. The Municipal Council of Berlin are gas suppliers; but they take no credit for the gas used for public lighting, and so seriously diminish the profit on the undertaking. The Imperial Continental Gas Association, however—a large private concern (with a capital of several millions) of which peradventure the "Review" has heard—also light a very considerable portion of Berlin proper, and nearly all the western suburbs. Furthermore, the Municipality draw an extraordinarily large revenue from the electric light undertaking; and so the more current that is used, the better for them. This rather alters the position as presented by the "Review."

Then this mirror of electrical opinion says the Corporation of the City of London ought not to have much difficulty in dealing with any such recommendation as that alleged, for they themselves possess ample testimony, from actual experience, of the great advantage of electricity for street lighting over high-pressure gas-lamps. This is why, we suppose, electric arc lamps are about to be uprooted in New Bridge Street, and high-pressure gas-lamps take their place. Our friends of the "Review" are fond of antiquity. There comes to mind some testimonials as to the superiority of electric lighting published in its columns, the writers of certain of which by the time of publication had passed to the land where neither rust nor moth corrupts, and where electric bills and collapses cease to trouble. The experience of the great advantage, &c., which the "Review" refers to, is a test of three or four years ago between flame arc lamps and high-pressure (vertical burner) gas-lamps. Our contemporary, without any reference to the dictates of its conscience, says the illuminating power of the three flame arcs used in the tests was 3951-candle power (it is necessary to be particular to 1 when dealing with candle power in four figures), as against 1220-candle power by the five gas-burners. Because our contemporary lives so much in the past, it has not heard of single high-pressure inverted gas-burners that will give 1500-candle power on much less consumption of gas than was required by the old type of, and only half as efficient (if that), high-pressure vertical burner. Our contemporary does not know that high-pressure lighting has been greatly advancing in efficiency; and, in its ignorance, it finds it amusing to read the statements of gas companies as to the relative cost of incandescent gas and electric lighting. Let our electrical contemporary go on finding similar amusement, for its laughter under such circumstances amuses others. There is much else in our contemporary's article; but it is of the common order of electrical argument. There is an omission. We do not see any notice in the article as to Westminster, Bethnal Green, and Hackney having bowed to the inverted gas-burner, and resolved to make no conversions to electricity for at least five years.

Electrical news is informative as to the scraping together by electricity-supply departments of all the little pieces of municipal lighting or power business that they can lay hands on. This is interesting; and it is easily worked. Nothing is left undone to enable the municipalities to carry out their sacred duty of making the electricity undertaking pay at the expense of the ratepayers. One thing that is done is to so arrange Committees that the interests of the electricity undertaking are well looked after. We seem to trace cause and effect in one or two happenings in connection with Hastings; and illustration of one of the serious disadvantages under which gas companies are placed who have to compete with municipally-controlled electricity concerns. A report was recently made to the Hastings Town Council regarding the comparative cost of gas and electricity for lighting and power at the Corporation Queen's Road Depot. The average for four years' gas, of course, came out higher than for electricity. But there is a careful guarding from the public of knowledge as to the price per unit charged at the depot; and there is no statement as to the time and work conditions under which the rival commodities were used. We should not be surprised to learn that some old gas-engine that sadly needed repair or replacement was formerly used for power, and that old flat-flame burners were partly, if not wholly, employed there (especially in the winter time by the men for warmth), without any consideration for economy. Notwithstanding, the difference in cost is only a few pounds; but in this comparison, the Committee take no account of the £208 (or thereabouts) that it was estimated would have to be, and so no doubt was, spent on the electricity installation, repayment and interest on which on the ordinary lines would represent a financial engagement running over some twenty years. It is, too, a beautiful example of the effrontery of the Roads Committee publishing a comparison like this without details, when the Electricity Committee have had £2000 from the rates for the same year to cover trading losses. Perhaps a bit of this was lost at the depot. But this paragraph may end on the point with which it started. It is interesting to note that Mr. Councillor Coussens, the Chairman of the Roads Committee, is also a member of the Electricity Committee; and therefore to that extent he is partly responsible for running the electricity undertaking at a loss. Alderman Tree, who in the Council expressed his delight with the saving shown at the depot, is the Vice-Chairman of the Electricity Committee. There are, we believe, altogether seven or eight members who sit on both the Roads Committee and the Electricity Committee. Recently the Electricity Committee have been increased by the addition of four members; so that now, with a little engineering, the Electricity Committee can have a majority on most of the

Corporation Committees. How can a private competitor hope to work in obtaining municipal business against such a condition of things as this, or how can the interests of the ratepayers be safeguarded?

There are one or two interesting points regarding charges for electricity before us. In various quarters lately, there has been much discontent regarding the repressing power, in the matter of trading freedom, of the old public lighting clause in Gas Acts, which gives the local authority the right to have gas for public lighting at the lowest price charged to any consumers in the district of supply. This clause had birth when gas was used only for lighting purposes; but the local authorities in most cases now, notwithstanding the changed conditions, refuse to recognize that the clause refers to the lowest price under the circumstances existing at the time it was framed, and insist on its literal interpretation under the modern conditions of gas use and trading. The unfairness of this is obvious. Electricity suppliers are not subject to this restriction; and certainly, in common fairness, the regulations affecting the supply of gas and electricity ought to be on uniform lines to give equal freedom in competition. The matter in a somewhat similar form has cropped up at Watford, where, at a Local Government Board inquiry, it has been asked that no firm or firms, or private consumers, should be supplied at a cheaper rate than that paid for public lighting. Of course, the electricians can trot out no end of musty stock answers to this request, though there is no doubt that, if the suggested regulation were applied, and the average public lighting charge were adopted as the minimum price for any private purpose, there would be less cause for complaint as to the ridiculously low charges made for power and heating in some places. Designedly we use the word "average," as several cases have come under notice where, though the street lighting load comes on top of the private lighting load, the price for current for street lamps, in order to get to a cost something comparable with gas, has been cut down to an extraordinarily fine figure per unit—so fine that we should not be surprised to see it disappear altogether, and some excellent and receptive alderman get up in the local council and assure his fellow-members that the electrical engineer tells him, and he is convinced, that the transaction is a healthy thing for the electricity station.

As to the second point, in regard to prices. In certain places—Sunderland comes to mind—there have been little tussles regarding the price of energy for driving motors used with gas-compressing plants for high-pressure gas lighting. Of such plants, electricity departments are highly jealous; and apparently, judging from their attitude, find them dangerous competitors. This finds expression in a resolution passed by the Electricity Committee of the Woolwich Borough Council that, for the guidance of consumers, the term "power" shall include all purposes to which electrical energy may be applied other than for use either directly or indirectly for lighting. The price of supply to consumers who use motors for driving gas-compressing plants is now to be at the rate of 4d. per unit. Electricians are mightily inconsistent nowadays in respect of those principles that of old they used to "love, honour, and obey" in ordering their prices for different purposes. A motor for a gas-compressing plant is required practically every working-day of the year; but an electric radiator is required only in the winter time, when more current is needed for lighting. The electric heater is favoured. The public lighting load comes on top of the private lighting load. That, too, is favoured as against the motor for the gas-compressing plant. A motor is employed for driving a knife-cleaning machine. That is favoured against the motor for driving a gas-compressing plant. The motor that drives a gas-compressing plant demeans itself. It is a pariah, and must be treated accordingly. What idiocy! By making this distinction, electricity suppliers not only bring ridicule upon themselves, but help to advertise the economy of high-pressure gas lighting. Some of them would, if they could, refuse to supply these motors altogether. Sunderland tried this on; but the law was not with the Electricity Department, and happily this was realized before going to further senseless lengths.

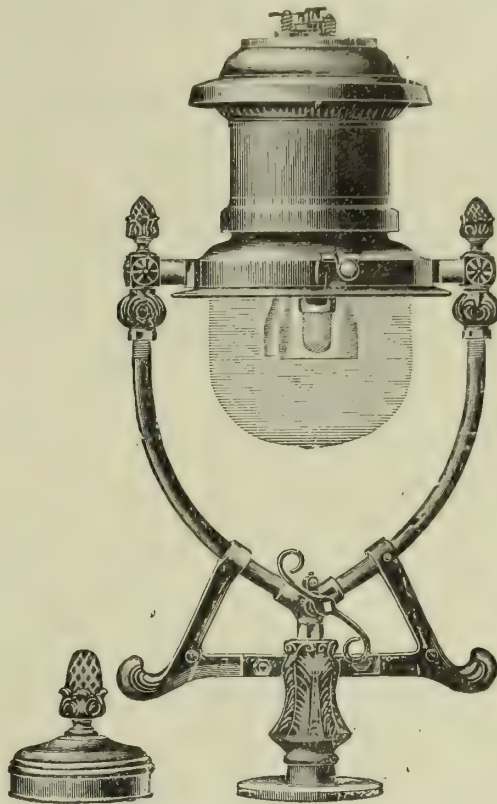
The Livesey Professorship at Leeds University.

At the monthly meeting of the Council of the Leeds University last Wednesday, the draft Deed of Gift by which the Livesey Memorial Fund is transferred to the University (*ante*, p. 487) was approved. An Advisory Committee was appointed to manage the department under the control of the Council, and the following resolution was passed: "The Council record their deep sense of the honour done to the University by the offer of the fund raised as a memorial to the late Sir George Livesey for the endowment of a professorship of applied chemistry relating to Coal Gas and Fuel Industries. The Council gratefully accept the offer, and hereby establish a Livesey Professorship of Coal Gas and Fuel Industries, subject to the conditions prescribed in the Deed of Gift submitted on behalf of the Livesey Memorial Fund."

Among the honorary degrees conferred by the University of Cambridge on the occasion of the announcement of the results of the Mathematical Tripos last Tuesday was that of Doctor of Science upon Sir Oliver J. Lodge, Principal of the University of Birmingham, and Mr. W. H. Perkin, Professor of Organic Chemistry in the Victoria University, Manchester, and son of the discoverer of the aniline dyes.

GRAETZIN STREET-LAMP IMPROVEMENTS.

THERE is now to be seen in the show-rooms of Messrs. J. & W. B. Smith, of Farringdon Road, a type of Graetzin street-lamp which embodies one or two improvements that should add further to the popularity of this particular make of high-power gas-lamp. As shown in the illustration, air and gas adjustment are secured from the outside; all the regulating parts being at the top of the lamp, and simply covered by a removable cap. The addition to the lamp, however, to which our attention was principally directed was in connection with the arrangements for lighting. This is accomplished from the outside; and there is no need to have a bye-pass burning during the whole of the twenty-four hours. When lighting-up time arrives, all that it is necessary to do is to give the lever a quarter-turn, in which position it acts upon a spring



A Graetzin Street-Lamp.

fitted just above it, and this allows what is practically the bye-pass supply of gas to flow—the main-cock being bored for this purpose. The bye-pass gas, taking, for example, a two-burner lamp (though, of course, the device could be equally well arranged for any other number), then passes into a three-way spray. One outlet of this is in direct line with a small channel communicating with the outside of the lamp; and there in a very short space of time sufficient gas collects in this aperture for the attendant to light it with a torch, when the flame flies back to the other two jets of the three-way spray. When the lever is given another quarter-turn the spring already referred to is released, and the bye-pass supply consequently cut off—the full flow of gas passing to the burners. Thus the bye-pass is shut out of action both when the ordinary gas supply is full on and when the lever is turned right to the "off" side. This should prove a useful adjunct to the lamp—from the point of view of convenience, as well as that of cost of gas and maintenance.

Reduction in Price by the Commercial Gas Company.—The Directors of the Commercial Gas Company announce a reduction from 2s. 6d. to 2s. 4d. per 1000 cubic feet in the price of gas, commencing from the taking of the Midsummer quarter indices. In a notification to the prepayment consumers, it is stated that the penny-in-the-slot meters are adjusted to give 25 cubic feet of gas for each penny; being at the rate of 3s. 4d. per 1000 cubic feet. The collector will calculate the amount required to pay for the gas consumed at the rate of 3s. 2d. per 1000 cubic feet, and return to the consumer the difference.

British Rainfall Statistics.—The British Rainfall Organization, which was founded by the late Mr. G. J. Symons in 1860, has been placed upon a permanent footing by the gift of the unique collection of rainfall records, and the leasehold of the historic rainfall house in Camden Square, to a Board of Trustees, who are all rainfall observers, consisting of Dr. H. R. Mill (Chairman), Sir John Murray, Sir Alexander Binnie, Mr. Francis Druce (Treasurer), Mr. R. M. Barrington, Mr. C. L. Brook, Mr. C. J. P. Cave, Mr. D. W. Freshfield, Mr. H. Mellish, and Mr. J. G. Wood. An endowment fund is being formed by the Trustees, and several observers who intended to leave legacies have expressed their intention of contributing the amounts to this fund. The institution has always been self-supporting.

PUBLIC LIGHTING—COMPETITION AND CHARGE.

A RETROSPECT AND A FORECAST.

[COMMUNICATED.]

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(Concluded from p. 695.)

IT is interesting here to note that it was in 1852 that the first officer was appointed to test the gas for illuminating purposes—viz., Dr. Letheby. In 1860 the police first rendered assistance by reporting the defects in the public lamps, owing to the “loud

complaints,” while in 1864, for the first time, it was suggested that a “Clerk of the Works” be specially appointed for the “inspection of the public lighting, and to give his whole time to that duty.” Thus the period of “districting” and “competition” and the beginning of “amalgamation” has been dealt with, when the charge for public lighting by meter was in vogue. The following table shows the prices charged for public lighting for 54 years.

During 1865, a Special Committee in the City of London sat dealing with complaints as to defective street lighting and the inferior illuminating power of the gas, and considered as to the propriety of—(1) Seeking statutory powers to take upon itself the manufacture, supply, and sale of gas; (2) as to purchasing the mains of the gas companies and establishing a manufactory for

TABLE Showing Prices Charged per 1000 Cubic Feet of Gas for Private Consumption, and the Prices Paid for Lighting the Public Lamps from 1807 to 1864 Inclusive.

| Name of Company Contracting for the Public Lamps | | | | | | | | | | | |
|--|---|--|---|--|---|--|----------------------------|--------|---------|-----------------------------------|---|
| Year. | City of London Gas Company. | | | Chartered Gas Company. | | | Great Central Gas Company. | | | Number of Hours Burning, 4300. | |
| | Price per 1000 Cubic Feet Supplied by Meter to Inhabitants. | Batswing Burners. Estimated Consumption 5 Cubic Feet per Hour. Price per Lamp per Annum, including Lighting, Extinguishing, and Repairing. | Price per 1000 Cubic Feet Supplied by Meter to Inhabitants. | Batswing Burners. Estimated Consumption 5 Cubic Feet per Hour. Price per Lamp per Annum, including Lighting, Extinguishing, and Repairing. | Price per 1000 Cubic Feet Supplied by Meter to Inhabitants. | Batswing Burners. Estimated Consumption 5 Cubic Feet per Hour. Price per Lamp per Annum, including Lighting, Extinguishing, and Repairing. | | | | | |
| | | | | | | | s. d. | s.* d. | £ s. d. | | s. d. |
| 1807 to 1822 | | | | | | | | | | | Rental per burner per hour. |
| 1823 | | 15 0 | 5 5 0 | | 15 0 | 5 5 0 | | | | | |
| 1824 | | 15 0 | 5 5 0 | | 15 0 | 5 5 0 | | | | | |
| 1825 | | 15 0 | 5 5 0 | | 15 0 | 5 5 0 | | | | | |
| 1826 | | 15 0 | 5 5 0 | | 15 0 | 5 5 0 | | | | | |
| 1827 | | 15 0 | 4 14 6 | | 15 0 | 4 14 6 | | | | | |
| 1828 | | 13 6 | 4 14 6 | | 13 6 | 4 14 6 | | | | | |
| 1829 | | 13 6 | 4 14 6 | | 13 6 | 4 14 6 | | | | | |
| 1830 | | 13 6 | 4 14 6 | | 13 6 | 4 14 6 | | | | | |
| 1831 | | 12 6 | 4 14 6 | | 12 6 | 4 14 6 | | | | | |
| 1832 | | 12 6 | 4 10 0 | | 12 6 | 4 10 0 | | | | | |
| 1833 | | 10 0 | 4 10 0 | | 11 3 | 4 10 0 | | | | | |
| 1834 | | 10 0 | 4 10 0 | | 10 0 | 4 10 0 | | | | | |
| 1835 | | 10 0 | 4 10 0 | | 10 0 | 4 10 0 | | | | | |
| 1836 | 10 0 & | 9 0 | 4 10 0 | 10 0 & | 9 0 | 4 10 0 | | | | | |
| 1837 | | 9 0 | 4 10 0 | | 9 0 | 4 10 0 | | | | | |
| 1838 | | 9 0 | 4 10 0 | | 9 0 | 4 10 0 | | | | | |
| 1839 | | 9 0 | 4 10 0 | | 9 0 | 4 10 0 | | | | | |
| 1840 | | 9 0 | 4 10 0 | | 9 0 | 4 10 0 | | | | | |
| 1841 | | 9 0 | 4 10 0 | | 9 0 | 4 10 0 | | | | | |
| 1842 | | 9 0 | 4 10 0 | | 9 0 | 4 10 0 | | | | | |
| 1843 | | 8 0 | 4 10 0 | | 8 0 | 4 10 0 | | | | | |
| 1844 | 8 0 & | 7 0 | 4 10 0 | 8 0 & | 7 0 | 4 4 0 | | | | | |
| 1845 | | 7 0 | 4 4 0 | | 7 0 | 4 4 0 | | | | | |
| 1846 | | 7 0 | 4 4 0 | | 7 0 | 4 4 0 | | | | | |
| 1847 | 7 0 & | 6 0 | 4 4 0 | 7 0 & | 6 0 | 4 4 0 | | | | | |
| 1848 | | 6 0 | 4 4 0 | | 6 0 | 4 4 0 | | | | | |
| 1849 | | 5 0 | 4 4 0 | | 5 0 | 4 4 0 | | | | | Reduced at Lady Day to 6s. per 1000. Reduced at Midsummer to 5s., and at Christmas to 4s. |
| 1850 | | 4 0 | 4 4 0 | | 4 0 | 4 4 0 | | | | | |
| 1851 | | 4 0 | | | 4 0 | | 4 0 | 3 17 6 | | | Contract taken by the Great Central Gas Company. |
| 1852 | | 4 0 | | | 4 0 | 3 12 0 | 4 0 | 3 17 6 | | | |
| 1853 | | 4 0 | | | 4 0 | 2 19 6 | 4 0 | 3 3 0 | | | Contracts let for three years. |
| 1854 | | 4 0 | | | 4 0 | 2 19 6 | 4 0 | 3 3 0 | | | |
| 1855 | | 4 0 | | | 4 0 | 2 19 6 | 4 0 | 3 3 0 | | | Contracts let for three years. |
| 1856 | | 4 0 | | | 4 0 | 4 2 0 | 4 0 | 4 4 0 | | | |
| 1857 | | 4 0 | | | 4 0 | 4 2 0 | 4 0 | 4 4 0 | | | Contracts let for three years. |
| 1858 | | 4 0 | | | 4 0 | 4 2 0 | 4 0 | 4 4 0 | | | |
| 1859 | | 4 0 | | | 4 0 | 4 8 0 | 4 0 | 4 10 0 | | | Contracts let for three years. |
| 1860 | | 4 0 | | | 4 0 | 4 8 0 | 4 0 | 4 10 0 | | | |
| 1861 | 4 0 & | 4 6* | | 4 0 & | 4 6* | 4 8 0 | 4 0 & | 4 6* | 4 10 0 | | The Contract with the Great Central Gas Co. was for 3 ft. burners. The Chartered Co. 5 ft. burners. |
| 1862 | | 4 6 | | | 4 6 | 4 14 6 | | 3 0 0 | | | |
| 1863 | | 4 6 | | | 4 6 | 5 9 6 | 4 6 | 3 10 0 | | | |
| 1864 | | 4 6 | | | | 5 9 6 | 4 6 | 3 12 6 | | | |

a Commencement of competition. * Raised at Michaelmas to 4s. 6d.

the supply of gas, or laying down their own mains, and obtaining the supply of gas in bulk by public tender. At this time matters became so serious that it was decided to consult Mr. T. G. Barlow, “an engineer of considerable eminence,” and to have the opinion of Mr. Hawksley, “probably the first gas engineer in England,” to assist Dr. Letheby.

With regard to the charge for public lighting, the Directors of the Chartered Gas Company, in 1865, stated that until recent years “the charges had been framed on an erroneous principle, that the former price was unremunerative to them, and that, recently, the companies had come to the conclusion that there was no reason why the price to the local authority should be less than to other consumers, and that the prices had been, accordingly, calculated upon the amount of gas consumed and the other expenses incurred in the lighting, and this mode they

thought to be fair, and one from which they could not depart.” It was then finally decided to make an offer to the companies for authority to undertake the lighting, cleaning, &c., of the street lamps (affixing a meter to every twenty lamps or thereabouts, so as to ensure an average consumption), and that further assistance be obtained, if possible from the Police, in the supervision of the public lighting. It having been decided to fix the meters, the companies shortly after broke away from the attitude they took up, that a meter should be fixed to every post; and eventually it was agreed to pay upon the “average meter system”—viz., one meter to about every 36 lamps, the mean of the readings to be the charge.

PRICE PER GOVERNOR BURNER PER HOUR.

In 1865, reports of defective street lighting being continuous,

it was stated that "the deficiency cannot have escaped the observations of any one, and all the investigations of the last few years show that there has not only been a deficiency in the quantity of gas supplied, but a general neglect in most of those conditions necessary to be observed to ensure efficient public lighting;" and it was suggested that the placing of governors or regulators, "so as to ensure, in some degree, that the proper quantity of gas is afforded to the lamps," should be required of the companies.

As the system of gas lighting became extended, and the new flat-flame burner became more reliable, together with the introduction of governors or regulators that could be placed on the line of service immediately before the burners, so as to ensure that neither more nor less gas per hour than that contracted for should pass into the burners, and also to satisfy the officers under the local authorities charged with the oversight of lighting, the "average-meter system" began to fall into disuse; and with a settled number of hours for lighting per annum—viz., 4300 in the central or busy parishes, and 3940 and 3773½ for the outlying districts who take advantage of the twilight and dawn, especially during May, June, and July, and in country districts where the moon was taken into consideration, and instructions were given that the lamps were to be lighted one hour before the moon set and extinguished one hour before it rose—a scale of 2300 hours was agreed upon. The settled hours per annum—viz., 4300, 3940, 3773½, and 2300—enabled the companies to contract per lamp per annum with governor burners. At the present time, the writer only knows of one Metropolitan local authority (Shoreditch) who still retain the meter system.

In 1883, on the amalgamation of the London Company with the Gaslight and Coke Company, it was ordained by an Order in Council dated May 22, that the charge for gas for public lamps to the local authorities north of the Thames should not exceed the price charged by the Company in the area of the London Company south of the Thames—viz., that of the South Metropolitan Company's charge. This has caused a saving of many hundreds of thousands of pounds to the northern authorities, as the South Metropolitan Company's price is, at this date, 6d. per 1000 cubic feet less, and it has been 11d. per 1000 lower than the Gaslight and Coke Company.

CHARGE PER BURNER PER RECORDED PRESSURE.

In May, 1908, the City of Calcutta decided "that all public streets should in future be lighted by gas;" and at the end of last year the Municipality invited tenders for the public lighting of their city and introduced a system of charge that is as novel as it is new—viz., price per lamp per annum according to a recorded pressure. Details having been settled and the contract with the Oriental Gas Company signed, it remained to constitute a Lighting Department to carry out the details of the new arrangement. The birth of the present proposal originated from the same cause that has been detailed in the early part of this article.

The scheme which had been brought forward by the Special Gas Committee of the Corporation was the outcome of the thought and suggestions of Mr. Alfred Mansfield, who has been the adviser to the Corporation. In coming to this decision, the Chairman of the Calcutta Corporation (the Hon. A. Earle) said that while he had no inordinate belief in the capabilities of local bodies to undertake work of a commercial character, the experience of what the Oriental Gas Company had done for them, and the situation presented in connection with the public lighting, admitted of exceptional treatment.

Councillor Braunfeld, speaking at the meeting of the Corporation at the time the report was adopted, said that the experiment they were about to make might prove a success or a failure, and after all the past experience of experiments, he was not so sanguine as the Chairman and others with regard to its success; while Councillor Mitter said he was against the local administration of gas lighting, as they would not be able to fix the responsibility of anyone in particular for defective lighting.

The general outline of the scheme is as follows:—

- (a).—A general survey of the public lights should be made which should be diagonally spaced.
- (b).—Where the positions of the lights have not been selected with due regard to efficiency and economy, they should be altered.
- (c).—Lamp provided with consecutive numbers.
- (d).—The preparation of a plan on a large scale showing the positions and number of all lights, the illuminating value of the lamps to be indicated by several circles—i.e., a 40-candle power light by one circle, a 60-candle power light by two circles, &c.
- (e).—A general survey of the pressures at all points should then be taken during the hours of lighting, when the private consumption is heaviest, to ascertain the minimum pressure to be expected at any lamp. The pressures to be marked on the plan in different colours, the plan would then show at a glance any unevenness of pressure. If the plan is not found to be satisfactory, owing to the great unevenness of pressure, steps are to be taken to insist on the Company using every endeavour to distribute the pressure evenly. It being reasonable to expect that the pressure would not be higher than 3 inches, the contract provides that no pressure must be less than 2 inches.

(f).—The pressures to be taken to the nearest tenth of an inch; a separate colour being used on the plan for each tenth of an inch between 2 and 3 inches. These pressures to be accepted as pressures it is possible to maintain for an extended period, and at which tests of the consumption of nipples will be made.

(g).—Having settled the plan of pressure, the next step is to ensure that these pressures are maintained. For this purpose, positions must be selected for fixing recording pressure-gauges. Each recording gauge is to be an index of the pressure of a certain number of lamps. For instance, if a pressure recorder indicates a pressure of 2½ inches, it will show that every lamp would be getting, within a certain area, not less than 2 inches. The nipples being tested and gas paid for at these pressures, care must be taken that the penalties are enacted for any fall of pressure on the recorder below 2½ inches; a table of penalties to be prepared in connection with each pressure holder.

In addition, a laboratory is to be set up with a laboratory assistant, to make tests and see that the conditions of the contract are faithfully carried out, and the records tabulated. He is to be a superior, well-paid man, be familiar with instruments of precision, and have had experience in laboratory work. He should be able to understand and appreciate the difficulties of distributing gas over an extended area, and rigidly enforce the penalties clauses when desirable. It was also suggested that the Chief Engineer of the Municipality, who had been associated with Mr. Mansfield in the preparation of the contract, should be the officer responsible for the carrying out of the contract; being, in Mr. Mansfield's opinion, eminently capable of undertaking the work, having an excellent knowledge of the subject, and skilful in the laboratory—debiting the new Lighting Department with a portion of this official's salary.

It was decided to appoint a "Superintendent of Lighting" at a salary of £400 or £600 per annum, according to ability, who should have full charge and be capable of advising the Corporation as to the Department, selection of burners, &c.; be experienced in photometric work; able to take charge of a thoroughly up-to-date and well-equipped laboratory; and capable of accurately testing pressures in and outside of the laboratory, and of determining the discharging capacity of burner nipples. This latter would be the measure of the amount of gas to be paid for in the lighting contract—the Corporation having proper and efficient apparatus for doing this work.

To assist the new Lighting Superintendent to properly carry out his duties, four overseers are to be appointed, four supervisors, ten special men for the renewal of mantles, fifty lamp-lighters, having an average of fifty lamps each to attend to (making 180 lamplighters in all), with ten extra lighters in case of sickness. The City will be divided into four sections, having its headquarters at the district offices of the Corporation. An overseer and supervisor would be attached to each section; their duties being to take care of the pressure recorder.

In addition to this oversight and supervision, and so that the Corporation might be satisfied that the whole department was working in the most efficient manner, that the records were being accurately kept, the instruments kept in perfect order, the lights working at their best, and no excess of gas being paid for, Mr. Mansfield suggested that an independent expert should investigate and report fully once a year on the working of the whole system, at a fee of 100 guineas per annum. The brunt of the work would fall upon the new Superintendent of Lighting to be appointed; but it was not proposed to exclude the Chief Engineer from his proper share of supervision. He would deal with difficult points as they arose.

The burners to be used are to be of the incandescent type (up-right or inverted) capable of consuming 3, 3½, 4, and 5 cubic feet of gas per hour at 20-10ths pressure. The burners are to have arrangements by which the nipples can be easily and quickly changed, to make the burner suit different pressures; but 20-10ths is to be the minimum pressure on which they will be used. The air inlets are not to be adjustable, as it is found that the lamp-lighters and cleaners are apt to interfere with adjustable openings. The quality of the Calcutta gas is of 14-candle power, when tested with the No. 2 "Metropolitan" burner, and is of rather low calorific value. The nipples for the burners are all stamped with their size legibly by a number representing its diameter in one-thousandths of an inch; the lighting hours being 3914 per annum.

This experiment will be watched by all gas engineers concerned with the question of public lighting with unusual interest, more especially in view of the magnitude of the experiment; there being some 270 miles of streets in the City of Calcutta, and the operation extending to (say) 9000 public lamps.

CHARGE PER ILLUMINATING VALUE.

Following closely on this innovation of charge of the Calcutta Municipality came, during the early part of this year, the decision of the City of Westminster, when fixing their new contracts for public lighting, to abandon the old method of paying per cubic foot of gas or unit of electricity consumed, and to inaugurate an equally new system of charge—viz., the payment per tested illumination value; the lamps, whether of gas or electricity, being tested *in situ*. Advantage being taken of the expiry of certain

electrical contracts in various parts of the city, tenders were advertised for the lighting of the thoroughfares concerned; and it was felt that it was now possible to deal with the subject in a comprehensive manner, owing to the marked improvements which have been made in recent years in the methods of producing light from gas and electricity at less cost per unit of higher power than formerly, and the still further improving of the lighting without any extra cost.

Competitive tenders were therefore obtained from the Gaslight and Coke Company and the Electric Lighting Companies for the installation of lighting units of different powers—viz., 90, 180, 300, 1800, and 3000 candles; the Council being placed in a position to select one or other of the lighting units, according to the needs of each class of street, as may be determined by considerations of width, traffic, &c. For the supply of gas or current, as the case may be, to these several units, and for maintenance, the Council obtained tenders for a term of 5, 10, or 15 years.

The Council invited the tenders on the basis of so much light for a given number of hours per annum. They contended that candle power—for instance, 90 or 3000 candles—has exactly the same value whether produced by glow-worms, gas, or electricity; and for practical purposes in the streets, the only factors were the width of the thoroughfare and the height of the column. All they had to consider was the cost of the installation and the annual up-keep cost. The test for carrying out the contract would be the portable outdoor photometer; the tests being made by the Council's officers. Under the conditions of the contract, the Company having the lighting are to be mulct in a penalty of 5s. per day for every lamp not giving the specified candle power provided by the conditions of the contract. The Gaslight and Coke Company having obtained this contract, are to replace flame arcs with high-power gas lamps. This will cause any local authorities who are about to enter on new contracts to pause and hold their hands, as they watch the results of the Westminster experiment. The largeness of the experiment, as well as the importance of the area, will cause it to be very carefully scanned. Some idea of the magnitude of the new contract may be gathered from the fact that 3056 lamps of all kinds (gas and electric), giving approximately 350,000-candle light, will be done away with and 2708 modern low-pressure inverted and 179 high-pressure inverted gas-lamps, giving about 800,000 candles, will take their place; while the annual cost will be less—viz., £14,450, against £15,642. The contract is to be based on illumination; and though many are somewhat sceptical with regard to photometrical tests of street lamps *in situ*, yet all will await with interest the results of the further investigations of Mr. Bradley (Westminster City Engineer) and Mr. Jacques Abady, the Chairman of the Works Committee, to whom are due the inception and the carrying out this new step in public lighting charge.

ILLUMINATION OF INTERIORS.

Daylight Illumination.

As announced in the "JOURNAL" for the 7th inst., arrangements were made a short time since for the delivery of three special lectures, on the "Illumination of Interiors," at the East London College, Mile End Road. The first was given on the 8th inst. by Professor J. T. Morris, M.I.E.E.; his subject being "Daylight Illumination."

The lecturer began by remarking that though the question of illumination is one with which people are so familiar in a general way that they imagine they have a very good idea of the subject, yet, as a matter of fact, there is probably not one on which there are so many erroneous ideas. In order that some of these might be removed, it was necessary that the problems involved should be approached in a thoroughly scientific manner; and though it would be impossible, in the three lectures to be delivered, to deal with anything more than outlines, it was hoped that even this would clear away some of the false impressions existing in many minds.

With these introductory observations, the lecturer proceeded to consider his subject. He pointed out that if we place a powerful electric lamp immediately in front of some reading matter, and then view the latter with the direct rays of the lamp full in our eyes, we shall observe that while the print can be read this can only be done with difficulty. The eye feels strained, and there is a natural instinct to screw up the eyelids so as to reduce the dazzling effect on the eye. On the other hand, if we place the lamp to one side and screen it, or, what is better still, place the light so as to shine over the left shoulder, it will be found that we can read with ease. In the first case, the print must have been much more brightly illuminated; and yet the lighting, from a practical point of view, was not nearly so satisfactory. This brought out the important fact that practical illumination is more a question of contrast than of absolute intensity. It is desirable, for the satisfactory viewing of an object, that all others within the field of vision should be illuminated as little as possible. And yet there are people about who do not seem to realize this elementary notion. It should further be remembered that, even if we can see "somehow," satisfactory eyesight can only be preserved by attending to questions of the nature of those just referred to. It would be very desirable, said the lecturer, if all lighting could be done on the indirect system—i.e., could be so arranged that the lamps giving light—the light sources—should

not be seen. This could be done by inverted electric arcs; but the method was too wasteful for ordinary purposes.

Professor Morris next passed on to remark that both candle power and illumination are comparatively easy things to measure in a properly equipped laboratory; but that until a few years ago there was no really simple and reliable method of measuring daylight. Mr. A. P. Trotter, of the Board of Trade, and Mr. P. S. Waldram have, however, devised instruments and carried out tests with them which he thought must rather startle people who have not given any special attention to the subject. Some of Mr. Waldram's results and others obtained at the East London College on the light coming from the sky and the proportion of it entering the building through the windows of different rooms were of great interest. If a sheet of printed matter were handed to a person, with the request that he would examine it first in an average lighted room and afterwards in the open air, and then state what he considered was the ratio of the inside to the outside illumination, he would probably, as a generous and outside limit, say the latter was ten times as great as the former; but, as a matter of fact, a nearer figure would be from 100 to 2000 times as great. Another important point was the wide fluctuations taking place in light during an ordinary day. The eye is only capable of following them to a small extent, and it is a very poor guide with which to judge the intensity of illumination. In this connection the lecturer exhibited a diagram prepared from measurements taken in the College grounds during the afternoon and evening of the 7th inst. It showed that the maximum light value was reached at 3500 candle-feet, and after fluctuating for several hours it gradually began to fall off until, at 6.30 p.m., the intensity was only about one-twentieth of its value at midday, while by 8 p.m. it had come down to such a small quantity as not to be recognizable on the curve plotted to the original scale. The light continued to decrease until at 9.5 p.m. it had fallen to a value of 0.02 of a candle-foot in comparison with 3500 candle-feet at midday. At 9.10 p.m. the arc lamps in the grounds were lighted, and the illumination then rose to 0.1 candle-foot. The lecturer explained that very few of these wide variations in the daylight could be distinctly observed with the eye until they amounted to reductions of several hundred per cent. This was owing to the remarkable adapting power of the eye. Calling the minimum amount of light necessary for telling the time by a watch unity, an illumination 10,000 times as great would still not seem dazzling. He thought it was doubtful whether any other organ of sense was capable of encountering such wide ranges.

The next matter dealt with was the question of window efficiency; and the striking fact was presented that the ratio between the intensity of illumination increases in a room, while that of the sky remains constant over wide ranges. This was exemplified by the tabulated results of some tests made at the East London College and in several well-known buildings. The lecturer remarked that the ratios would remain fairly constant, providing there was no direct sun on the windows, whether the day were bright or dull, or whether in full daylight or in dusk. They would depend in a large measure upon the ratio of window area to floor area; and, this being so, he thought it of interest to examine briefly the legislative and other regulations laid down on this matter. He pointed out as a significant fact that nothing was said about artificial illumination; and it was with the object of removing the widespread ignorance existing as to what constitutes satisfactory lighting under greatly varying conditions—in short, of putting illuminating engineering on a scientific basis—that the Illuminating Engineering Society had been formed. Reverting to the subject of the ratio of internal to external illumination, the lecturer said it must be remembered that while this remains fairly constant provided there is no alteration in the method of decorating the room, the latter has a very marked effect. Many people blame the architect for the bad lighting of an apartment, when probably they are themselves largely responsible for it, owing to their selection of a dark coloured paper for the decoration of the walls.

Returning to the subject of the remarkable adaptability of the eye to different intensities of light, the lecturer explained that this was made possible by the power of contraction possessed by the pupil, so that it can automatically shut out the light, and keep more or less constant the quantity falling upon the optic nerve. In order to obtain some quantitative figures on this matter, experiments were carried out at the College; and the results were given. They showed that when a person looks slightly away from the direct rays of light, the pupil opens over 50 per cent.; and the lecturer thought it was probable that in this condition the eye is more strained than when it is looking direct at the light, but with the pupil considerably contracted.

The instrument used for measuring the quantity of illumination in the experiments referred to was Mr. Trotter's daylight photometer, a description of which brought the lecture to a close.

We have received from Messrs. J. G. Hammond and Co., Limited, of Birmingham, Section I. of their "Miniature Pocket Directory of Gas Undertakings for 1910." It includes particulars in regard to all the gas undertakings in Great Britain and Ireland, corrected to date from special information received. The book consists of 48 pages of tables (8 in. by 5 in.), which in two folds are brought down to a convenient size for the pocket. The particulars furnished comprise the name and population of each town, the names of officials of the undertaking, financial and working statistics, number of consumers, and prices charged.

THE QUALITY OF LIGHT.

The above-named subject formed the basis of a lecture delivered a short time ago before the Franklin Institute, Philadelphia, by Mr. PAUL F. BAUDER. It contained much matter which has come before most of our readers in various ways; but it may be of interest to reproduce some portions of it.

The lecturer began by remarking that as new illuminants have been placed upon the commercial market, the question has arisen as to the relative value of the light given by them as an artificial duplicate of daylight. Such a broad use of the term "daylight" had, he said, led to much discussion between the advocates of each artificial light source; and it was his purpose to submit the results of some investigations upon which an estimate could be formed as to the comparative merits of each of the more common commercial illuminants. Daylight was the only natural light source; while under the heading of "Artificial Illuminants" might be placed all those which have been in use from the beginning of time. The qualities which mark the sun as the ideal illuminant for the majority of conditions, might be classified under the following headings: Intensity, colour value, direction of rays, ability to reveal detail, and adaptability. These qualities the lecturer proceeded to consider separately.

Dealing first with the intensity of daylight illumination, Mr. Bauder pointed out that the sun is brightest at noon; in other words, it is at its maximum intensity when there is the smallest chance for its direct rays to enter the eye and injure the retina. At sunrise and sunset, however, the rays of light come in a horizontal direction, and are therefore more liable to cause injury to the delicate interior of the eye. At the same time, the organ will adapt itself to great changes in the intensity of daylight. With regard to colour, daylight is composed of varying proportions of the seven primary or fundamental colours; and its greatest variation in quality may be attributed to the different percentages of these colours. In all forms of daylight, a certain relationship exists between the different component colours. The directional relation of natural light plays a very important part in the general appearance of any surroundings. Maximum daylight is usually received in a plane approaching more nearly the vertical than the horizontal; causing shadows and high lights to appear in correct proportion. On the other hand, an extremely flat effect would be caused by a light with almost complete diffusion. The question of having the proper direction of light in order to make objects visible and reveal detail has a direct bearing on visual acuity. The important requirement for a light is that one may be able by it to distinguish colour values, fine detail, &c., with the proper intensity and direction.

The qualities of efficiency and steadiness of light production may be grouped under the heading of "Adaptability," inasmuch as all light should be readily adaptable to meet various requirements. The light from the sun was primarily used for purposes of mechanical labour, where the necessity of revealing fine detail, obtaining proper colour quality, and intensity were not needed to so great a degree as they are at the present time. On account of the requirements which have been developed in the progress of civilization, daylight has failed to answer for all purposes, due to the fact that our vocations must be pursued at all times without depending upon daylight. For this reason the adaptability of all sources of light, both natural and artificial, must be given proper consideration. It has been necessary to use prismatic glass, and to adopt an entirely new construction of building and skylights, in order to use natural daylight for such classes of effort as are generally undertaken for manufacturing and industrial purposes. It is true that artificial illuminants must be adapted for more diverse purposes than daylight. They must likewise be directed in such a manner as to meet all interior requirements. Practically all commercial illuminants have been designed with this thought in mind. The ideal light source, on the other hand, must have such qualities of colour and ability to reveal detail, such intensity and direction of maximum rays, as to make it capable, in all conditions of service, of meeting certain requirements depending on the conditions surrounding the work for which they were intended.

Having indicated the various characteristics of daylight, the lecturer proceeded to compare them with the similar qualities of various illuminants, with the object of determining, from the standpoint of adaptability, which is the best for use under certain conditions. This part of the lecture is given practically in full.

The illuminants compared were the following: Carbon treated filament lamp; carbon untreated filament lamp; "Gem" metallized filament lamp; tantalum filament lamp; tungsten filament lamp; Nernst lamp; enclosed arc; upright gas arc; and inverted gas arc. The light flux of all these lamps was so different, that no attempt was made to determine their candle powers. The endeavour was to obtain the actual effects of the quality of light produced by these sources. The brilliancy of any of them is so far below that of the sun, that the impossibility of obtaining comparisons in intensity between them and the sun is apparent.

In referring to the intensity of the light sources investigated, the advisability of placing one of high intrinsic brilliancy a sufficient height above the floor level of any space, in order to benefit by the principles previously noted regarding the sun, is self-evident. An alternative, likewise possible, is to reduce the intrinsic brilliancy of the source by using glassware of proper design and

intensity to increase the diffusion of light and to decrease its brilliancy. By the use of this principle, the necessity of resorting entirely to height in order to produce a sufficient diffusion of light is eliminated.

The question of the colour value of given commercial light sources is one which has caused more diverse opinions to be raised than any other quality of artificial illuminants. All artificial light sources have a characteristic quality of colour which is apparent from observation. The colours of the illuminants investigated may be tabulated as follows:—

| Designation. | Colour. |
|--|-----------------------|
| Carbon (new) | orange-yellow. |
| " (seasoned) | yellow. |
| " metallized (new) | pale yellow. |
| " metallized (seasoned) | yellow. |
| Tantalum (new) | yellow-white. |
| " (seasoned) | lemon-yellow. |
| Tungsten (new) | cream-white. |
| " (seasoned) | yellow-white. |
| Nernst lamp (new glower) | pale lemon-yellow. |
| " (seasoned glower) | deep lemon-yellow. |
| Enclosed arc (opal outer, clear inner globe) | bluish-white. |
| Gas arc, upright (new mantle) | pale greenish-white. |
| " " (seasoned mantle) | pale greenish-yellow. |

The colours of these sources are not readily apparent when used for general illumination purposes. Nevertheless, when a given series of colours is viewed beneath the light from any one of them which in each case is compared to the similar result under daylight illumination, it is evident the effects produced vary a great deal from the true colour values as seen under daylight illumination.

The true importance of obtaining the best form of illuminant, in order to give the most desirable and attractive results for all classes of service, may be observed when a comparison is made between the colour effects produced by a carbon and tungsten illumination and daylight. The results show that a surprising advance has been made in the incandescent lamp industry in the endeavour to get a type of lighting unit which would cause objects to appear more nearly natural under artificial illumination.

Not only for store lighting, but likewise for residence lighting, the production of the proper colour values and of the proper intensity and direction of light to give a pleasant appearance to interiors should be the general aim for all users of artificial light. Not only from the standpoint of the merchant, but likewise from that of the architect, the interior decorator, and the furnisher, there is necessity for obtaining the best means to advance his efforts in artistic lines. This view should not be limited to mere financial ends for the use of light, but a lasting benefit should be gained by improving the standards for all classes of human effort in art and decoration as well as commercialism.

It has been shown that, from the standpoint of direction of light, there must be, for satisfactory illumination, not a complete diffusion, but a balance giving the proper proportion of light and shade. In order to obtain a true determination of how different interior decorations are affected by the use of light of varied colour quality, the effect accentuated to a certain degree may be observed by projecting on a coloured curtain the three primary colours of light—red, green, and blue. If the colours on the curtain and the primary colours of directed light were pure or free from a combination of colour pigments forming them, the lines which were not illuminated by a light of a corresponding colour quality would appear black. This is easily appreciated, for the colour which is seen is only the impression received upon the retina of the eye by wave-lengths of light which have not been lost by absorption after falling upon the coloured surface. The necessity for obtaining a proper proportion of colours forming the light flux emitted from an ideal artificial light source, whether alone or with the aid of glassware, is apparent. This proportion might not be that of daylight, but the colours composing the ideal light source should be such that there would be an equal or equivalent percentage of each of the fundamental colours.

It is evident that the æsthetic tastes are sometimes appealed to by an incorrect use of illumination, in order to impress the observer with the beauty of surroundings. A more useful result would, however, be obtained by making the most practical efforts to impress the user of artificial light with the necessity for living and working to his best advantage under conditions requiring the use of artificial light. Owing to the inability of natural light to meet our modern requirements for constancy of intensity, colour value, &c., it is obvious that artificial light sources correctly applied must be adopted.

It has been shown that some of the investigated sources are better for one condition of service than are others; and it must be concluded that the best artificial illuminant at present upon the commercial market is that which is adaptable to the largest number of classes of service, providing that it maintains a high standard of the before-mentioned qualities of light.

The importance of obtaining the best possible illumination can be better appreciated when it is considered that, at the present time as never before, there is in the minds of most people a broader comprehension of what constitutes good illumination. The five qualities of the ideal light source should not be overlooked, for many thousands of dollars are spent annually on the production of pleasing lighting effects. If these can be improved, and the art of illumination placed upon a higher plane, we are effecting material progress.

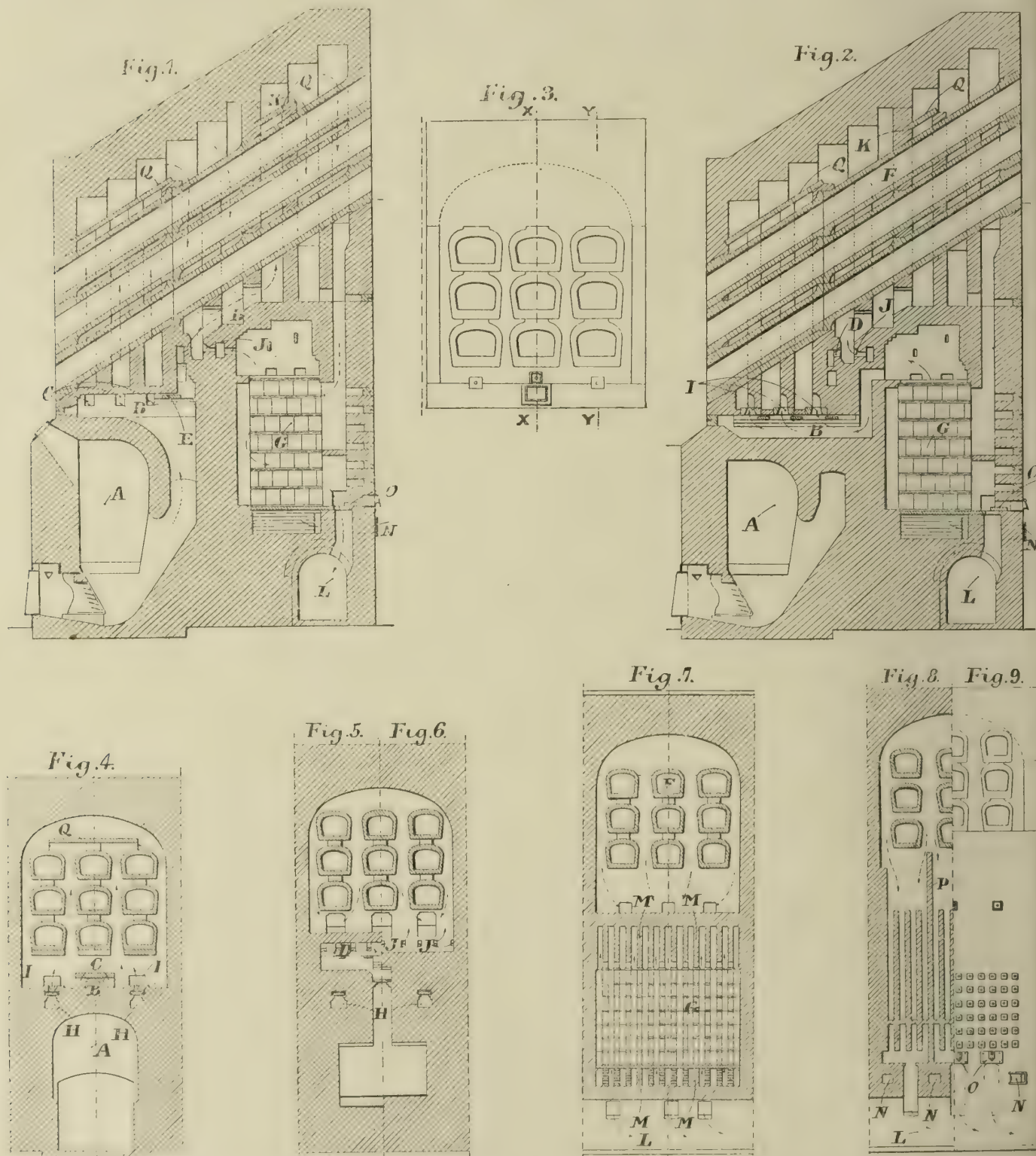
HEATING RETORT-SETTINGS.

The specification has lately been published of a patent taken out for France by MM. Stein et Cie. for a method of heating inclined or horizontal retorts for the distillation of coal or any other material. The setting is heated by three rows of nostrils—two being placed before it, perpendicularly to the front, and the third in an intermediate position. The front part of the retorts is heated by the two first-named rows of nostrils, and the products of combustion mix with the flames coming from the other nostrils and heat the back part.

The arrangement is shown in the accompanying illustrations,

in which figs. 1 and 2 are longitudinal sections of the setting—the former on the line X and the latter on the line Y of fig. 3, which is a front view. Figs. 4 to 8 are sections of fig. 1 and fig. 9 is a half back view of the setting.

The gas generator A is similar in construction to an ordinary generator. The gas produced flows into the chamber B, which communicates with the combustion chambers by means of the openings C D, which are provided with dampers E. The gases produced in the generator pass into the combustion chambers by two series of nostrils, following the course indicated by the dotted arrows. In the combustion chambers are the retorts F, in which the coal or other material is carbonized. At the back of the setting is the recuperator G, which is heated by the burnt gases coming from the furnace. The recuperator heats the air for supporting combustion at the nostrils. The conveyance of the



heated air into the front combustion chambers of the setting is effected by the channels H and openings I, furnished with dampers. The combustion of the gas coming through the openings D is supported by a current of hot air, which comes from the recuperator and enters the combustion chamber by the openings J. The course taken by the air supplied to the nostrils is shown by the full arrows.

In the portion of the furnace in front of the partition K, heating is effected by means of the gas entering by the openings C in presence of the air arriving by the openings I. Combustion takes place first in ascending and afterwards in descending flames,

as shown by the broken arrows. The retorts between the partition K and the back of the setting are heated by the combustion of the gas coming from the openings D. This is supported by the secondary air coming from the openings J. With the jets of flame thus obtained are united the fully burnt gases resulting from the primary combustion. Heating is effected as in the front portion of the setting—viz., first by ascending and afterwards by descending flames. The products of combustion pass through the recuperator G in the direction shown by the broken arrows in fig. 1, then into the flues L, and escape by the chimney.

The lower part of the recuperator is divided into three separate

chambers by partitions M, the outer ones conveying hot air to the openings I, and the openings J receiving hot air from the central chamber. Three bye-passes N allow the air conveyed to each group of openings to be exactly regulated; and the production of gas can be regulated by opening more or less the three dampers O. By means of these, the flames can be made to pass as required either to the centre or to the sides of the furnace. For this purpose, they are provided with partition walls P, the tops of which are near the retorts. Slabs Q placed above the retorts deflect the flames on to the portion of the retorts heated by the ascending flames.

CORROSION OF INDUSTRIAL IRONWORK.

At a recent Meeting of the Birmingham Section of the Society of Chemical Industry, a paper on this subject was submitted by Messrs. A. R. Warnes and W. S. Davey. They thought that a short paper dealing with some of the most important cases of corrosion of iron which had come under their notice would stimulate other workers to publish their experiences, and so ventilate a matter of extreme importance to people connected with the chemical and engineering industries. The following are the portions of the communication (the text of which is published in the current number of the "Journal" of the Society) which are of special interest to our readers.

Considering its importance, the literature on the subject of the industrial corrosion of iron appears to be very scanty. Iron is acted upon by very dilute solutions of calcium chloride, sodium chloride, potassium sulphate, and calcium nitrate, and the action becomes more pronounced in the presence of carbon dioxide. Carulla, in a paper on the "Corrosion of Iron by Raw Tar," he read before the Nottingham Section of the Society in 1896,* calls attention to two bolts taken out of the valve-box of a pump that raised water from a well to supply a works. These bolts, which were originally 1 1/8 inches thick, had become badly corroded, the erosion in some parts being 3/8 inch in depth. The corrosion was supposed to be due to something communicated to the water by tar, as tar residues existed on the surface soil. Bolts in a pump used to raise tar at the same works were similarly corroded. Ammonium chloride was supposed to contribute to the corrosive action in both cases. In several cases brought under our notice, and also in our own experience, we have not found the internal parts of tar-pumps suffer from any marked corrosion, nor in one case of a water-pump which raises approximately 40,000 gallons per day of water contaminated with tar products. A portion of the end of a knocking stud taken from a tar-pump after being in use for upwards of five years showed practically no signs of any corrosion.

Herr Donath, in a paper on the "Production of Ferro-Cyanogen from Gas-Liquors,"† states:

We can see easily that gas liquors exercise a corrosive action on iron; but this action apparently is more energetic when the water is heated. While the pumps which are used to pump up the cold ammoniacal liquor are corroded but slightly, it is by no means uncommon to observe strong corrosive action on the iron portions of the distilling apparatus. I have even seen . . . a Feldmann distilling apparatus which had become so completely friable that at many places it was easy to pierce the thick sides with an ordinary knife. A portion removed with a knife consisted principally of graphite and prussian blue; and it is highly probable that this latter body was formed, thanks to the presence of sulphides in the gas liquors, by the same process as in the purifying material.

In regard to the action of cold ammoniacal liquor on the iron portions of pumps, we can confirm Lange's observations. In a valve taken from a pump which has constantly pumped ammoniacal liquor for over 3 1/2 years, the greater part of the valve face still exists. Hence it may be concluded that cold ammoniacal liquor is not a serious corrodent so far as iron is concerned. The corroded parts of the valve have taken on a granular appearance. We are also able to partly confirm the same worker's observation that portions of the cast-iron columns of ammonia stills are corroded, in many cases becoming cellular; portions of the iron being eroded, and leaving cell-like spaces. We cannot confirm the presence of prussian blue in the corroded parts.

Carulla finds cast-iron everlasting when used for ammonia stills; and he instances the case of a still which had been at work for eighteen years, the numerous cast-iron cylinders of which showed no signs of wear. He also calls attention to the possibility of ammonium chloride attacking the iron of which tar-stills are constructed, and the marked corrosion taking place in castings of iron containing wrought-iron chaplets when they are brought in contact with many chemical liquids.

When dealing with the corrosion of tar stills, we shall have occasion to refer to the part which ammonium chloride plays in that action; but in this place we should like to confirm Carulla's observations in regard to wrought-iron chaplets in castings. It

was found that the cast-iron pipes used to connect the swannecks of tar-stills to the condenser coils rapidly corroded at the point where the chaplets had been introduced, and in some cases the chaplets were eaten right out. It is most likely that the rapid corrosion which takes place at the chaplets is due to marked local electrolysis; corrosion of all metals being probably more or less due to electro-chemical action. A remedy was found in this case by using pipes which were cast vertically without the use of chaplets.

To the tar distiller, the corrosion of his stills is a continued source of anxiety and expense; and he would welcome an alloy at a reasonable price that will resist for a longer period than wrought iron or mild steel the corrosive action of the vapours which are given off during the distillation of tar. The mechanism of the process of corrosion of the iron of tar-stills is, without doubt, a complicated one; and it is somewhat difficult to form a theory to fit in with all the conditions that may exist in the still from the commencement to the finish of the operation. We are of the opinion that the dissociation of ammonium chloride, ammonium sulphide, ammonium hydrosulphide, and ammonium cyanide, and the subsequent action of the dissociation products upon the iron, is the chief cause of the corrosion. The rate of the action is probably increased by electro-chemical conditions (self-corrosion). It is quite possible also that strain contributes towards corrosion by producing a certain amount of molecular instability in portions of the iron plates; thus rendering these parts more easy of attack. The plates are eaten away at a greater speed at the points where excessive condensation takes place—for instance, under the manlid-stool; and this is due, probably, to the continuous flow of liquid removing the final products of corrosion more rapidly at these points than they are removed elsewhere, and thus exposing a fresh surface of iron to the attack.

It is thought that the process of corrosion goes on at a greater rate during the latter portion of the distilling operation, principally during the period when steam is used to assist in the distillation. The final products into which the corroded iron is converted appear to be chiefly ferrous sulphide and ammonium ferrocyanide. Ammonium thiocyanate occurs in small quantities, and traces of ferrous chloride and prussian blue have been found in portions of the corroded iron. It is considered that the steam introduced into the still plays no other part than that of producing ionization of the ammonium chloride, &c., and increasing the power of action of the products of dissociation.

As far as possible, it has been endeavoured to prove the theories just enunciated. To secure in glass apparatus like conditions to those existing in a tar-still during work, is next to impossible. On the under sides of manlids of stills after working, a deposit of a dirty brown colour was noticed. Several samples of this material were collected and examined, when it was found that more than 50 per cent. consisted of ammonium chloride. The carbon appeared to be in the graphite state, and contained a trace of iron. In the water soluble portion, which was faintly acid to litmus paper, a trace of ferrous iron and a large trace of sulphates were found in addition to the ammonium chloride. Ferrocyanides and thiocyanates were absent. Large quantities of ammonium chloride and ammonium sulphide were found in some of the liquors which come over during the working of the still. It is a well-known fact that ammonium chloride and ammonium sulphide dissociate at high temperatures into ammonia and hydrochloric acid, and ammonia and sulphuretted hydrogen respectively; and it is quite reasonable to suppose that the hydrochloric acid and sulphuretted hydrogen set free will attack the iron of the stills, especially in the presence of steam which is to a certain extent superheated owing to the temperature of the still. It is considered that ammonium chloride exerts a greater action upon iron than ammonium sulphide; and the fact that traces of ferrous chloride were found in the scrapings taken from plates in different parts of stills, supports the theory that ammonium chloride plays an active part in the corrosion.

The results of an examination of the ammoniacal liquors which distil over during the process of tar distillation are given in the following table. It will be noticed that the amounts of ammonium chloride and of iron as ferrocyanide (expressed in grammes per 100 c.c.) are greatest in the liquor which comes over during the end of the distillation. It is at this stage that steam is passing into the still and the temperature is high; and it seems quite within reason to assume that the action of corrosion is at its height during this period.

| | Ammonium Chloride. | Ammonium Sulphide. | Ammonium Ferrocyanide. | Ammonium Thiocyanate. |
|---|--------------------|--------------------|------------------------|-----------------------|
| Liquor collected— | | | | |
| When still commences to work | 0°130 | .. 0°40 | .. Trace | .. Trace |
| At finish of crude naphtha | 0°053 | .. 2°20 | .. 0°040 | |
| During working of heavy creosote (steam passing into the still) | 2°020 | .. 0°54 | .. 0°056 | .. Large trace |

The final products of corrosion are found chiefly in the shape of loose scale on the plates. Small quantities occur in the oils which distil over, and in the ammoniacal liquor—in the former case as ferrous sulphide in the form of a fine black powder or in coagulated masses, in the latter as ammonium ferrocyanide. An examination of the scale removed from several plates in various positions showed ferrous sulphide as the chief final product. Ferrous chloride and prussian blue occurred in small traces.

* See "JOURNAL," Vol. LXVIII., p. 73.
† Ibid., Vol. LXXVIII., p. 1663.

STUDIES IN THE MANUFACTURE OF COAL GAS.

At the Meeting of the Michigan Gas Association in 1907, a paper on this subject was submitted by Messrs. Alfred H. White and Frederick E. Park; the latter being the holder for 1906-7 of the Association's Fellowship in Gas Engineering at the University of Michigan. The paper was the seventh to be presented to the Association as the result of its support of the fellowship. At the previous annual meeting, it was resolved to erect experimental plant in connection with the works of the Ann Arbor Gas Company, where the factors influencing gas manufacture and purification might be more closely controlled and better studied than had been possible in tests made on full-sized plants. The Committee having charge of the matter decided that the plant should consist of complete condensing and purifying apparatus designed small enough to be suitable for the investigation of the products from a single retort; and it was quite hoped at the time that it could be equipped within a few weeks. The manufacture of the special apparatus, however, went but slowly; and it was not till the spring of 1907 that the completed plant was ready. The paper submitted later in the year, which was given in the "JOURNAL" for Oct. 8, 1907 (p. 101), was in the nature of a preliminary report on its operation. At the meeting of the Association last September, a second paper on the subject was presented by Mr. White, in association with Mr. W. A. Dunkley, the holder of the fellowship for 1908-9, Mr. J. H. Wyman, who held it the preceding year, and Mr. Percy Barker, an Assistant-Engineer in the Technological Branch of the United States Geological Survey. The text of the paper was not available at the time; but the Secretary of the Association (Mr. Glenn R. Chamberlain, of Grand Rapids, Mich.) has since forwarded us a copy, and we are thus able to give the following extracts.

INTRODUCTION.

The present paper is the ninth to be presented to the Michigan Gas Association as the result of your support of a fellowship in gas engineering at the University of Michigan. Two years ago, the paper presented by Messrs. White and Park was the result of a year's preliminary work at the experiment station established by you at the works of the Ann Arbor Gas Company. It was intended that this should be simply a preliminary report to show the construction, method of operation, and possibilities of the plant, and not a statement of final results. The following year was spent in bringing the plant into more reliable working condition; new equipment being added and alterations being constantly made in equipment and method of operation to make the results more accurate. In the summer of 1908, it was believed that the plant had been brought to a point where it could be used for systematic research work.

At this time, we were fortunate enough to obtain the co-operation of the Technological Branch of the United States Geological Survey. The Geological Survey agreed to send one of their field inspectors to sample the mines from which coal was desired, to deliver the coal at the testing plant free of charge, to make all chemical examinations of coal and coke samples, and to station one of their assistant engineers at Ann Arbor during the college year 1908-9 to assist in the work. This not only made it possible to obtain coal samples with authentic histories, but also

added greatly to the amount of work which could be done at the plant. The present paper represents, then, two years of work at the experiment station, but contains only data obtained during the last year. The work of the preceding year was no less carefully performed; but on account of the development of the testing plant, the results were not so satisfactory as are the later ones.

DESCRIPTION OF EXPERIMENT STATION.

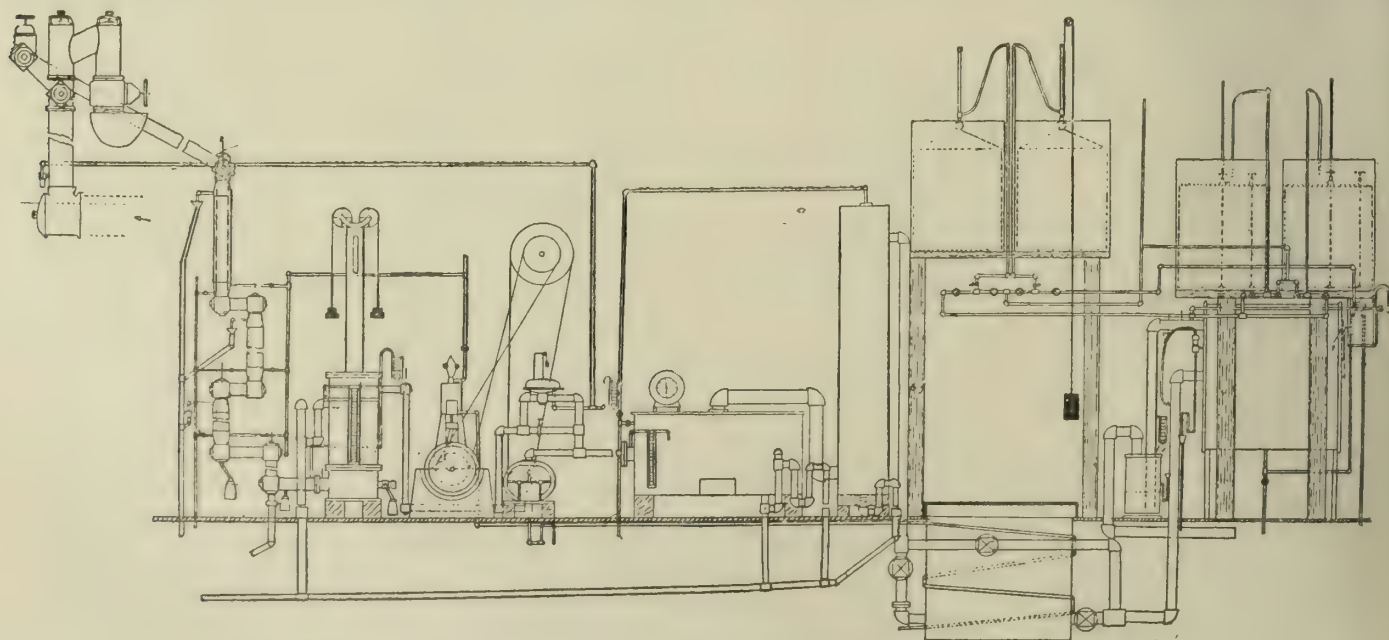
The experiment station was described and illustrated in the preliminary report made to you two years ago, and it does not seem worth while to publish again a full description of it. It seems wise, however, to briefly present enough of the general arrangement to make this paper intelligible without reference to the earlier one, and to report on the changes that have been made for the betterment of the work during the past two years, for the benefit of the members of the Association who are interested in the progress of the plant.

The gas is taken from a single retort 26 in. by 16 in. by 9 ft., which is one of the upper retorts of a bench of six, with three-quarter depth regenerative settings in the retort-house of the Ann Arbor Gas Company. This retort is in regular work; and when it is desired to use it for experimental purposes, it is isolated from the Company's mains and connected to the experimental plant immediately adjoining. The equipment of this plant (shown in elevation in the accompanying diagram) consists of a condenser, a Pelouze and Audouin tar-separator, exhauster and engine, tar-washer, ammonia-scrubber, oxide of iron purifier, and station meter, together with the necessary sampling equipment and a laboratory for the determination of candle power, heat value, and for chemical examinations.

Although the general arrangement of the plant is the same as it was two years ago, nearly every piece of apparatus has been modified one or more times since its installation. The temperature of the retort, both inside and outside, is now measured with a pyrometer, and the pressure is controlled by a diaphragm governor acting on the exhauster by-pass. Satisfactory valves have been installed for isolating the experimental retort; and the foul main has been jacketed to avoid sudden cooling of the gas. The condensers have been changed to three vertical units, with an annular space in which either cold or hot water can be circulated, so that the gas can be brought to the inlet of the tar-separator under fairly well-controlled conditions. This has had a lighter drum installed to make it more sensitive.

The greatest trouble has been experienced in obtaining a satisfactory exhauster. The amount of gas to be handled is small, and varies during the test from a possible maximum of 12 feet per minute to a minimum at the end of the run of 1 foot per minute. The slow-speed exhauster first used transmitted positive and negative modes of pressure which showed fluctuations as rapid as an inch of water pressure at the retort. Three separate exhausters and several modifications of governors have been tried in the effort to overcome this difficulty. In the present arrangement, a small rotary blower is run at about 400 revolutions a minute with a primary by-pass operated by a hand-wheel for coarse regulation, and with a secondary by-pass controlled by a modified diaphragm governor which is actuated by the pressure of the gas in the retort to which it is directly connected by a $\frac{3}{4}$ -inch pipe. This arrangement is not perfect, for the leather diaphragm in contact with unpurified gas soon stiffens, and does not respond quite so rapidly as the fluctuating speed of the engine requires. But with care it has been possible to operate it so that the pressure has never for more than a minute at a time varied over 1-10th of an inch of water pressure from the 1-10th back-pressure which it is aimed to maintain on the retort.

Much attention has been paid to improving the accuracy of the various gas-sampling devices on which so many of the results



The Equipment of the Experimental Plant Employed.

depend. The tanks which sample the gas by half-hour intervals have given relatively little trouble, for there is not much variation in the rate of gas production or in its quality during a single half hour. The contrary is the case, however, with the proportional tank, which is supposed to collect a mixed sample representative of the whole of the gas from beginning to end of the run. This tank is filled by a small wet meter working as a pump, and geared to the shaft of the station meter, so that an aliquot portion of all the gas made is forced by it to the proportional tank. So far as appearances go, the arrangement works well; but the results obtained for the proportional tank do not check as they should do the figures for chemical composition and heat-value calculated from the half-hour tanks. The proportional tank usually gives high results, which causes the belief that the proportional meter lags at the extremely slow speeds at the end of the test, and does not deliver the proportionate amount of the poor gas at this period. It is possible also that incomplete mixture of heavy rich gases in the bottom of the proportional tank with the light poor gases on the top has caused part of the trouble. It is proposed to instal a larger proportional tank, which will allow the meter to run faster; and it is hoped the other difficulties may also be overcome.

The equipment of the laboratory now includes an excellent bar photometer, a Junkers calorimeter, a complete gas analysis outfit, a Drehschmidt apparatus for ascertaining the total sulphur in purified gas, two Hoskins pyrometers, and a Morse thermo-gauge, lent by the manufacturers, for the optical measurement of retort temperatures. All chemical work which does not have to be done on the spot is performed in the chemical laboratory of the University of Michigan, in quarters set aside especially for the work. During the past year, the analyses of all the coals and cokes were made at the Pittsburg Laboratory of the United States Geological Survey.

SCOPE OF EXPERIMENT.

In the study of a complex problem which presents as many variables as does the destructive distillation of coal, it is not wise to omit any test which can possibly be of service. The aim has, therefore, been to collect all experimental data which could have a bearing, and to put quality of work ahead of quantity. The equipment of the plant is such that it is possible to study the effect of changes in the method of operating the retort or the condensing or purifying system when working with a single variety of coal, or to study the behaviour of different coals when tested under the usual conditions of practice. It was recognized that both of these studies were worth making, and, in fact, that they were so closely intertwined that it was impossible to completely separate them. But as the interests of the Geological Survey lay in studying the coals of the country, it was decided to spend the year in testing different coals, in order to ascertain whether there were other coals than those at present being used for the manufacture of illuminating gas which might be so utilized.

The first list of coals was made up after a study of the records of the coking division of the Geological Survey, and only such coals were included as had shown in the coking tests that they were available from this standpoint, and whose proximate analysis and percentage of sulphur indicated that they might be available for the purpose of the investigation. It was also deemed desirable to get samples of coals from widely-separated areas of the United States. It was hoped that in this way not only would the attention of gas engineers be attracted to coals not now used as possibilities, but that the data compiled from a large number of these tests might also be useful as a basis for a study of the phenomena taking place in the retort.

METHOD OF CONDUCTING TESTS.

The method of conducting the tests will be described in some detail, to show the precautions taken to get reliable results. The coal was usually shipped by the Geological Survey inspector in canvas sacks holding 100 lbs. each; and 3 tons were sent from each mine. Occasionally this had been screened at the mine before shipment; but as many of the mines were unprovided with screens, much of it came as run-of-mine coal. The rough handling received by the coal in shipment in sacks broke it up considerably; so that to make all tests comparable from the standpoint of size of coal charged into the retort, the coals were screened (except on the first few tests) before charging. A standard screen as used at the mines in the preparation of gas coal was made 2 feet wide and 6 feet long, of $\frac{1}{4}$ -inch bar iron spaced to $\frac{3}{4}$ -inch and set at an angle of 30 degrees. The fine coal which fell through this screen was rejected, though screenings were frequently sampled and analyzed to determine the effect of screening on the composition of the coal.

Before starting the regular test, a preliminary charge of 400 lbs. of coal was carbonized for four-and-a-half hours—to fill all parts of the condensing system with the products of this particular coal, and to see that everything was in order. None of the test observations were taken; and the condensed tar and liquor were allowed to flow into the tar-well of the city works. During this period, the jars for the collection of tar and liquor were tared and tagged, the gas sampling tanks and vessels were filled with water, the sampling apparatus for ammonia and naphthalene in the gas put in place, the coal for the test proper weighed up, and the pyrometer for the measurement of the temperature in the fire-space surrounding the retort inserted through the hole in the end wall of the setting opposite the middle of the retort until the thermo-couple was about 1½ inches from the retort.

In the interval while the coke of the preliminary test was being drawn, the valve into the tar-well was closed, the tar which had accumulated in the Pelouze and Audouin tar-separator was drawn off, and the tar-separator itself was filled to overflowing with fresh ammoniacal liquor from the works, the jars for the collection of tar and liquor were put in place on the condenser, and the hands of the station meter were set to zero.

While this was being done in the experimental plant, an operator in the retort-house was supervising the charging of the test retort. The retort was first examined to make sure it was clean and in serviceable condition, and the car of coal containing the exact weight to be used was then brought up and charged by the regular stokers in the usual manner—all of the coal on the car being thrown into the retort. As soon as the mouthpiece was closed, the rise in pressure on the gauge in the experimental plant gave the indication to the operator there, who at once started the engine. The pyrometer to measure the temperature on the inside of the retort was then put through the hole in the mouthpiece, and pushed back until the unprotected thermo-couple was lying on the coal half-way between the front and the back of the retort. It was then luted in; and when the operator had made sure that the mouthpieces and all connections were tight, he returned to the experiment station.

In the experimental plant the speed of the engine was regulated so that the manometers showing the pressure upon the mouthpiece of the retort and at the inlet of the Pelouze and Audouin tar-separator showed a back-pressure of about 1-10th inch. So long as both manometers gave concordant results, it was proof that there was no stoppage between the two points. After the pressure had been regulated by means of the engine throttle and the gate-valve on the bye-pass of the exhaust, the diaphragm regulator controlled the pressure quite automatically. As the yield of gas dropped off near the end of the run, it was necessary to open the gate-valve on the bye-pass more and more, thereby allowing the gas to circulate more freely through the bye-pass and diminishing the suction on the retort.

The collection of tar and ammoniacal liquor, and the registration of the gas made, started automatically as soon as the retort was closed; and the apparatus for testing the ammonia in the gas at the inlet of the Pelouze and Audouin separator and the naphthalene in the gas at its outlet were also started promptly at the beginning of the test. However, since the system had been filled with air while the coke of the preliminary charge was drawn, five minutes' interval was allowed to elapse before the gas for candle-power and heat-value tests was turned into the sampling tanks.

The division of duties among the testing crew was as follows: One man read the station meter every five minutes, and he also recorded the pressures shown by the gauge on the diaphragm governor line from the standpipe, the pressure at the inlet of the Pelouze and Audouin separator, the differential pressures on the Pelouze and Audouin separator and tar washer, and the pressure at the meter outlet. A second man every five minutes read temperatures at the inlets of the three units of the condensing system, at the inlet and outlet of the Pelouze and Audouin separator, and he took the temperature of the water of the station meter and of the gas leaving it. This man was responsible for the regulation of the condensers. By the use of cold water on the condensers, it was possible to keep the temperature at the inlet of the Pelouze and Audouin separator from rising above 120° Fahr. after the first few minutes of the test. As the test progressed, and still less steam came over to be condensed, the water was cut off. Towards the close of the test, steam was turned on the condensers; and at the last, even with full steam, it was not possible to keep the temperatures above 100° Fahr.

The sampling of ammonia, tar, and naphthalene present in the gas at the Pelouze and Audouin tar-separator kept one man extremely busy, and requires further description. It was necessary to deviate from the usual works' practice of determining the amount of ammonia in the liquor flowing from the separator and scrubber, because of the large volume of liquor present in these pieces of apparatus at the beginning and end of the test as compared with the volume collected during a five-hour test. The ammoniacal liquor from the condensers was collected each half-hour; and the ammonia in the gas at the outlet of the condenser was determined by sampling the gas at the inlet of the Pelouze and Audouin tar-separator. This was done by drawing a portion of the gas through bottles containing dilute acid. The aspirator tanks used for this purpose held approximately a cubic foot of gas, and were set to empty in half-an-hour; the exact time of starting and finishing each being recorded. After analysis, the quantity of ammonia in the whole of the gas was computed from the station-meter readings, and allowance was made for the few minutes interval between tests. These figures were, for ready comparison, calculated to even half-hour intervals.

The naphthalene in the gas was determined in a similar manner at the outlet of the Pelouze and Audouin separator, and sometimes also at the inlet; the tar fog being filtered out by an asbestos filter, and the naphthalene in the gas being scrubbed out by an acetic acid solution of picric acid. The methods for determination of naphthalene were those which were devised several years ago in connection with this same work.* After analysis, the results were computed for even half-hours as for ammonia. On account of the great analytical labour involved, the naphthalenes in the tar fog and gas at the inlet of the Pelouze and Audouin

* "JOURNAL" Vol. LXXXVIII., pp. 262, 323; Vol. XCII., pp. 388, 466.

separator were determined in a few instances, and those at the outlets in only about half the tests. For the same reason the naphthalene dissolved by the tar in the condenser and the Pelouze and Audouin separator was determined only on an average sample of the combined tars for the whole distillation period.

Hydrogen sulphide was determined in the later tests in the gas leaving the ammonia scrubber by bubbling a portion of the gas slowly through ammoniacal cadmium chloride and then through an experimental meter. The usual lead acetate test for hydrogen sulphide in the purified gas never disclosed its presence.

The two tanks for sampling the purified gas were used alternately and changed exactly at the close of each half hour. They were connected with the laboratory above, where determinations were made of heating value and candle power. Any error due to solubility of the varying gases in the calorimeter and photometer meters was avoided as far as possible by allowing the gas to flow through the meters for fifteen minutes to saturate the water before commencing a test. The candle powers reported here were made with a Sagg "D" argand; the standard source of light being a Hefner lamp. The heat values were determined with a Junkers calorimeter. No attempt was made at gas analysis during the half-hour intervals. The samples for analysis were preserved in glass gasholders, which prevented leakage and left only a small amount of water in contact with the gas; so that it could safely be preserved for 24 or 48 hours if necessary before analysis.

The standard test charge of 400 lbs. of coal was usually carbonized in four-and-a-half hours; but in case a longer time was needed, it was allowed—carbonization being continued till the evolution of gas had dropped to about one foot per minute from the 400-lb. charge. The coke was then drawn by the regular stokers into a special buggy placed just below the mouthpiece of the retort, and weighed at once without quenching. It was then quenched and allowed to stand in the buggy for two or three days and re-weighed. It was expected to obtain some idea as to the relative amounts of water which the coke from the various coals would retain; but it was found necessary to drown the coke so completely (to prevent its catching fire) that it absorbed exorbitant amounts of water, which it still retained on the second weighing. So that the figures on quenched coke have little value. The wet coke was then screened over the $\frac{3}{4}$ -inch bar-screen in the same manner as the coal, and a representative sample was sent to the Geological Survey laboratories for analysis.

COMPUTATION OF RESULTS.

Since this paper presents a study of the products of destructive distillation of coals of different composition, especial care has been taken to set forth their differences as fully as possible. Most people will probably consider that a study of the products of distillation should be based on the unit weight of coal charged. Some will prefer to base the computations on the unit weight of dry coal; and from the standpoint of scientific study of products of distillation, the study can best be made on a basis of coal free from moisture and ash. Both the proximate and the ultimate analysis of the coals have accordingly been calculated in these different ways, and the whole mass of material, together with notes on the geographical source of the coal, are incorporated in an appendix. In the same way, the products of distillation have been calculated to a basis of coal as charged, dry coal, and coal free from moisture and ash. These also form part of the appendix.

All operations during the test were made to coincide so far as possible at even half-hour intervals. It was feasible to collect the tar and ammoniacal liquor samples, and the tanks of purified gas for determining candle power and heat value, and for analysis by exact half-hour intervals. The ammonia and the naphthalene tanks sometimes ran over, and sometimes under, the half-hour; but as the exact time of starting and completing the emptying of these tanks was recorded, it was possible, by reference to the amount of gas registered by the station meter in the interval, to recalculate the results to even half-hour periods without any error other than that involved in the assumption that the constituents being tested had been evolved at a constant rate throughout their half-hour period. This might cause a slight error in the half-hour data, but could not affect the totals.

The average heating value, candle power, and chemical composition of the gas, as calculated from the figures for the nine half hours of the test, were computed by taking into account the volume of gas made during the period. Thus if in one half hour 250 cubic feet of gas of 650 B.Th.U. were produced, the product of 650 by 250 would be taken as the number of heat units produced during the period, and would be added to the figures similarly obtained for the other periods. The total number of heat units thus obtained, divided by the total output of gas, gives the average heating value. This process gives correct averages of heat value and chemical composition, but gives only an approximate average candle power, since the candle power of a gas is a function of two entirely separate variables—temperature, and the amount of free carbon liberated in the flame; and hence, in the case of a mixed gas, it will not usually be the arithmetic mean of the component gases.

The weight of gas has been computed by multiplying the corrected volume of gas by its weight per cubic foot. The latter figure was calculated from the percentage composition of the gas and the known weights of the constituents. For this purpose, the "illuminants" have been assumed to be ethylene—an assumption not strictly accurate, but involving only a slight error. These weights of the various gases as usually given are calculated for zero Centigrade. They have been recalculated to the standard

conditions of 60° Fahr. and 30 inches of the barometer, with the gas saturated with moisture. The values are given in the table.

| | Pounds per Cubic Foot, |
|---------------------------|------------------------|
| Carbon dioxide | 0'1140 |
| Carbon monoxide | 0'0726 |
| Ethylene | 0'0726 |
| Hydrogen | 0'0052 |
| Methane | 0'0415 |
| Nitrogen | 0'0728 |
| Oxygen | 0'0830 |

The weight balance is the sum of the products of distillation recovered *plus* the loss unaccounted for. The weights of coke, gas, tar, and ammoniacal liquor collected are added together, and a further addition is made of the water in the form of vapour at the outlet of the tar-separator which would condense when the gas was cooled to the standard temperature of 60° Fahr. This computation is readily made by the use of tables of vapour tension. The difference between the sum of the known products and the weight of the original charge is reported as being "loss unaccounted for."

RELIABILITY OF RESULTS.

The preceding presentation of the methods of testing and obtaining results should be supplemented by a discussion of the means of measuring the accuracy of results so obtained.

There are several ways in which the accuracy of the work may be tested. The first is by the use of a standard coal, which should give known results. In order to check the operation of the plant in this manner, a standard Pittsburg gas coal was procured, and the first three tests, as well as one later, were made on it.

Another means of checking results is found by comparison of duplicate tests on the same coal. Exact duplication of results can hardly be expected, because of the number of variables affecting the operation; but it should sometimes be possible to partially explain divergencies as being the result of differing conditions which had been noted in the test.

Valuable internal evidence of accuracy is afforded by a study of the data gathered from a single test when viewed with the knowledge gained from other tests. The curves showing the rate of formation of gas, ammonia, and tar should bear a relation to each other, and to the retort temperature, and the curves showing candle power, heat value, and chemical composition of the gas should show some concordance.

A conclusive proof of inaccuracy is sometimes afforded by the amount of unaccounted-for loss. The sum of the products should always be less than the coal charged, for there is loss of products while the retort is open during the charging process. In our work, there is further unaccounted-for loss, because no account is taken of tar which sticks in the stand-pipe; and in our small plant there is no way of estimating the amount of water removed from the gas in the Pelouze and Audouin tar-separator nor carried past it in mechanical suspension, nor has any account been taken of the weight of hydrogen sulphide and carbon dioxide removed by the ammoniacal liquor in the scrubber and the purifier. The average amount of such unaccounted-for loss is 6.6 per cent. of the coal charged.

Each of the complete tests required over 1800 observations; and, as was to be expected, there may be found in almost every test points which are so far from their expected position that they are evidently in error. Fortunately, however, except for the initial weight of coal and the final weight of coke, the results were taken every half hour, or more frequently; so an error in any one observation exerts a relatively small effect upon the average.

It is believed that the care taken in the calibration of pyrometers, thermometers, gas-sampling tanks, and meters, has prevented any serious systematic error in the temperature measurements, or in the determination of the quantity, heat value, chemical composition, or candle power of the gas. The measurement of the quantity of tar and ammoniacal liquor from any given test is likewise believed to be fairly accurate, although the irregularities in the amount of tar from one half-hour period to the next sometimes indicate a temporary stoppage in the drips; and the possibility is suggested from results in the case of coals yielding stiff tars that the heavy tar collecting in the pipes during the latter part of the preliminary run has been washed out by the lighter tar during the first part of the regular test and has unduly swelled these samples.

There is some uncertainty concerning the yield of ammonia, as it had to be determined, as already explained, by sampling the gas at the inlet of the tar-separator. The results from the separate tests should certainly be comparable with one another; and the results on the standard Pittsburg coal, though better than customary practice, are not so high as to throw serious doubt on their reliability when it is remembered that the care taken to keep the retort in good condition and to keep the exhauster working properly should warrant higher than average results, not only in ammonia, but in all other products of distillation.

No great accuracy is claimed for the results on naphthalene, on account of the large correction factors involved in the tedious analytical process. The results should be comparable with one another; but an absolute error of 10 per cent. is probable.

It would seem that the data on coal and coke would be the least liable to inaccuracy; and yet—partly on account of the lack of sensitiveness in the scales used, partly on account of the loss in charging and drawing, or possible addition of carbon knocked off the roof of the retort in the charge, and possibly because of carelessness on account of the simplicity of the weighing operation which caused too great a reliance to be placed on a single

reading—it seems, from internal evidence, that the largest single errors are those involved in the weight of the coal and coke. The most exasperating illustration of this is found in the test on West Virginia coal, where the sum of the products is 101.7 per cent. on the weight of the coal—an error of such magnitude that it could hardly have arisen in any other way.

Another evident error is revealed in some of the tests by a comparison of the percentage of ash in the coal and coke. If the experimental tests were all correct, the calculated percentages of ash in the coke should be the same as that found experimentally, which is not the case in all the tests. The coke was carefully quartered, crushed, and sampled for analysis; but a similar procedure was not followed in the case of the coal, since it was not desirable to disturb the proportion of coarse and fine coal in the sample as it left the screen. The total amount of the charge to be sampled was so small, and the size of the material so uneven, that the accuracy of the coal samples cannot be very great. The greatest discrepancy will, of course, be noted in the ash. In the same way the composition of the few sacks of coal used for one test may vary quite materially from that of a duplicate test and from the mine inspector's sample.

RESULTS.

Eighteen tests are reported on eleven different coals from ten States. The data concerning the sources and chemical composition of all the coals and cokes are tabulated; and the course of each test, as indicated by the retort temperatures, rate of gas production, candle power, heating value, and chemical composition of the gas, rate of production of ammoniacal liquor, tar, ammonia, and naphthalene, is shown graphically for all the tests by half-hour intervals. The tables and diagram are appended to the paper; and these will be given in subsequent issues of the "JOURNAL."

The conclusions arrived at by the authors are set forth in the following

Summary.

The material here presented constitutes a progress report of results obtained in testing different coals at our experimental station for their suitability as gas coals. The conclusions are to be taken as tentative and suggestive, and not in any sense as final. Indeed, since a coal which would give good results in one works might not be satisfactory under the differing conditions prevailing at another works, a positive statement can hardly be expected from an experimental station. Its object should rather be to make tests under diverse conditions, and show which conditions are best for a given coal. The results here set forth fall far short of this ideal, because of their lack of quantity, if for no other reason. Coals should be tested at both high and low retort temperatures, and the tests should be repeated until it is fairly certain that no serious experimental error is present. The time required for such a complete study of a number of coals is so great that it has seemed wiser to present data collected on these eleven coals, with such slight interpretative discussion as is profitable, and leave the readers to draw such conclusions as they feel are warranted.

So, although the results given have been studied from various standpoints, and some interesting conclusions have suggested themselves, the only one which seems to fit all cases closely enough to warrant presentation is that which concerns the percentage yield of coke. This figure is only slightly dependent upon retort temperature, for the retort will always be hot enough to drive off the volatile matter; and the secondary changes of the distillation products at high retort temperatures will not much affect the yield of coke.

As would seem natural, the yield of coke is roughly in proportion to the ratio of the total fixed constituents to the volatile constituents of the coal. Calculating the ratio of

Fixed Carbon plus Ash

Moisture plus Volatile Matter

the following table is obtained. The agreement between the calculated and the actual percentages of coke is very good; the only coal not in agreement being that from New Mexico.

| Source of Coal. | Ratio | | Coke in Coal as Charged. Per Cent. |
|-------------------------------|-----------------------|--------------------------------|--|
| | Fixed Carbon plus Ash | Moisture plus Volatile Matter. | |
| Wyoming | 0.82 | .. | 50.2 |
| Michigan | 1.43 | .. | 59.5 |
| Oak Creek, Colorado | 1.53 | .. | 60.0 |
| Illinois | 1.55 | .. | 62.3 |
| Tennessee | 1.58 | .. | 66.8 |
| Pennsylvania | 1.82 | .. | 67.0 |
| Kentucky | 1.88 | .. | 67.0 |
| New Mexico | 1.93 | .. | 69.4 |
| Alabama | 2.04 | .. | 68.3 |
| West Virginia | 2.21 | .. | 73.3 |
| Sopris, Colorado | 2.90 | .. | 74.9 |

It seems safe to say that the most important contribution which the experimental station has so far made has been its own development, and the proof that it can yield reliable results. The cost of equipping such a station at a gas-works is not high; and valuable results can be obtained without the large testing staff required by our efforts to collect all possible data. It would seem worth while for individual works to instal such stations to work out the problems which are peculiar to themselves.

As the results from this experiment station multiply with the years, it will be possible to draw from the accumulated data valuable generalizations which will increase the economy and the efficiency of gas-manufacturing operations.

RECONSTRUCTED CONCRETE GASHOLDER TANK

The "American Gaslight Journal" for the 23rd ult. contains an article, specially prepared by Mr. C. C. Folger, giving an account of the reconstruction of the concrete tank of the 150,000 cubic feet gasholder of the Light, Heat, and Power Department of the Municipal Council of Kingston, Ontario. The following particulars are furnished by the writer.

The original specifications were for a concrete tank, 68 feet diameter, 24 feet deep, and approximately 2 feet thick, to be composed of cement, sand, and stone, in the proportions of 1, 3, and 6; and large stones were allowed to be placed in the mixture so long as they were kept a distance of 5 inches from the inside face of the wall. The excavation for the tank was quarried out of a limestone foundation, and the wall when completed was not to be more than 4 feet above the ground. This was thought to be advisable on account of the saving effected as regards heating, depreciation, &c.

The contract for the entire masonry was placed with a local man; and upon completion the tank was found to be defective in two ways—first, on account of the enormous leakage; secondly, in respect of the irregularity of the circle, which made it impossible for the holder to work properly upon the lower T-rails—the rollers binding at different sections. This defect was remedied somewhat by cutting away the wall, and substituting smaller wheels; but the other was a serious problem. Various means were employed to stop the leaks—all kinds of loose material, such as bran, sawdust, &c., being dumped into the holder. But this process failed to check the waste. The leakage varied from 4 to 20 inches in 24 hours. The whole interior of the tank then received a coating of pitch and resin, applied as hot as possible; but this also proved a failure.

The contract was then placed with an American waterproofing concern, who proposed to line the entire interior, including the bottom, with tarred paper and asphalt. The paper was to be held against the main concrete by a brick wall which would completely encircle the tank, while the bottom was to be covered with about 4 inches of fine concrete placed over the paper after it had received a good coating of the liquid. The latter suggestion was carried out; but the building of the brick wall was suspended owing to considerable opposition regarding permeability or making it a lasting and satisfactory job. It was finally decided to call in expert advice; and Captain W. E. McKay, Engineer of the Boston Consolidated Gas Company, was engaged to submit a detailed report on the existing conditions and the most advisable plan of dealing with them. The conclusion arrived at was either to remove the defective walls, or contract with a waterproofing firm to align the face of the tank wall, vertically and horizontally, and apply an efficient cement waterproofing to the side wall and the bottom.

This advice was acted upon, and in the spring of last year it was decided to call for tenders for the complete reconstruction of the tank—that is, the entire concrete work was to be gone over so as to conform with the original specifications, as laid down by the Davis and Farnum Manufacturing Company, of Waltham (Mass.), who received the contract to place the steel structure in commission. The specifications were drawn up, and the contract was awarded to Messrs. Merrill and Allen, of Toronto, who carried out the undertaking successfully; the leakage being checked, and the ironwork placed in position in accordance with the original design.

The following particulars of the operations were furnished to the Council by Mr. Folger: On the 12th of July the main valves of the new holder were closed, and Messrs. Merrill and Allen commenced work. The first step was to inflate the holder with air, in order to allow the grab-hooks to be placed in proper position under the outer shell. These hooks being properly installed, the work of raising the outer lift was undertaken and carried out successfully; the shell being raised several feet above the top of the main concrete wall. The inner lift was then blown up to the water-line, and another allotment of hooks placed in position. By means of chain blocks, both were raised so as not to interfere with the proposed work on the defective concrete structure.

The concrete work consisted first in the removal of 3 to 8 inches from the interior lining of the walls of the tank, and the lowering of the base of the tank to its proper elevation. This having been done, the debris was lifted clear of the tank, and deposited on the ground around it—being afterwards carted away to waste dumps. A drain was then dug all round the inside edge of the tank, to deal with leakage from the outside. This drain had a fall to a sump-hole, where proper pipe connections were made for pumping by means of a steam-pump on the surface of the ground clear of the tank, and discharging into a manhole connected with a drain. The pump was operated continuously until the concrete work was finished. On the completion of the drain, an entirely new bottom, from 4 to 5 inches thick, of a rich mixture of concrete, was spread over the whole base—being well rammed and worked into place. As soon as the bottom became sufficiently dry to walk upon, the work of placing the lining on the walls of the tank was proceeded with. The forms for this were of special design, being about 30 inches high, and a complete circle of them was coupled up, behind which was placed the mixture of concrete. This, as before, was very rich in mortar, and contained a percentage of hydrated lime; being designed to

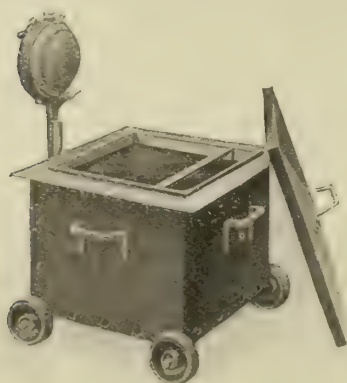
be as impervious as possible to the action of water. The work was carried out in a very successful manner; and in most places, on removing the forms, a good, clean close-grained surface was shown. The bond between the interior lining and the part of the old wall left in place seemed to be first class; every precaution being taken as this part of the work progressed. A section of the wall near the surface was removed to test the bond, and the joint appeared to be practically sealed. The lower T-rails and landing-piers were entirely removed during the course of construction; being replaced at proper intervals and in line with the upper guide-rails, so that the joints at the base of the guide-columns were decidedly improved upon.

On the completion of the concrete work, the tank was made as dry as possible, and allowed to stand for a few days before being filled with water. About the 6th of October the tank was filled up, and the work of lowering the suspended lifts was carried out successfully. The air-blast was again turned on, and the steel holder raised so that the grab-hooks might be released. Everything appeared to be going along smoothly until the wheels working in the guide-supports reached the first cross-section of the lattice girder, when the whole vessel began to bind, and a couple of rollers jammed against the T-rails. The holder was then lowered a little; and adjustments being made at the necessary columns, it was elevated a second time to the top.

On the 12th of October, gas was admitted, and the new holder brought into regular use. The first test for leakage was made from 9 a.m. on the 15th until 9 a.m. on the 16th; and it showed that the water dropped $\frac{1}{8}$ inch, or 236 gallons, in 24 hours, which was less than 10 gallons per hour. This was considerably within the guarantee; the Contractors being allowed a margin of 15 gallons per hour. Since then it has not been necessary to add any additional water in order to maintain the seal. The ironwork, as a whole, stood well the strain put upon it, and kept in good shape.

A HANDY PORTABLE TAR-BOILER.

The need has frequently been felt of a portable tar-boiler suitable for use in executing small repairs requiring a few gallons of tar, pitch, bitumen, or other compound, heated to boiling point. It has now been supplied by Messrs. A. C. Wells and Co., of Midland Road, St. Pancras, the makers of the well-known light bearing their name. The boiler, which is shown in the accompanying illustration, consists of an iron container mounted upon wheels and provided with a cover; and its capacity is 5 gallons. The tar is heated by a Wells lamp burning petroleum, and costing about $\frac{1}{4}$ d. an hour; and it will easily keep the



material at boiling-point. The lamp, which is entirely of iron, is readily removable, and can be used separately for lighting, if required. The boiler, which weighs only 90 lbs., can be put into a cart with the tools and other materials, and thus the expense of a separate tar-cart is saved.

ADVANTAGES OF SCREENING COKE.

This was the subject of a paper read by Mr. Guy Fortescue Gregg, the Manager of the Coke Department of the Milwaukee (Wis.) Gas Company, at the recent annual meeting of the Wisconsin Gas Association. The Company's revolving screens are 4 ft. 6 in. diameter and about 30 feet long, and are placed at an angle of 11° ; the coke being elevated into a bin at the top, where it readily rolls into the screen. This is divided into three sections. The first, with openings $\frac{5}{8}$ in. by $1\frac{1}{2}$ in., with $\frac{3}{8}$ -inch web, is the one through which the breeze or screenings fall; the second has openings $\frac{7}{8}$ in. by 2 in. with $\frac{3}{8}$ -inch web, through which the small nut or chestnut falls; the third has openings $1\frac{1}{2}$ in. by 3 in., with $\frac{3}{8}$ -inch web, through which the range or nut coke falls. The balance of the coke, which is egg size, runs out of the end of the screen into the last bin.

Mr. Gregg pointed out that there are two general advantages in screening coke. In the first place, the gross receipts from screened coke will run at least 50 c. to 75 c. per ton higher than those from pile-run coke; and the screening expenses ought not to be more than 25 c. per ton. Secondly, there are the many additional outlets for it. The egg size is screened suitable for various manufacturing purposes, such as core-ovens, &c., bakeries, and large hot-air furnaces; the nut size can be used to better advantage in hot-water furnaces, small hot-air furnaces, and kitchen ranges; while the small nut is used extensively in place of blacksmith coal for chain forges, and is also the only size that works successfully in self-feeding stoves. The breeze, mixed with soft coal screenings, can be used for boilers, as it does away with all smoke.

WATER-WORKS CONSTRUCTION ABROAD.

In the course of the Inaugural Address of the President of the new Society of Engineers (Incorporated)—Mr. Diogo A. Symons—delivered at the first ordinary meeting, held a few weeks since, he gave the following particulars of some foreign water undertakings with the designs of which he had been connected.

I will first mention an extensive scheme of water supply for a large city in Eastern Europe, the water for which it was ascertained would have to be conveyed from a source over 80 miles distant; this being the nearest spot whence a supply sufficient in quantity and efficient in quality could be obtained. After full investigation on the ground, involving the expenditure of a great deal of time and money, it was found that the water could be brought to the city by gravitation; and it then became necessary to fix upon the cheapest, and at the same time the most reliable, method of constructing the main conduit from the head works to the locality to be supplied. As a result of most careful consideration and exhaustive inquiries, it was ultimately decided that lock-bar steel pipes should be adopted—first, on account of the great saving thereby effected in weight as compared with cast iron; secondly, on account of the higher tensile qualities of this form of conduit; and, lastly, on account of the practical form of construction of the pipes themselves, coupled with the fact that the convenience of shipment was far superior to that of other pipes or tubes of similar dimensions. It will doubtless be remembered that this description of steel pipe was adopted in the construction of the Coolgardie Water-Works, Australia. The pipes varied in diameter from 31 to 18 inches; and it is interesting to note that the greatest pressure falling on the 31-inch pipe was 366 lbs. per square inch with the water flowing. The stress imposed upon the pipe material was 6.75 tons per square inch; and it will easily be realized that, though the stress could by no means be considered small, yet with steel of approved quality a sufficient factor of safety had been allowed for.

The service reservoirs, three in number, were situated at different levels, and naturally in the most advantageous positions. It was calculated that the most economical and satisfactory method of working the reservoirs was first to charge the intermediate reservoir, from which the water would flow by gravitation to the low-level reservoir; the high-level reservoir being served by means of suitable machinery operated by the flow of the water from the intermediate to the low level. It was confidently anticipated by those responsible for the design of the scheme that this method of distribution would prove far more efficacious than gravitating the water from the head works direct to the high-level reservoir. The difference of level between the intermediate and high-level reservoirs was about 170 feet; and it will be readily understood how large an increase of pressure would have been imposed on the main by gravitating direct to the high level, owing to the increased height of the hydraulic mean gradient.

The great importance of giving due and careful consideration to future requirements was much emphasized in the case of the water supply of one of the best known foreign seaside resorts, upon the inefficiency of which it was my privilege to advise. This instance was remarkable from the fact that though the head works were of excellent design, and the quantity of water (which is obtained from the chalk formation) was ample for many years to come and thoroughly efficient in quality, the system itself was designed and constructed without any regard whatever to the future requirements of the town, and, moreover, absolutely no accommodation was provided for the storage of water for use in cases of emergency. A further remarkable fact was that the service reservoirs were situated in such positions that in many instances the pressure was insufficient to force the water above the second floor of the important buildings in the town. Fortunately the supply is ample; but it is not difficult to realize what disastrous results would without doubt be occasioned in the event of accident or damage to the main supply conduit to the reservoirs. I may mention that the scheme was not designed by an English engineer. It was found necessary to entirely re-design it, involving the expenditure of several thousands of pounds, in order to make the supply efficient.

At a special meeting of the Leamington Town Council held on Monday last week, a resolution was submitted confirming a recommendation of the General Purposes Committee that the freedom of the borough be conferred on Alderman Sidney Flavel. Mr. G. Norris, in moving the resolution, said Alderman Flavel had worked for the public of Leamington for 35 years. He had been Mayor six times, and was now the senior member of the Council and Chairman of the General Purposes Committee. He was also senior Justice of the Peace for the borough, and a Magistrate for the county. He had been a member of the County Council many years, and had done good work on that body. It may be remembered that Alderman Flavel was present at the dinner given to the members of the Midland Association of Gas Managers by the Leamington Gas Company, on the occasion of their visit to the town in May, 1905; and that subsequently he entertained them at tea in the Imperial Foundry of the Flavel Range and Gas-Stove Company.

ASSOCIATION OF WATER ENGINEERS.

Abridgments of Papers and Discussions.

We continue to-day our report of the meeting of the Association, with the following extracts from the two last papers and discussions.

PERMANENCY OF OVERFLOW SPRINGS.

By HENRY PRESTON, F.G.S., of Grantham.

Stretching through the County of Lincolnshire in an almost unbroken line from the Humber in the north to Grantham in the south, is a range of hills known as the "Cliff," consisting of an escarpment of Oolitic limestones overlying Lias clay; the scarp slope facing west owing to the easterly dip of the strata. The scarp slope of the cliff shows several interesting phenomena relating to springs, particularly in regard to those usually known as "overflow springs."

In 1903, the author referred to one of these in a short paper read before the Geological Society, and showed by means of certain sections what appeared to be the cause of the permanency of a small spring which flowed in an opposite direction to the usual dip of the strata. Since that time other examples have been noted by him, of permanent springs flowing against the dip, and two of these he now proposes to describe. Also he proposes to describe an example of a spring being found when excavating in dense clay, because the explanation which he offers of the origin of this spring helps to throw light on the origin of one at least of the other two.

In 1907, the Grantham Water Company purchased a piece of land lying south of their pumping-station at Saltersford, for the purpose of constructing a storage reservoir. The land formed part of the river valley, and was locally known as the "Swamp." Several springs flowed into the Swamp from the east, and though they were all of the character of overflow springs, yet one spring at least has been permanent in character, even during the remarkably dry seasons of the last twelve or fifteen years. To increase the width of the reservoir, it became necessary to cut away the foot of the hill to the east of the Swamp for a distance of about 160 yards. The ordinary superposition of strata here is: (3) Lincolnshire limestone, (2) Northampton sands (ironstone), (1) Upper Lias clay; and the junction planes were expected to be practically level. It was soon found, however, that the surface of the Upper Lias formed quite an irregular line. In one place a perfectly V-shaped valley, 40 feet wide, had been eroded in the clay, and the cavity filled with ironstone, which appears to have steadily followed the erosion of the gap. But the most important variation in the line of section occurred just where a quarry was made. Here a valley 140 feet wide had been carved into the clay to a depth of 14 feet. It is perhaps impossible to say definitely how the valley originated; but the bottom had a decided inclination to the west, and the whole space was filled by a thick tongue of boulder clay. This tongue has then been buried by land creep, and preserved in this manner from ordinary denudation. The character of the boulder clay was somewhat unusual, inasmuch as it consisted largely of huge limestone blocks—"strangers" to the district—weighing from 1 to 10 tons each. It was at this point that the permanent spring occurred which fed the Swamp; and the excavation showed that beneath the surface a mass of coarse boulder clay, lying on a westerly inclined surface, had formed a hidden drainage valley, which collected water from a limited watershed, and had given rise to a permanent spring flowing in an opposite direction to the normal dip.

On the west side of the river at Saltersford, where, as has been explained, the strata all dip towards the river, it became necessary a few years ago (in 1906) to construct a covered reservoir so as to store filtered water. Generally, the Upper Lias clay in which the excavation was made is a dense, uniform blue clay, and is very suitable for purposes such as that named. Knowing that trouble had been experienced by building reservoirs in clay beds having a strongly defined dip, we had taken precautions against penetrating into the hill, and built on a level piece of ground by the side of the river. Our excavation, after passing the soil and alluvium, entered the clay to about 11 feet, and all went well until one morning when we noticed a mass of clay which had slid from its position leaving a slickensided surface, the strike of which was roughly in a north and south direction parallel to the river. After this, the sectional face of the clay was carefully examined and a number of fold lines were discovered which were only revealed by a slight stain of iron-oxide. Before the bottom of the excavation was reached, some of these folds were found to contain water under pressure; and it ultimately became necessary to carry the springs to the outside of the reservoir walls, and to keep the pressure down by pumping until the floor had been put in, and had become strong enough to resist the pressure.

The second case of overflow spring occurs on the scarp slope of the "Cliff" at Leadenham, about 11 miles south of Lincoln. The water supply for the village is taken from a number of small springs, which rise immediately under the brow of the hill; and although the yield varies according to the season, the supply is generally sufficient for the village, showing again permanent springs issuing in a direction opposite to the normal dip of the strata. Quite recently a section has been cut at the top of the hill to test the thickness and quality of the ironstone (Northampton sands) which here overlies Upper Lias clay. This cutting

has extended 76 yards from the brow of the hill in an easterly direction; and it was found that the beds overlying the Upper Lias were dipping towards the west for the whole length of the section—the amount being 5 feet in the total length. At the top of the ironstone, two bands of very tough and dark-coloured clay occur, separated by a thin bed of sand; and these showed a series of corrugations having steep faces to the east, and gentle slopes to the west. These corrugations are sections of natural gutters running in a northerly direction.

The principal springs which supply the village occur about 400 yards north of this section; and the ground having a slight northerly dip, the area of supply lies to the east and south of the springs. It would also appear that their permanency is materially increased in consequence of the folds in the clay bands catching the drainage, and diverting it northwards towards the springs. In this way the water is prevented from seeping out at the brow of the hill.

The westerly dip of the strata is probably due to two causes—firstly, to the erosive action of water issuing as overflow springs at the hill-brow, whereby the upper surface of clay and the lower surface of limestone would be gradually wasted away; and, secondly, by the great scarp face of Lias clay (over 100 feet deep) being gradually forced out by the superincumbent weight of rocks above. Both actions have had the effect of lowering the limestones and giving them a new direction of dip. The corrugations in the clay bands seem to show that this latter action has been the most important.

Briefly then, the permanency of the Leadenham overflow springs is due primarily to alteration of dip caused by erosion of the junction planes lowering the water-bearing rocks; and it is greatly assisted by the ridges and furrows in the thin clay bands holding up the water, and allowing it to drain more slowly to the spring outlets.

In conclusion, the author desires to point out that underground erosion has often had extensive influence on the local dip of strata; that the phenomenon of "creep" is much more common than is sometimes supposed; and that river valleys which cut across various kinds of strata have the effect of relieving pressure at one point, and bringing it into action at another, so as to cause distortions of stratified rocks, which at times are very puzzling. The small examples here noted are but an indication of what we may expect upon a larger scale under other circumstances. The rocks of the earth's crust are very susceptible to change by pressure, and the slow action of denudation and erosion, whether sub-aerial or subterranean, is continuously effecting changes in the lie of rocks, which may, and often do, affect the underground water supply.

Discussion.

Mr. W. WHITAKER, F.R.S., F.G.S. (Croydon), prefaced his remarks by, on a question of terminology, laying a formal protest against the use of the term "overflow spring." To him "overflow" and "spring" meant the same thing. But he understood there was some good reason for wanting to differentiate between these springs and springs flowing down long slopes. He (Mr. Whitaker) preferred calling them scarp springs. At some length, the speaker explained, in supplement to Mr. Preston's information, the geological changes that gave rise to springs of this kind. It was interesting, he said, to note how local geological changes would have important practical change; and one had to be careful whatever work was being done, because slips would happen, and where they had once happened might happen again.

Dr. HERBERT LAPWORTH (Derwent Valley Water-Works) said, to his mind, the paper was particularly interesting, because it happened to be on a subject of great importance to engineers in the matter of land creep. In this particular district, as Mr. Preston had explained, and he thought quite rightly, this movement of the scarp to such a large extent was due to underground solution. He believed they would hardly find a case where they had sidelong ground sloping towards a river where they did not get movement of this sort—where they had beds normally dipping away from a valley being dipped over from the surface towards the river. In North Derbyshire (in connection with the Derwent Valley works), in the shales where they cut their trenches through sidelong ground, they found this phenomenon. In his section of aqueduct, there were something like seven or eight miles of pipe-trench; and he found the phenomena wherever the trench entered sidelong ground. This was a subject of great importance to engineers. Where a trench was cut, the pressure was relieved; and the tendency for the ground to slip down into the trench in such cases had been very serious. There was an instance in a large water scheme, some years ago, of a line of syphon pipes being carried down hill by this creeping movement. Some time since, when he was working out the dam sites in a valley he found there were trial boreholes sunk for some distance down—20 to 25 feet deep—close to where he found the beds out of place. On the top there was a little slip down the hill; but lower down things were in their normal place. He asked Mr. Preston whether he found the limestone much fractured, and the cracks filled in with material; and whether he had gone into the question of the yield of these springs in relation to the area of reverse dip.

Mr. F. W. HOBSON (Loughborough) thanked Mr. Preston for putting in such clear language the reasons for these scarp springs. He had recently been interested in the water supply of Horncastle, which was entirely supplied from scarp springs in the chalk; and one of Mr. Preston's illustrations almost entirely met the case he

had worked out there. At the same time, he did not think the explanation would be entirely applicable to all scarp springs.

Mr. PRESTON, in reply, said he was obliged to Mr. Whitaker for what he had said in enlarging on the purport of the paper, and in further explaining the origin of the scarp springs, which was undoubtedly a finer name than overflow springs. The word "overflow," however, appealed to him, inasmuch as they flowed out after the land had been pulled in the opposite direction to the ordinary travel of the water. Then Dr. Lapworth asked about the yield of the springs. In the cases he (Mr. Preston) had noted, the yield was comparatively small—one did not yield more than 18,000 to 20,000 gallons per day. But the one at Leadenham yielded more than this; it was quite double the strength in the summer time at its lowest yield. The limestone that had crept down the hill over the boulder clay was undoubtedly fractured a lot. It seemed to have tumbled down, and become fractured and more pervious to water, and the fissures had taken a westerly direction, looking as though it was an ordinary dip of the strata. Respecting Mr. Hodson's remarks, he believed that at Horncastle he had a longer area to deal with in regard to the dip than he (Mr. Preston) had at Leadenham; and his explanation was very interesting.

NOTES ON THE COLOUR OF WATERS.*

By AD. KEMNA, D.Sc., of Antwerp.

From the hygienic point of view, which is undoubtedly the most important, the colour of a water is in theory only a subordinate question. In practice, however, it is quite the reverse. People go by the most apparent characters; and a discoloured water always raises suspicion, which is, after all, legitimate.

First of all, what is the colour of pure water? All our textbooks reply none at all. Pure water was for years declared to be absolutely colourless; but natural waters present us with a variety of hues and shades. At last, Bunsen had a novel idea. Having prepared some distilled water, he poured it into a long tube; and looking through the tube, he found the water had a blue colour. This being proved, it then follows that any other colour indicates an alteration of the original degree of purity. Tyndall's work on the blue of the sky as due to polarization was also applied to water. The theory of colloidal solutions is a new departure in physico-chemistry and certainly has a bearing on the question of the colour of water. These so-called "solutions" are really suspended solid matter. The suspended particles are of extremely minute size. Quite recently it has been contended that the so-called peaty acids are not solutions at all, because of their non-conductivity for electricity, which is characteristic of colloids, whereas all salts really dissolved are electrolytes and good conductors. Their extremely small size keeps the dispersed particles in suspension; but there are means of increasing their size by aggregation, till they get heavy enough to precipitate. To use the language of the engineer, this means simply clarification through settling. This we have been doing for years past; and, on the whole, with some success.

All this goes to show that there is no lack of scientific interest in the question of the colour of water. This paper is, however, devoted to the more practical side of the question, in which theoretical considerations may be largely dispensed with. When watching the gravel strainers at work at the Waelhem pumping-station, the author's attention was called by his assistants to the fact that sometimes after the first passage there was an increase of colour; the effluent water being yellower than the inlet water. The difference was not much, but still appreciable. This result seemed strange. The tubes containing the water were special tubes for nesslerizing (Wanklyn's chemical test for free and albuminoid ammonia). Having flat bottoms, they were placed in a rack and rested on two wires. It was noticed that these wires were better seen, and more clearly defined, through the effluent water than through the inlet water. In tubes with round bottoms, and if they had been standing on a glass plate or on a wooden tray with holes, this difference would very likely have escaped notice. The result showed that, after passing through the strainers, the water was more yellow and more clear, more coloured, but more transparent or less turbid. The gravel strainer has, therefore, done its duty by taking out something; and this something was evidently matter in suspension, as the turbidity was reduced. But this clever reasoning ends in a truism, as the very reason for the introduction of strainers is the removal of suspended matter. The real problem is not there; but in the logical connection between the reduction of turbidity and the increase of colour.

To observe the colour of a water seems simple enough; but the foregoing proves that, after all, it may be more complicated than we expect. The first question that arises is the length of the tube. That a greater length will give a deeper colour is quite obvious, and is borne out by fact. The 2-foot tube was formerly in constant use by water engineers, as it was generally admitted that the colour of water afforded a valuable guide as to its condition. On the other hand, it was a mistake to rely upon this alone, although a pardonable mistake when there was no other test available. Now that bacterial analyses have come into general use, the tube has been somewhat neglected, which is also a mistake.

The next question is whether the tube should be of glass or

metal. This seems at first sight of no consequence; but, in fact, it involves the obviously important question of side illumination or no side illumination. Glass being transparent, light can enter the tube, not through the bottom only, but also through the sides at every level; so that we work, not only with transmitted light, which has passed the whole thickness of the water, but also with a certain amount of light which has come into the water sideways, and which has passed through a part only of the layer of water. Now the quantity of such "side light" depends upon the presence of something which can arrest the side ray, and reflect it axially towards the eye—i.e., it depends upon the turbidity of the water. The intensity of colour depends upon the thickness of the layer of water; but the rays reflected by the solids suspended in the upper strata will scarcely suffer any alteration, and will appear nearly white. This admixture of white light, of course, makes the water look less yellow; and as the amount of reflected light is proportional to the number of reflecting particles, the more turbid water will not appear such a deep yellow as it really is, and the less turbid water will better show its natural yellow tinge. This explains the deeper colour of the filtered effluent.

Now as to some further consequences. If the side light really diminishes the colour of a water, the exclusion of such side light must increase the colour. Wrapping the glass tube in black cloth or paper does increase the colour, and to an unexpected degree. Two samples of the same water, in identical tubes, the one naked, the other covered, differ so much that it is difficult to believe that they are really the same. There also the difference of colour is proportional to the amount of the suspended (reflecting) matter, diminishing after each passage through successive compartments of the gravel strainers, and being almost imperceptible after final sand filtration.

Another very simple experiment consists in excluding transmitted light, and working with reflected light alone. This is easily done by shutting the lower end of the glass tube with a short cup of black cardboard. If, now, there are no suspended particles, there cannot be any reflected light—in fact, pure distilled water looks as black as ink; while the greater the turbidity, the more light is visible. This light is to a great extent unaffected by the real colour of the liquid. The raw water shows a white bluish opalescence, only slightly tinged with yellow; the luminosity gradually decreasing at each stage of straining. Another way of excluding transmitted light is by looking through the tube from the side, so as to catch the reflected part of the axial rays. The results are the same as with the other method; but a very strong light is wanted, so that for practical purposes and daily use the first method is the best.

Following a reference to Dr. Tyndall's experiments at the Royal Institution, he said: The members who went to Paris in 1906 will remember an interesting example of colour in water. Two of the sources of supply from the south of Paris, the Vanne and the Loing and Lunain are discharged into the Montsouris reservoir. A handsome building contains two tanks lined with white porcelain tiles, against which the beautiful blue colour of the water is very conspicuous. Part of the surface, however, in each tank shows a slightly greenish tinge, which at first is difficult to account for. The explanation lies in the fact that the handsomely decorated ceiling above each tank bears the name of the source on a scroll, having a yellow background; and it is the reflection of this yellow on the surface of the water which, combining with the pure blue of the water itself, produces the green tinge. This is an excellent instance of the sensitiveness of water to colour.

Discussion.

The PRESIDENT (Mr. W. H. Humphreys) said it was with deep regret that they heard the author of the paper was at the last moment prevented from attending the conference. Dr. Kemna was one of the most eminent scientists in Northern Europe. Those who had had the privilege of knowing something of his great work in connection with water supply would appreciate his difficulties, and admire the skill and ability with which he had overcome them. He had alluded to Dr. Tyndall's beautiful experiment before the Royal Institution. Dr. Kemna's own experiments and methods of showing the colour in water were quite remarkable, and brought the subject up to date. When Professor Tyndall carried out the experiment referred to, he drew attention to the fact that distilled water in an ordinary drinking glass exhibited no trace of colour, but he arranged an experiment which gave sufficient depth of distilled water so that it produced a very decided colour. He took a tube 15 feet long, fixed on plate glass ends, and laid it horizontally on supports. He placed at one end of the tube an electric lamp for the purpose of sending light through. The tube was half filled with freshly distilled water, which cut the tube in two equal parts horizontally—half of the light going through air, and half through water. At the other end of the tube, he fixed a lens, which projected the light which had passed through the tube on to a screen. By this means, he magnified an image composed of two semi-circles—one formed by the light passing through the water, and the other by the light passing through the air. Placed side by side, it was at once seen that the air semi-circle was pure white, and the water semi-circle bright and delicate blue-green. His experiment was to prove that, by augmenting the thickness through which the light had to pass, it deepened the colour—proving that the destruction of the light rays took place within the absorbing body, and was not an effective surface merely. The researches of Tyndall and Kemna provided them with both cause and effect;

* In the author's absence, the paper was read by Mr. Easton Devonshire, A.Soc.M.Inst.C.E., Chairman of the Antwerp Water-Works Company.

and, so far as they were able to go into the subject in the absence of the author, the colour tubes exhibited in the room would enable the members to judge as to some of the effects. The colouring matter found in their local waters arose mainly from peat and vegetable matter, and was considered by scientific men to be harmless. The colour was reduced by exposure to the light. For the purpose of noting the effect of light on a slow-flowing river, he had taken samples of the water on the same day from the same river, and at varying distances; and he had found that the higher they got up the river, there was an appreciable increase in colour. For the purpose of testing the colour of water, there was in use at the York Water-Works an apparatus known as the United States Geological Survey apparatus. In outline, the method consisted of the selection of a standard glass colour disc, whose depth of colour was the same as that of a 200 mm. column of the water to be tested. It consisted of four aluminium tubes with water-tight glass ends. Two of these were 200 mm. long; one, 100 mm.; and one, 50 mm. One of the long tubes was fitted with a small spring clip, so that it could hold one or more of the standard glass colour discs, of which there were six furnished with each set. These discs were of various degrees of colour, and were mounted in aluminium rings. Each disc was carefully rated or calibrated, and was stamped with a number corresponding to its value in the platinum-cobalt scale. If the water to be tested was of moderate colour, it could be poured into the 200 mm. tube. This should be rinsed out once or twice. The 200 mm. standard holder could then be fitted with one or more colour discs until the eye could detect no difference between the colour of the water and that of the disc, when both were held about 8 or 9 inches from the eye, and in the direction of a clean white background—such as a piece of white paper or tile, brightly illuminated by daylight. If the day was somewhat cloudy, the tube could be pointed towards the sky. Good results could not be obtained by artificial light. Each colour disc carried two numbers—one of which was less than 100, and represented the colour value; the other was over 100, and was merely the serial number. If it was necessary to use two colour discs together, the sum of the two colour numbers represented the colour value. If the water was rather highly coloured, it could be tested in the 100 mm. tube; but in this case the colour values on the discs must be multiplied by two; if the water was very highly coloured, the 50 mm. tube must be used, and the readings multiplied by 4.

Dr. SAMUEL RIDEAL said that Dr. Kemna was wise in bringing this subject before the members at the present time. It was a matter that concerned the consumer, because they had to supply a water that would satisfy not only the consumer's nose, but his eye. If there was any objectionable colour as it appeared in a tumbler, it was their (the engineer's and the chemist's) duty to find out the cause, and how to prevent it. Alluding to the experiments of Tyndall and Bunsen, he reminded those present of the lecture experiments of Dr. Edward Frankland. In these, long opaque pipes were used, so that there was no transmitted or side light. These tubes passed round the room, with reflectors at different distances. As the length of water increased, a deeper blue colour was obtained. Therefore, if they had a long enough tube, they could say there was no colour at all in the water; but, as a matter of fact, when one had a colourless water, it meant that they had all sorts of colour in it. They had to consider how much of the different kinds of colour passed through the water. This involved measuring the amounts of the different kinds of colour passing through different lengths of water. The American tubes referred to by the President were a modification of Lovibond's tintometer, which had been used for water colour in this country. He had worked with it; and the most extensive set of records made with this instrument were those of Mr. Parry of the Liverpool water at Vyrnwy. The speaker then gave an account of some of his own work on the subject, when employing Lovibond's tintometer. In his concluding remarks, he said it would seem from the Antwerp results that Dr. Kemna had filtered his water too much to give a satisfactory supply. If he did not take out all the suspended matter, the water would not look so yellow, and consumers would be better pleased with it.

Mr. J. J. LACKLAND (St. Helens) said, in relation to the colour of softened water, they had observed for some years, after lime had been added to the water and filtered out in the usual way, that the softened water had a beautiful blue colour; but, when the water was in this condition, it had the peculiarity of depositing lime in the pipes. The water was first passed out of the filters, and stored in the service reservoir, in which, in the course of twelve months, it deposited several inches of white mud, and then again in the mains, and periodical flushing had to take place, which gave something like whitewash after the course of weeks. In order to stop this objectionable feature, they adopted the device of blowing in, by a steam jet, carbonic acid from burning coke on the water passing from the filters to the reservoirs. This had the effect of removing the colour from the water; and after it passed from the reservoir, they could see a pin through 16 feet of water. But the peculiarity was that, instead of blue, there was a suspicion of green—possibly due to the rust from the coke.

Mr. W. M. LANGFORD spoke of the usefulness of the tintometer in making comparisons between the raw and the supplied water, and alluded to an occasion when, by its aid, detection was made of pollution in filtered water arising from leakage in the sides of the filter. By the bacterial method, through the period of incubation, this would not be detected for several days; but, as it was, they were able to put the filtered water out of use at once.

Mr. WILLIAM WHITAKER, F.R.S., F.G.S. (Croydon), said this question of the colour of water was being taken up by Lord Rayleigh. Only the previous week, he (Mr. Whitaker) came across an account of a research of his on the colour of water and air. He read it; and it disagreed with his feelings a little, so that he came to a conclusion a little adverse to Lord Rayleigh. He thought that eminent physicist might be a trifle colour-blind. Care must be taken that experimenters were not colour-blind in any way; but the curious thing was that so many people were. Lord Rayleigh had come to the conclusion that the prevalent colour of water was green; but he (Mr. Whitaker) could not say that it appeared so to him.

Mr. EASTON DEVONSHIRE explained the differences between the apparatus brought before the members by the President and that introduced to them in Dr. Kemna's paper. Incidentally, he mentioned that the natural colour of river water was apple-green. At the time of the visit of the Association to Paris, some of the members would remember a rather curious effect that the ozone process had in practically bleaching the water after it had, to all intents and purposes, been freed from turbidity. The water was perfectly transparent in a considerable length—he thought it was 4 metres—of tube. It was transparent; and the apple-green, after treatment by ozone, changed to an intense or pure blue.

[Dr. Kemna will reply to the discussion through the "Transactions," after reading the official report.]

The discussion on the paper presented by Mr. E. Young Harrison on "The Wellingborough Water-Works and Softening Plant" was postponed until the winter meeting; and we defer publication of extracts from it till the discussion takes place.

REGISTER OF PATENTS.

Producing Gas and Coke.

GOBBE, E., of Jumet, Belgium.

No. 11,265; May 12, 1909. Date claimed under International Convention, May 16, 1908.

This invention consists (in the words of the patentee) in a continuous process and apparatus; being characterized in that a portion of the comparatively cool gases produced in a single vertical oven is repassed therethrough in such quantities as to cool the red-hot coke and transfer the heat from the coke to the distillation zone to continue the distillation. In order to effect this transfer thoroughly, the gas must circulate slowly, so that the greater part of the cool gas may have time to pass actually into the interior of the lumps of coke which are sufficiently spongy to permit of this. If, on the other hand, the gas should circulate too rapidly, the gas would reach the distillation zone (the zone in which distillation of the coal actually takes place) in too cold a state, the effect of which would be speedily to cool the apparatus and bring the reactions to an end.

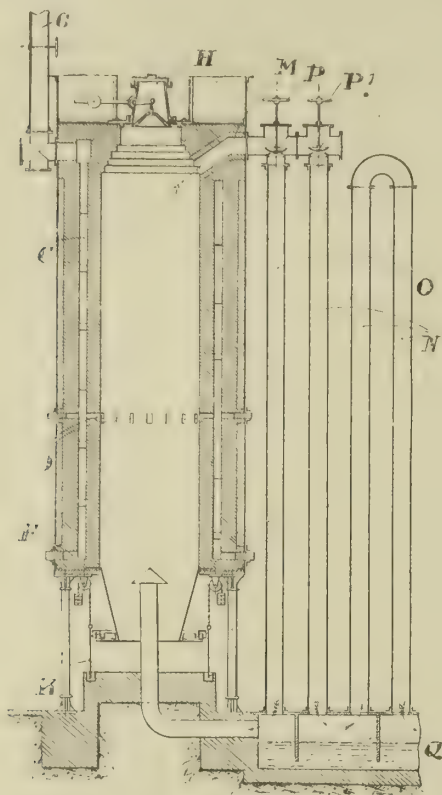
The process is to be distinguished from the operation of that type of intermittently acting gas-retort in which part of the gas obtained in one charge is cooled and separated from all bye-products, and, when the next charge is being distilled, is utilized to cool and scour through the space which exists between the bottom of the retort and the part which is not sufficiently heated to effect proper distillation of the material to be coked, in order to prevent an accumulation of the gaseous distillation products in the empty spaces between the filling material. It is necessary to provide the usual external heating jacket in continuous operation in connection with the retort; "so that it must not be assumed that the recuperation of heat from the red-hot coke, which plays so important a part in the economical aspect of the present invention, comes into operation. But it may be surmised that the quantities in which the gases are passed through the retort, in order to scour effectively the space above referred to, are such as to cause the gas to reach the distillation zone at a comparatively low temperature, which would result in the rapid cooling of the retort were no continuous heat supplying means provided." Not only are the gas and the coke produced continuously, but the flow of gas is so regulated that it enters the reaction zone at a temperature almost equal to that of the red-hot coke through which it has just passed; so that, were it possible to avoid all heat losses through the walls of the apparatus, &c., no external heating means would be required. In practice, however, it is usually necessary, in order to compensate for unavoidable heat losses, either to burn continuously a small quantity of gas in a jacket surrounding the distillation chamber, or to consume part of the coke for a short period of time. As, however, only a relatively small amount of heat is required, the fuel expenditure is practically at a minimum.

The inner jacket (p. 876) is separated from the outer jacket by a space C, in which gas supplied from the apparatus through small holes D can be burnt. The air enters at the base of this annular space through openings F, which can be closed as desired. The combustion which takes place in the space C heats the walls of the apparatus to prevent losses of heat therethrough; and the products of combustion escape comparatively cool at G. The coal is introduced through a hopper H. The ash-pit is formed by a circular apron K, the edges of which enter water-seals.

The illuminating gas issues at the top of the apparatus through the opening M; part of it being directed towards the scrubbers and the gasholder or bell in passing through the conduits N, while the other part returns to the base of the apparatus in passing through the conduit O. The tar which condenses in the conduit and the condenser constituted by the conduits N is collected in a tank Q.

The operation of the apparatus is as follows: When the apparatus contains well-kindled fuel and the charge proper has been introduced,

the ash-pit and the hopper are closed. The registers P and P¹ are then opened, so that a part of the comparatively cool gas leaving the apparatus descends towards the ash-pit through the conduit O; while the other part proceeds directly into the conduits N, the scrubbers, and the gas bell. The cooled gas which reaches the ash-pit absorbs the heat stored in the coke which is at the base of the apparatus, and cools it in transferring its heat units upwards into the reaction zone, where some of the heavy hydrocarbons lose a portion of their carbon, thereby forming, by dissociation, new gaseous compounds. The mixture of return gas and gas produced passes through the layer of cool coal with which the apparatus is regularly charged from above, and heats this coal before escaping in a comparatively cooled state through the discharge conduit M.



Gobbe's Gas and Coke Producer.

Cooling of the apparatus is avoided by constantly burning a small quantity of gas in the space C of the jacket, or by allowing air to enter through the ash-pit every time it is opened for withdrawing a certain quantity of cool coke. Assuming that it is necessary to open the ash-pit every hour in order to extract cool coke, and assuming that this operation occupies a few minutes only, during this time the air will burn a small portion of the coke in the reaction zone, which will reheat the distillation zone. During this period, carbonic oxide gas is produced, and is burnt in the space C by opening the chimney G and the air-holes F when the ash-pit is opened. The coke burnt during this period of internal reheating, and also the gas that is allowed to burn in the jacket of the apparatus, cannot amount to any considerable expenditure of fuel, because the apparatus produces comparatively cool gas and coke. It only loses heat through its walls, which can, however, be made very thick. "It therefore realizes the conditions which must be obtained for distilling coal with a minimum amount of fuel for combustion."

Bye-Pass for Gas-Meters.

THORP, T., of Whitefield, near Manchester.

No. 12,090; May 22, 1909.

This invention relates to the conducting of gases alternately either through a meter or other apparatus or line of piping (or past the same) direct from the supply to the delivery pipes, and consists in an improved arrangement of bye-pass with liquid seals for this purpose. It is more particularly intended for use with station meters of the rotary fan-wheel type.

In bye-pass arrangements with liquid seals hitherto proposed, three pairs of compartments were arranged, one of which would be filled while two were emptied, and *vice versa*, for conducting the gas either in one or the other way; the emptying and filling being done through three-way or other cocks. This arrangement depended for its satisfactory working on the attention of the operator in manipulating the several cocks, as if one set of compartments were filled before the other set were emptied, complete stoppage of the gas would result, and the lights (for instance) supplied by the delivery pipe would be extinguished. Also undue pressure in the supply pipe would be set up in many cases—for instance, if the supply were forced to a station meter by an exhauster. On the other hand, if the cocks were not turned off as soon as a set of compartments was emptied, gas would be passed into the drain pipes. These risks are obviated by effecting the change of way by transferring the liquid from the compartments to be emptied to those to be filled, by means of a pump, and regulating the volume of water contained therein, so that the way to be opened is always opened before the other way is closed.

Fig. 1 is a sectional elevation of the bye-pass, with the liquid in the position for passing the gas direct from the supply to the delivery pipe.

Fig. 2 is a plan with the cover removed. Fig. 3 is similar to fig. 1, with the liquid in the position for passing the gas through the meter or other pipe line.

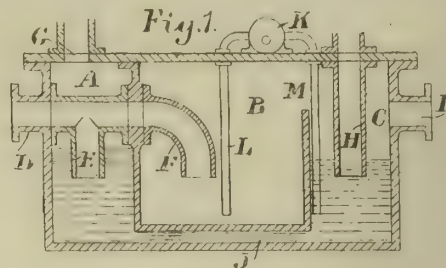


Fig. 2.

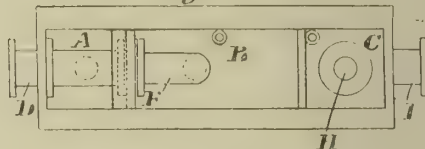
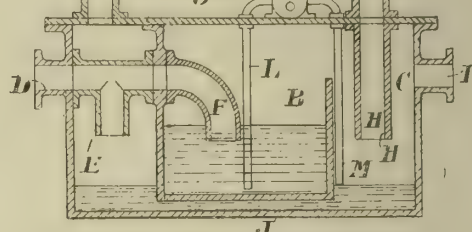


Fig. 3.



Thorp's Bye-Pass for Station Meters.

The bye-pass consists of a closed chamber or cistern divided by two vertical partition walls into three compartments A B C. One partition plate extends to the cover and is gas-tight with it, while the other one stops short at some distance from the top, or has openings in it, so that the compartments B C are in communication with each other at the top. The gas-supply pipe passes gas-tight through the compartment A, where it has a downward branch, and into the compartment B, where it is bent downwards. A branch D is cast on the end of the cistern, to which the supply pipe is connected. A tee-pipe is fixed between the end of the cistern and the left-hand partition, having a downward branch or dip-pipe E; and an elbow dip-pipe F is fixed to the other end of the partition. The compartment A has an outlet to which is connected the pipe leading to the measuring chamber of the meter or pipe line to be disconnected and connected—for instance, an outlet G at the top, or at the side. The delivery pipe from the meter is connected to a pipe H depending into the compartment C, either to a straight pipe (as shown) or an elbow pipe, as may be most convenient. The gas delivery pipe to the main is connected to the compartment C, either through a branch I, at the end as shown, or at the side near to the top of the cistern. The compartments A C are in communication with each other at the bottom through a passage J cast in the cistern or through other pipe connections.

If the middle compartment B is filled with liquid to such a height that the downwardly directed end of the gas-supply pipe is sealed to the depth corresponding to the gas pressure, while the first and third compartments A C are empty except for the quantity of liquid required to seal the passage J (as in fig. 3), the gas will pass through the downward branch of the supply pipe into the compartment A, and through the pipe G to the meter; then through same, and through the down pipe H into the compartment C, and on to the outlet I. If the liquid is now emptied out of the middle compartment B into the end compartments A C (as shown in fig. 1) so as to seal the dip pipes in them, the gas will pass through the end of the pipe F into the compartment B and over the right-hand partition into the compartment C, and to the outlet I, without passing through the meter or other pipe line.

The transfer of the liquid from the middle to the end compartments and *vice versa* is effected by a pump actuated, when required, by hand or power. Preferably a rotary pump K, with sliding vanes, adapted to be rotated in either direction without any valves being required, is used. One pipe branch of the pump is connected to the pipe L, depending into the compartment B, and the other to the pipe M, depending into the compartment C. The latter stops short at such a distance from the bottom that sufficient liquid is left in the meter compartments to seal the passage J.

Conveyors for Hot Coke.

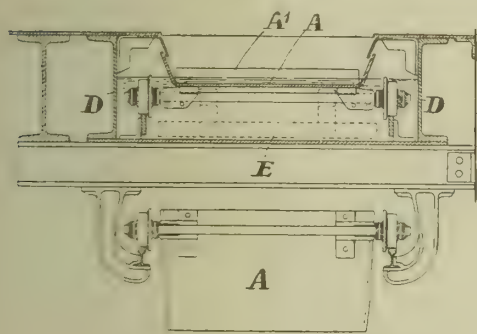
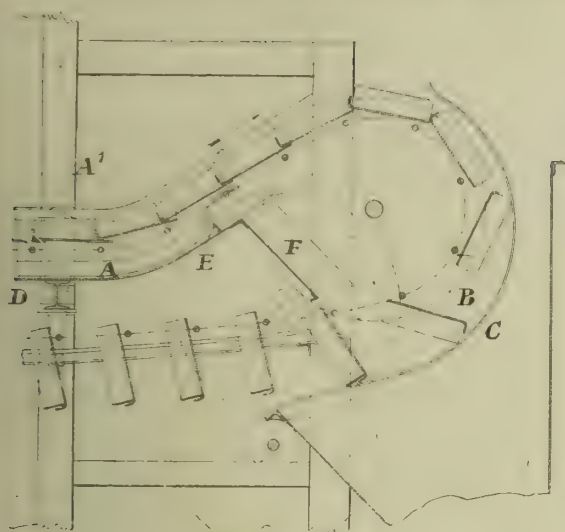
BABCOCK AND WILCOX, LIMITED, and PATON, P., of Farringdon Street, E.C.

No. 12,313; May 25, 1909.

This is a "Patent of Addition" to No. 15,582 of 1906; and it has for its primary object to render conveyors of the kind then described better adapted for handling hot coke.

As shown, the conveyor comprises (as described in the 1906 patent) a series of trays A carried on two endless chains, and adapted to be tipped as they pass over the end drum B in contact with the end guides C; the trays being each formed with side flanges and with a lip A₁ at one end, so that in their movement in the direction of the arrow they have a positive action in taking with them the coke as it is discharged from the retorts.

A trough D, composed of side and bottom plates (made water-tight),



Paton's Hot-Coke Conveyor.

is fitted in the line of travel of the trays, and filled with water to any depth required, so that the bottom of each tray, as it passes through the trough, may be submerged in order to keep the trays and chain cool when in contact with the hot coke, and, if desired, to partly quench the lower strata of coke. In addition, automatic sprinklers at intervals would quench the coke in the usual way.

Rakes E are attached to the conveyor chains to drag any sediment deposited in the trough bottom towards the delivery end, where it is discharged down a shoot F along with the main coke discharge.

Fuel for Gas-Fires.

FOUCAR, J. L., of St. John's Park, Blackbeath, S.E.

No. 12,785; June 1, 1909.

This fuel for gas-fires consists, broadly, of fused silica in the place of the ordinary fire-clay balls or other substances (such as asbestos) which are heated by the burners and radiate heat into the room. The silica is first fused, and blocks or pieces of any convenient form and size are arranged so that they are heated by the burners.

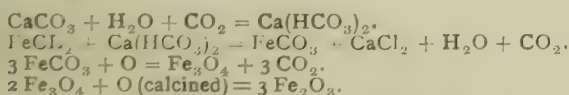
Fused silica, the patentee remarks, presents considerable advantages as a fuel for gas-fires. In the first place, it is more durable than fire-clay, and is dustless. A frequent cause of trouble with gas-fires using fire-clay balls is the partial choking of the burner holes with dust or particles of fire-clay; but this objection "is removed with the silica fuel forming the subject of this invention." He has further found that fused silica fuel possesses high radiating power.

Manufacture of Ferric Oxide.

GILL, J., of Pendleton, Lancs.

No. 21,884; Sept. 25, 1909.

In an earlier application (No. 5618 of 1909), the patentee described a process of preparing ferric hydrate $\text{Fe}_2(\text{OH})_6$ and ferric oxide Fe_2O_3 by treating ferrous chloride FeCl_2 with calcium carbonate CaCO_3 at a temperature of about 180°Fahr. , and forcing carbon dioxide and air through the mixture, while maintained at a considerable pressure above normal. He now finds that, by increasing the temperature of the mixture of ferrous chloride and calcium carbonate or bi-carbonate during the oxidation process to about 200° to 220°Fahr. , magnetic oxide, Fe_3O_4 , is formed. The product is washed to free it from soluble salts, and is then filtered and calcined.



By this improvement in the process of making ferric oxide, Fe_2O_3 , a great advantage is said to be obtained, as the magnetic oxide Fe_3O_4 can be calcined and reduced to the red oxide Fe_2O_3 at a temperature of 800°Fahr. in about two hours—there being no combined water of hydration to drive off; whereas a temperature of about 2000°Fahr. for about five hours was required to calcine and reduce the ferric hydrate $\text{Fe}_2(\text{OH})_6$ to the ferric oxide Fe_2O_3 .

Anti-Vibrator for Incandescent Mantles.

OULTON, J., and NEWHOUSE, W. A., of Bradford.

No. 15,527; July 3, 1909.

This is a "Patent of Addition" to No. 6700 of 1909, with the object of providing a simple means for increasing the effect of the interposed vertical open spiral concentric spring in combination with the transversely divided mixing-tube of the burner in absorbing any shock.

For this purpose, an additional support is supplied to the concentric spring and divided mixing-tube, in order that they may always retain the burner, mantle, and other parts of the apparatus in a vertical position (with due regard to any vibration of the parts caused by shock) "without in any way destroying or reducing the flexibility of the tube, but, on the other hand, increasing the qualities of the anti-vibratory action."

This is effected by inserting a second or inner supplementary open concentric spiral spring in the divided mixing-tube extending throughout the interior of the concentric spring mentioned in the earlier specification. The ends of this inner concentric spring rest against the interior of the shoulders of the upper half of the divided mixing-tube, and the gas-nozzle is screwed into the lower half of the divided burner.

Regulators for Incandescent Gas-Burners.

NEUE KRAMERLICHT G. M. B. H., of Charlottenburg, Germany.

No. 23,545; Oct. 14, 1909. Date claimed under International Convention, Dec. 8, 1908.

This invention relates to a development of the apparatus described in patent No. 11,122 of 1908, in which a reservoir, divided into two chambers by a flexible plate, is used in order that, after closing the conduit leading to the main flame or to the pilot flame, the contents of the chamber communicating with the conduit in question can be utilized in this conduit for supplying the expiring flame and cause the latter to remain burning for some time longer, so that the other burner which the gas does not reach immediately the cock has been opened may certainly be kindled.

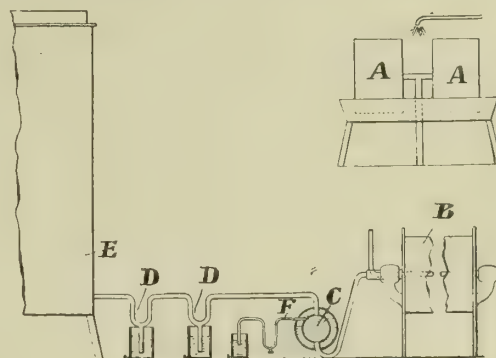
The device is constructed in such a manner that the lights can be turned on and off not only in the separate compartments of the railway carriage, but also from the main stop cock, which is generally located at the end of it; while in each case, owing to the automatic operation of the auxiliary reservoir, the kindling of the flame that it is desired for the time being should burn is ensured. With this object, a cut-off device is provided in the auxiliary reservoir for the bye-pass conduit leading to the pilot burners; this device being connected with the flexible plate, and being automatically operated when the path for the gas is altered.

Producing Gas from Peat.

OLIGNY, J. D., and PEAT GAS AND COAL COMPANY, of Montreal.

No. 23,760; Oct. 16, 1909.

According to this invention, the peat is taken in its natural moist state, crushed, and sprinkled with petroleum oil; and then subjected to intense heat—air being injected, preferably by forced draught, to mingle with the gas from the peat during the heating step, so as to lode the gas with air. The air-laden gas is then passed through liquid tar for carburetting purposes; the bye-products are withdrawn by condensation; and finally the gas is passed to a holder.



A Peat Gas-Producer.

The illustration shows merely the outline of the plant used.

The first step in the process is to destroy the capillary nature of the peat by placing it (say) under crushing rollers. During this step, it is saturated with petroleum or other hydrocarbonaceous oil. The peat so pulped and charged with petroleum is placed into a retort B, and "baked" until the mass becomes thoroughly coked and relieved of all the gas. During this step, air is injected (preferably by forced draught) into the retort. The gas from the retort then goes through a carburetting chamber C containing tar, preferably obtained as a bye-product from the peat itself; then through suitable pipes and condensing arrangements D, where it drops the bye-products into suitable receptacles; and finally it passes into a holder E.

The gas on leaving the retort is, as mentioned, laden with air. In this state it reaches the carburetting chamber containing the tar; and in this cooled chamber the mixed air and gas is carburetted, and much of the tar carried from the chamber C with the gas drops back into the chamber from above. The overflow of the chamber is taken care of by a syphon pipe F and receptacle attached.

The condensing of the gas further on in the process will, the patentees assert, cause the exusion from it of any further excess of tar and other bye-products, as also, later on in its flow, the exusion of alcohol; the gas "finally reaching the gasholder with its illuminating, heating, and explosive properties intact and generally in first-class commercial condition."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Coalite Patents.

SIR,—Our attention has been drawn to the statement in your issue of the 10th of May last, *re* the above, and to Messrs. Edward Evans and Co.'s reply thereto, and your comments on that letter, in your issue of the 17th of May. Seeing Messrs. Edward Evans and Co. do not seem to have replied to your comments, we, as the Patent Agents acting for the Glasgow Syndicate referred to, beg to confirm the statements you make as being substantially correct.

The Coalite Company were unsuccessful in opposing our clients' patent on the ground that the invention described in our clients' specification was covered by what they were pleased to consider their master patent—the patent cited in their prospectus. Their claim, therefore, to a monopoly (in this class of smokeless fuel) has been effectively "knocked on the head."

Further, both ourselves and Counsel engaged on this case regard the invention covered by our clients' patent as of equal, if not greater, value to that of the "master patent" of the Coalite Company, as our clients' process and claims disclose advantages which are not even foreshadowed in any way in the Coalite Company's specification.

With this information before us (which is equally well known to Messrs. Edward Evans and Co.), it is not surprising that they have not replied to your *addenda* to their letter, nor that you have not hitherto "corrected the statements" in regard to the Coalite Company's patents which Messrs. Edward Evans and Co. asked you "to be good enough to do."

121, West George Street, Glasgow,
June 15, 1910.

EDMUND HUNT AND CO.

[It is not at all surprising that Messrs. Edward Evans and Co. did not reply to the editorial note appended to the letter from them published on May 17, although it would have added to the interest of the carbonizing world had they done so. Even now we should much like to know the grounds on which they alleged that the statements made in our columns were "absolutely untrue." If they were "absolutely untrue," why be reticent over the matter? What have they to say, too, to the substantial corroboration of our statements by Messrs. Edmund Hunt and Co.? We said before there seemed to be a little bit of bounce about the letter of Messrs. Edward Evans and Co.; and there is confirmation in the above communication.—ED. J.G.L.]

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Bristol Gas Bill, Egremont Urban District Council (Gas) Bill, Exmouth Gas Bill, Exmouth Urban District Water Bill, Mountain Ash Water Bill, Slough Water Bill.

Bills read a second time and committed: Gas Orders Confirmation Bills (Nos. 1, 2, and 3), Glasgow Gas Consolidation Bill, South Hants Water Bill, Water Orders Confirmation Bill, Worksop Urban District Council Bill.

Bill Royal Assented: Farnham Gas and Electricity Bill.

The Southampton Corporation have petitioned against the South Hants Water Bill.

The Abertillery and District Water Board Bill, Brighton and Hove Gas Bill, the East Grinstead Gas and Water Bill, the Glasgow Gas Consolidation Bill, and the Slough Water Bill have been referred to a Select Committee, consisting of the Duke of Bedford, the Marquis of Bristol, the Earl of Westmorland, Lord Digby, and Lord Basing; to commence sitting to-day.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bill read the first time and referred to the Examiners: Great Grimsby Gas Bill.

Lords Bills reported, with amendments: Matlock Bath and Scarthin Nick Urban District Council Bill, Thorne and District Water Bill.

Bills read the third time and passed: Bristol Gas Bill, Egremont Urban District Council (Gas) Bill, Exmouth Gas Bill, Exmouth Urban District Water Bill, Gowerton Gas Bill [Lords], Mountain Ash Water Bill, Slough Water Bill.

Bill withdrawn: Staffordshire Potteries Water Bill.

The second reading of the Gas Companies (Standard Burner) Bills [Lords], which was on the paper for Tuesday, was deferred till Thursday, and then till yesterday.

The Cambridge Water Bill, the Kingswood Water Bill, and the Water Provisional Order Bill have been referred to a Select Committee, consisting of Sir Luke White (Chairman), Mr. Paget, Mr. London, and Mr. Newman; to meet next Thursday.

The water-works of the Brighton Corporation have been contributing to the rates ever since 1876; the grand total received from this source having been £178,000.

LONDON COUNTY COUNCIL (GENERAL POWERS) BILL.

Gas Companies and the Smoke Nuisance.

Among the provisions contained in the London County Council (General Powers) Bill, which came before the Local Legislative Committee of the House of Commons last week, it is sought in Part IV., which deals with smoke nuisance, to amend and extend section 24 of their Act of 1891, to enforce certain provisions of the Act of 1891, and to expend moneys in investigating and advancing measures in respect to smoke consumption and abatement of nuisance arising from smoke.

The Gaslight and Coke Company and the South Metropolitan Gas Company, in a joint petition against the Bill, strongly object to the proposed alteration of the Act of 1891 and to the granting of the further powers sought, which, they contend, will seriously interfere with the carrying on of their statutory duties in connection with the supply of gas. They further contend that there are other provisions in the Bill which affect their rights and interests, and that not sufficient clauses are contained therein for their protection.

Mr. J. D. FITZGERALD, in opening the part of the Bill relating to smoke nuisance, said the smoke nuisance in London was a very real nuisance, and one of the main causes of the thick, black fogs prevailing there in the winter. If they could prove that black smoke in sufficient quantities to be a nuisance was being emitted from a chimney, conviction followed. But, unfortunately, in a recent case, a loophole of escape had been discovered by the offenders; and in the Lois Road case, it was proved by scientific witnesses to the satisfaction of the Magistrate that the smoke was dark brown or dark grey. It was really impossible to prove that the smoke was absolutely black—it was hardly ever, if ever, absolutely black. There were other serious defects in the existing law. With regard to statutory undertakings, they varied enormously. In some instances they were subject to the ordinary law of nuisances, and in others they were not. In some cases it was almost impossible to find out whether or not they were subject, because part of their works had been authorized by Parliament and part had not; and it might be contended that a chimney on one side of a works was immune, while one on the other side of the works could be proceeded against. Under the Gas-Works Clauses Act, gas-works were specially not freed from any liability with regard to nuisance. But gas-works were so admirably managed that they hardly ever created a nuisance. He was not aware of any case in London where a gas-works had of recent years been charged with creating a nuisance; and he would be much surprised, though there were two gas companies in opposition, if it was said that any nuisance were caused by them.

Mr. James Ollis, the Chief Officer of the Public Control Department of the London County Council, gave evidence in support of the Bill.

In cross-examination by Mr. BALFOUR BROWNE, K.C. (who appeared for the Gas Companies), witness said he knew the difference between black and very serious smoke. He thought, generally speaking, that smoke could be prevented. In proceedings under the Public Health Act, in order to establish a nuisance, they had to show that it was not a mere accident, that it was not temporary, and that it had injured some person or some body. The smoke must be black, and in such quantity as to cause a nuisance. It would be somewhat difficult to say how much of the smoke in London was produced by manufacturers and how much by private chimneys. He thought that the conditions were improving in regard to gas companies putting in gas-stoves. Some years ago, they had a very strong complaint against one of the gas companies in regard to smoke.

Mr. BALFOUR BROWNE: Do you know that there is very little smoke when charging a retort?

Witness: We are not worrying over a little smoke.

When the coke is drawn, it has water thrown over it; and steam and smoke must be produced?—Steam would be prominent, and smoke, too.

Do you know that the best-managed works in the world cannot avoid that?—I do not know that there are decreases of the amount of smoke that can be produced under these conditions. It entirely depends upon the care exercised.

I am asking you to assume that both the Gaslight and Coke Company and the South Metropolitan Company have not been complained of, and are managing their works as well as possible?—I am not going to assume that any local authority would take action against a manufacturer for accidental cases of emission of smoke.

Would it not be fair, if you are going to take away this word "black," that the emission should continue for a certain length of time, and this should be mentioned in the Act?—I do not know that.

If you could agree as to what was a requisite amount of smoke to be allowed in smoke cases?—I think you might get a worse condition even than you have at present. If you provide exceptions, you will place local authorities in great difficulty. Under the proposed powers, it would be on the local authority to prove that the smoke was a nuisance; and the manufacturer is protected by the London stipendiary magistrate.

Mr. BALFOUR BROWNE said one was protected if one used the best practical means with regard to a furnace; but one had no such protection in the case of a chimney emitting black smoke. The only protection was the word "black."

The CHAIRMAN said it seemed to him there was some protection in the words "in such quantity as to be a nuisance."

Mr. FITZGERALD, upon re-examining, said that if one had not a proviso in one's Bill, it might be necessary to prove negligence; and, if the contention of the other side was correct, it might be that if it were proved that a chimney was sending forth black smoke in such quantities as to be a nuisance, they would be able to meet that by saying there was no negligence on their part.

Witness, replying to a question by Mr. FITZGERALD, admitted that well-managed gas companies were very rarely complained about for creating nuisance. He also agreed that if a gas company did not look carefully after its business, it would create a nuisance.

Mr. W. H. Booth, a member of the American Society of Civil Engineers, next gave evidence. He said the objection to smoke was two-fold—first in the nuisance to the public, and, secondly, in the waste to the person who burnt the fuel. Smoke was caused by imperfect combustion. To experts, there were two classes of smoke—black and green. Black smoke was the result of the sudden chilling of hydrocarbon gases distilled from the coal before combustion was complete. The hydrogen burned, and carbon was thrown out in the form of soot. Green smoke was crude gas from coal which had never attempted to burn, as it was got in gas-works, unpurified. Black smoke might be brown or grey, or a combination of these different shades, depending upon the amount of carbon in it. Both qualities were objectionable things to discharge into the atmosphere. The appearance of what was known as green smoke was seen when a shovelful of coals was thrown on to a bright fire. This happened frequently with boiler furnaces. It was possible to prevent the mischief at comparatively little cost. Stoking should be done on the coking system. The smoke should be evolved gradually.

In cross-examination by Mr. BALFOUR BROWNE, witness agreed that there were occasions when it was necessary to stoke suddenly. In starting a boiler absolutely from the cold, they must make smoke. Bituminous coal was necessary for the manufacture of gas; but there were furnaces constructed which burnt bituminous coal smokelessly. In this case there would be no impropriety in saying that the person manufacturing the gas should be responsible unless he were using the proper kind of furnace.

Dr. H. Des Voeux said he had made a special study of the subject. With regard to the regulations in other countries, he thought "dense" was a very common word, and there were such words as "dark" and "dark grey." He was Treasurer of the Coal Smoke Abatement Society, which was founded in consequence of the great evil of smoke in London. He placed figures before the Committee showing the number of factories that had been reported for smoke nuisance.

In cross-examination by Mr. BALFOUR BROWNE, witness said they had done their best to instigate the County Council to promote the Bill. In London they had done very well towards lessening the evil; but they had not done sufficiently well. The Society's Inspector gave evidence in the Lots Road case; and the only difficulty was that he could not get the Magistrate to believe him. The prosecution failed because the witnesses who swore that the smoke was black were not believed. His (witness's) opinion was that no smoke was absolutely black.

The hearing was adjourned till to-day (Tuesday).

WATER SUPPLIES PROTECTION BILL.

The Joint Committee of the House of Lords and the House of Commons who have been charged with consideration of the above Bill met again Thursday, the 9th inst.—Lord MACDONNELL presiding.

The EARL OF ONSLOW, Chairman of Committees in the House of Lords, said it had been assumed that because companies or undertakers had power under their Special Acts to acquire land by agreement they had also power to sink wells on land so acquired without applying to Parliament for authority to do so. In 1907, the parliamentary authorities began to realize that it was desirable that where companies came to Parliament a clause should be inserted which would prevent the sinking of wells or the construction of any works except those which were auxiliary to the main works of the undertaking; thus carrying out what was decided in the Frimley and Farnborough case. The "wells" clause, as it was called, had accordingly been inserted in nearly all Bills since 1906, and in all since 1907. This clause applied only to undertakings in respect of which application had been made to Parliament; and the effect of clause 3 of the Bill would be to extend it to all existing undertakings. This was right and proper; and he failed to see where any hardship would arise except in a limited number of cases—that was to say, in cases such as the Barnet Company, in which the undertakers had received authority from Parliament to exercise the powers conferred on them by clause 12 of the Water-Works Clauses Act, 1847, and had already begun work. If the Bill passed, these undertakers would no longer be able to proceed with such works. He could see no reason why in future, whenever water undertakers desired to sink wells, they should not come to Parliament with a Private Bill or proceed by way of Provisional Order—a very much less expensive procedure. There might be some difficulty in including within the purview of the Bill small local authorities who were exercising powers under the Public Health Act. He had been unable to ascertain how many of these local authorities there were. It was suggested to Lord Onslow that the case of small authorities who had neither power nor money to apply to Parliament would be met by substituting application to the Local Government Board for application to Parliament. He replied that proceedings before the Local Government Board might be (he did not say that they would be) of a "hole and corner" character, and, moreover, proper notice might not be given to all the parties concerned. The Local Government Board usually held an inquiry locally; but they were under no obligation to do so. Possibly the difficulty might be met by making it obligatory on the Local Government Board to hold a local inquiry in every case. In this event, everyone in the locality would know what was being done; and thus the main object of the "wells" clause would be attained. In case of acquisition by a local authority of land otherwise than by agreement, a local inquiry was necessarily held, and the purpose for which the land was required would come up. He would exclude local authorities from the right which they at present enjoyed of acquiring land by agreement, unless means were established of making the matter public and giving the parties interested an opportunity to be heard. If the Frimley decision were upheld, clause 3 of the Bill might be unnecessary; but this decision might be appealed against and reversed. With regard to clause 4, which related to compensation, he was of opinion that protective clauses in existing Acts of Parliament ought to be safeguarded. As to underground water, there was a good deal of difficulty in fixing a general limit of possible injury that would be proper and adaptable to all geographical conditions.

Water-works in chalk strata and water-works in clay strata affected areas of very different size. An area of possible damage in one case might be too much or too little in others. Each case should be considered on its merits. If large water-works were established and there was diminution of the supply of water in neighbouring ponds and streams, it was reasonable to infer that the cause of the diminution was the water-works. To ascertain if there had been a diminution, expensive machinery would have to be erected. It would be hard on the owners of the water that they should be called on to undertake this expense in order to prove at some future date that the supply had been diminished by the undertakers. It was common to insert a provision that the undertakers should establish gauges and so forth.

The CHAIRMAN remarked that the erection of apparatus to register the rise and fall of water would be a protection which undertakers would provide in their own interests. Why throw on them the burden of proving that no damage occurred in consequence of their works? To do so would be to reverse completely the ordinary rule of procedure.

Lord ONSLOW replied that one of the main justifications for the proposal was the difficulty which, in the absence of methods of testing, the claimant would experience. He doubted, moreover, whether all companies and undertakers would go to the expense of putting up gauges if they had not to prove their case, and if they knew that the *onus probandi* rested with the claimant. He did not think the time within which a claim for compensation must be made should be limited. The water taken might be very much greater at the end (say) of ten years than at the time the works were erected. Wherever practicable, compensation should be in water, not money. With regard to clause 5, he recognized the soundness of the principle that every district had a natural inherent right to the water in it, and that it was a great hardship to take the water away without making adequate provision for the supply of the district. But when they came to supplying all the districts between the place at which the water was taken and the place to be supplied, it seemed that this was going a little far. A proposal was made by the London County Council some years ago to bring water from Wales to London. If every district on the way was to be supplied, it might be that there would be very little left for London. It seemed that only such water as was not required for the supply of the place to which it was taken should be given to the localities *en route*. Under the Bill, the power of asking for water—not necessarily of getting it—was strictly limited to district councils. Questioned as to whether the protection afforded by the fact that the Local Government Board could refuse to require a supply to be given *en route* was not sufficient, Lord Onslow pointed out that a decision of the Local Government Board, once given, would stand for all time. The population of London was increasing very rapidly; and a supply of water brought from Wales might a few years hence be wholly inadequate to supply London and the places *en route*, although in the earlier stages it might have been sufficient for both. The matter should therefore be subject to revision. As the Bill stood, difficulties of this sort might arise.

Mr. PERCY GRIFFITHS, representing the Association of Water Engineers, said he gathered that Lord Onslow admitted that in principle the exemption of local authorities working under the Public Health Act, 1875, was possible. What was his view with regard to a similar exemption being extended to water undertakings working under the Gas and Water Works Facilities Act—that was to say, under Provisional Orders granted by the Board of Trade, a department in many respects the equivalent of the Local Government Board?

The CHAIRMAN remarked that the two cases were not on all fours. The body in one case represented the ratepayers; while the body in the other case was independent, and worked for its own profit.

Lord ONSLOW said he thought the Chairman had answered the question.

Mr. GRIFFITHS said he wished to raise another point. The engineers he represented were considerably affected by the possibility of clause 3 preventing necessary duplication of boreholes, wells, and so forth. Did Lord Onslow anticipate such an interpretation of the clause as would have that effect?

Lord ONSLOW thought the intention of the clause was that, wherever it was intended to take or intercept water not at present taken or intercepted, the undertakers should go to Parliament for the necessary powers, and, incidentally, give due notice of their intention.

Mr. GRIFFITHS said the duplication to which he referred meant second plant for accomplishing the same purpose—a stand-by, not plant for doubling the quantity withdrawn.

The CHAIRMAN said the two sets of machinery often worked at the same time.

Mr. GRIFFITHS said he did not refer to such cases.

Lord ONSLOW said that if duplication meant that twice as much water was to be abstracted from the same area as Parliament had sanctioned in a measure that had been before it, the undertakers ought to go to Parliament again.

Lord DESBOROUGH remarked that if duplicate machinery were wanted merely as a stand-by, it was not intended that the undertakers should have to go to Parliament.

Mr. GRIFFITHS said it was not usual to define exactly the works—the number of engines, the number of pumps, and so forth. Members of his Association did not wish to have to promote a Bill in order to carry out works they might reasonably execute under a former Act.

Mr. H. R. CRIPPS, on behalf of the Metropolitan Water Board, said he did not desire to put any questions to witness. His clients thought it better that the facts and figures which they would have to place before the Committee should be given by their own witnesses.

Mr. A. V. FRERE, on behalf of the Barnet District Gas and Water Company, pointed out that where, for instance, a pumping-station had been authorized without any specification as to the quantity of water that might be taken, it would, from the passing of the Bill, be stereotyped, so to speak; and they would never be able to obtain more water from it. Did witness think that fair?

Lord ONSLOW replied that he thought it necessary that the Committee should consider very carefully the definition of "new works." A reasonable increase of existing works would probably not be objected to. The objection was to new works. Where new works were in progress under existing powers, some exception should be made.

Lord DESBOROUGH: Do you agree with the attitude that if a man

possesses a plot of land he should have unrestricted rights for all time of grabbing what water he can take from it?

Lord ONSLOW: No.

Mr. PELHAM, of the Board of Trade, explained the practice of the department with regard to the granting of Water Provisional Orders; pointing out that while the Board of Trade had power with regard to companies the Local Government Board had power with regard to local authorities. It did not appear to the Board that the Bill would seriously affect undertakings authorized by Provisional Orders of the Board, except in places where special power had been given to the undertakers to sink wells on land not specified in the Order. The Board saw no reason to suggest that the undertakings of companies authorized by Provisional Order should not be subject to the same restrictions as those imposed on companies who obtained their powers direct from Parliament by Special Acts. With regard to clause 3, many companies had acted on the assumption that they were entitled to sink wells on any land belonging to them, whether such lands were specified for the purpose or not. The Board had very readily followed the practice of Parliament in inserting the Model Bill clause with the object of definitely prohibiting such action. The view of the Board had always been that legally companies who were undertakers acquired no general powers to sink wells other than those specified in the Provisional Order. They had never considered that section 12 of the Water-Works Clauses Act, 1847, gave them power to sink wells on lands acquired by agreement and not specified in their Act. They had frequently refused to authorize capital asked for when the estimates showed that the money was wanted for the construction of works for which the promoters had not obtained statutory sanction. It appeared to the Board that full notice ought always to be given in the locality concerned of any proposed abstraction of water, in order that persons likely to be affected might have an opportunity of obtaining protection for their interests. So far as clause 3 was merely declaratory of the general law, it seemed to be unnecessary so far as companies were concerned; but where special powers had already been granted by Parliament in excess of the general law, as in the case of the Barnet Water Act, it would appear to have the effect of restricting and amending these powers. It was not customary, by means of a Public General Act, to repeal or amend powers specifically granted by a Special Act. In most cases, the effect of clause 3, so far as companies were concerned, would be merely to declare the present law. The Board hesitated to recommend the application of clause 3 to existing undertakings, except possibly as a condition of granting further statutory powers. The clause might be particularly hard on companies who had bought land by agreement in reliance on special powers in their Act to sink wells. The Board agreed with the principle of clause 3, and thought it should apply to all new undertakings of companies. As regarded clause 4, there did not appear to be any objection to the general principle that compensation should be given to the owners of private water supplies for injury caused by the abstraction of water for public purposes. But the clause seemed to be open to the objection that it was impossible, by a general enactment, to have a satisfactory definition of "protected area," for which purpose it would be necessary to consider the geological and other conditions of each particular district. The clause was also open to the objection that it threw the onus of proof on the undertakers. It seemed preferable to deal with each case on its merits, and to insert such protective provisions as were required. The obligations resting on a company under a clause of this kind were very indefinite, and might have the effect of discouraging the application of capital to the provision of new undertakings, or to the extension of existing undertakings. It would almost certainly tend to discourage an existing company from making provision for future requirements by timely extensions of their present works; and to this extent it might be detrimental to the public interest. As regarded clause 5, it would be practically impossible to grant powers by a Provisional Order which would involve bringing water from a considerable distance; and the experience of the Board of Trade did not enable them to offer any observations on the operation of this clause.

Mr. MIDGLEY TAYLOR said that the smaller district councils were not too ready, under present conditions, to provide their districts with water, even under the Public Health Act of 1875; and if application had to be made to Parliament by these authorities, the fear of the expense would act as a deterrent, and many authorities would not seek the necessary powers by Act of Parliament, whereas they might probably proceed by Local Government Board inquiry. In his experience, urban and rural district councils exercising their powers under the Act of 1875 took water in their own neighbourhood; and there was no need therefore for the Bill to apply to them. The Local Government Board, when sanctioning wells and borings by district councils, did not consider the damage which might be done to adjoining private supplies. Granting Provisional Orders, therefore, under section 303 of the Public Health Act, 1875, should not be excluded from the Bill. The sinking of wells and borings by authorized undertakers should receive the express sanction of Parliament. He agreed generally with the proposal that compensation should be given where private supplies were injured by the abstraction of water for a public supply, with the provision that where water was taken from any district for supplying communities outside that district the districts whence the water was taken and through which it was conveyed should be entitled to demand a share of such water, provided that the undertakers should be entitled to a certain quantity per head per day for their own district. He also approved of clause 4.

Mr. URBAN A. SMITH, the Surveyor and Engineering Adviser to the Hertfordshire County Authority since 1875, also gave evidence in support of the Bill.

Mr. G. L. COURTHOPE, M.P., on behalf of the Central Associated Chambers of Agriculture, gave evidence. He said that body had had represented to them the evils of the land being drained, and they had been asked in many cases by local agricultural bodies to represent their interests in opposition to the Bills promoted by water companies. A great many Acts had been passed without any action being taken by the Local Government Board; and it was admitted by the Local Government Board that they had not power to protect the consumers of water. The Central Associated Chambers had endeavoured to protect the consumer by blocking the Bills promoted by water companies;

and in many cases fairly satisfactory clauses had been obtained. Clause 3 provides that: "Notwithstanding anything contained in any Act of Parliament or Provisional Order, no authorized undertaker shall, after the passing of this Act, sink any well upon, or construct any other works for taking or intercepting water from, any land unless those works, and the lands upon which the same are to be constructed, are specified in an Act of Parliament." He said it was very desirable that there should be a model clause of this nature. Where a supply was affected by a water company, either the supply should be made good or compensation should be paid. A protective clause, either by agreement or arbitration, should be inserted. This Bill was the practical embodiment of the protective clauses which had been inserted in many Bills that had passed through the Houses of Parliament in the last few years; but though the Bill was not necessary for the purpose of protecting the public against damage, it would prevent unnecessary trouble, delay, and expense. The Bill was rather in the interests of the poor and weak than in the interests of the rich and strong; and it did not attempt to do anything or impose any obligation which had not already been recognized by one House or the other. By their opposition to individual Bills, the Central Chamber of Agriculture had succeeded in establishing precedents; and it was becoming more and more easy to look after the interests of agriculture in the House than had been the case in the past. There was not now the slightest chance of a Private Bill forcing its way through Parliament without some clause or other being inserted to protect any interests that might be threatened. There was ample protection with regard to the depletion of water by pumping.

Lord ROBERT CECIL said he had taken a lot of interest in the whole question of water supply; and he was of opinion that a great deal of unnecessary litigation, and very often unnecessary hardship, could be avoided if this Bill received the sanction of Parliament. With regard to the general law, he agreed substantially with the evidence of Mr. Lithiby. Of late years, Parliament had taken a certain definite view with regard to the matter which might not by some be regarded as the law of the day. When he first began to practise in these rooms, it was difficult to get *locus* to be heard—say, in regard to injury to a well. But Parliament must consider the actual state of things that now existed; and they could not put out of their minds the fact that the demand for water had enormously increased. There used to be a theory among water engineers that there was a great stream of water under the ground, and that therefore one could pump as much as one liked without injuring the stream. But this really was incredible. He had no doubt that the water pumped from a well diminished the amount that otherwise might find its way into a spring or stream in the neighbourhood. The time had certainly come when there should be general legislation on the subject. He thought very strongly that some limitation of the statutory rights of the undertakers ought to be imposed; and it should be done by a General Act. As a rule, some specific limitation was put in; but if it were done by a General Act, it would make it so much better for everybody concerned. In a matter of this kind, everybody should be protected. With regard to the advantage to water undertakers, he said the rich landowner could petition Parliament. But the only remedy of poor people was to induce the Member for their Division to block the Bill; and he was very strongly of opinion that it was better for everybody that there should be a law which was safe than one which at present was unsafe. There was no reason why this Act should not apply to Provisional Orders. Where a large source of water was tapped, the principle had been generally recognized that the people living in the district from which the water was taken ought to be supplied first. Although he was opposed to giving discretionary powers to Government Departments, he thought the only way of deciding certain small difficulties would be to allow the Local Government Board to decide. The sort of case he had in mind was where a water supply was taken from a district which, in the course of a few years, might need it, in order to benefit a growing manufacturing town.

The Committee adjourned till Thursday last.

Winding-Up of the National Lighting Corporation, Limited.

A petition for the compulsory winding-up of this Company was heard before Mr. Justice Swinfen Eady last Tuesday. The Company was formed in August, 1909, with a capital of £1000, in £1 shares, and the petitioner (one Lange) was a judgment creditor for £437 in respect of goods sold and delivered. His claim was disputed by the Company; and, under an order made by Mr. Justice Neville, the matter was referred to Mr. Malcolm Macnaghten as Arbitrator, who had found in favour of the petitioner, the amount due to whom was about five-sevenths of the total indebtedness of the Company. Resolutions purporting to voluntary liquidation were supposed to have been passed; but the procedure, as his Lordship observed, was full of irregularities from beginning to end. An attempt to increase the capital by issuing 2000 shares of 1s. each was equally irregular, as the resolutions were not properly passed. His Lordship made the usual order for compulsory winding-up.

Winding-Up of the Beaufort Gas Company.

At the Tredegar County Court last Tuesday, before His Honour Judge Hill Kelly, Mr. A. Parsons applied for the compulsory winding-up of the Beaufort Gas Company. Mr. Parsons said the petitioners were Messrs. Robert Cort and Sons, and there was no opposition. On the 13th of January last, they recovered judgment for £59 6s. 9d. and costs; and when execution was levied, the Sheriff found a Receiver in possession on behalf of the debenture holders. Debentures to the amount of £3700 had been issued; and since the debt had been incurred, 30 others of £10 each—27 being held by the Managing-Director. Frequent applications had been made for payment, but without success. The application had been made before his Honour at the previous Court, when it was adjourned in the hope that the applicants' claim would be met; but nothing had been done. He applied that the Official Receiver should be appointed Liquidator. His Honour asked if the Company had any parliamentary powers. Mr. Parsons replied that they had not. The application was granted.

MISCELLANEOUS NEWS.

THE RESIGNATION OF MR. W. R. HERRING.

A Special Meeting of the Edinburgh and Leith Gas Commissioners was held on Monday, the 13th inst., to consider the resignation of Mr. W. R. Herring. There was a full attendance, presided over by Lord Provost BROWN.

The CLERK (Mr. J. M'G. Jack) read Mr. Herring's letter of resignation, which was as follows: "It is with many feelings of regret that I now place in your hands my resignation as Chief Engineer and Manager of your undertaking. My professional future, however, necessitates my taking this action. For some time past I have been at least endeavouring to defer this otherwise inevitable step. But it is now considered by my friends to be adverse to my interests to further delay following my profession as a civil engineer in London. In doing so, I would like to place on record my sincere thanks to the Commissioners for the unstinted confidence they have shown towards me since I came to Edinburgh, for the great opportunities they have given me in my professional sphere, and for the unflinching courtesy that has invariably been extended towards me; and my wish is that the undertaking may be even more successful, both from a practical and financial point of view, in the future than it has been in the past." The Clerk said he had a further letter from Mr. Herring, in which he said: "In handing you the enclosed document, I believe I am right in saying that the terms of my appointment necessitate my giving three months' notice to terminate my engagement. If such is the case, I would like you to convey to the Commissioners that I do not wish to bind them to this particular period, as (say) Martinmas term would be a convenient period for myself; and I would further suggest that the Commissioners consent to name Martinmas term as the period when I should vacate Granton House."

Lord Provost BROWN said he was sure it was not the desire of any of them that there should be a discussion that day. It came as a surprise, to many of them at any rate; and he was sure they all regretted very sincerely the position which Mr. Herring considered it necessary to take up. He thought the right course would be to remit the matter to a small Committee; and if that were the feeling of the Commission, they might name the number they wished to act. The first thing to do was to consider the delicate position in which they were placed. There were various interests to be considered; and he thought the course he suggested would be in the interests of the Commission. They must not do anything hostile.

Baillie STEWART: Is this resignation final?

Lord Provost BROWN: I have no idea whatever; we must see Mr. Herring.

Provost SMITH, of Leith, extremely regretted that Mr. Herring should have sent in his resignation. They, who had been there for some years, knew the very great value he had been to them. He came to them when the old works were in use—producing gas in a somewhat antiquated and expensive manner—and, acting upon his recommendation, they decided to adopt a scheme for removing the gas-works to one site—viz., Granton. This had all been carried out, without employing a consulting engineer, at a cost of over a million sterling, and carried through within the time, at several thousand pounds less than the estimate. This had saved the Commissioners, in architects' and engineers' fees, between £25,000 and £30,000. They had found Mr. Herring to be an excellent business man, whose advice was always sound and reliable; and in this respect their loss was a very severe one. He approved of the suggestion that they should remit to a Committee, with the object in view of asking Mr. Herring to reconsider his decision, and remain with them some time longer; and failing that, that the Committee have power to proceed to fill up the vacancy.

Mr. RAWSON thought it would be a very great mistake if, for any reasonable sum of money, the Commissioners should allow their Engineer to leave Edinburgh. Mr. Herring practically stood unique in the gas world.

The Commissioners appointed a Committee of seven, with instructions to first approach Mr. Herring, and with, in the event of failure to get him to reconsider his decision, a free hand in the procedure to be followed in filling up the vacancy, and to report.

STAFFORD GAS AND ELECTRICITY SUPPLY.

The Past Year's Accounts.

It was recorded in the last number of the "JOURNAL" that the accounts of the Gas and Electricity Departments of the Stafford Corporation for the year ended the 31st of March had been submitted to the Town Council and passed. We have since received a print of the accounts, signed by the Chairman of the Committee (Alderman Wright) and the Engineer (Mr. Herbert Pooley), and from them and the Committee's report the following additional particulars are taken.

The quantity of gas sent out from the works during the year was 202,436,000 cubic feet, compared with 203,843,000 cubic feet in the year 1908-09; and the unaccounted-for gas amounted to 2,156,643 cubic feet, or 1.07 per cent.—this figure being the lowest in the history of the concern. The total revenue was £33,596, and the total expenditure £18,315; the gross profit for the year being £15,281, compared with £14,754 for the preceding year. After deducting charges against the net revenue account, amounting to £7072, and adding the balance of £241 brought forward, there was an available balance of £8450, compared with £5660. In the Electricity Department there were sold 390,070 Board of Trade units. Of this quantity, 152,712 units were sold for lighting purposes and 212,139 units for power; while the public lamps used 8635 units. The total number of units sold in the year

1908-09 was 380,353. The equivalent of 893 eight-candle power lamps was connected to the mains during the year, and also ten additional motors. The revenue from all sources amounted to £4343, while the expenditure was £1865; the gross profit being £2478, compared with £2465. Charges against the net revenue account amounted to £2104; leaving a net profit of £374, which, added to £110 brought forward, came to £484.

According to an analysis of the accounts of the Gas Department by Mr. Pooley, the capital invested in the undertaking at the close of the year amounted to £40,446; being at the rate of £2 4s. 4d. per ton of coal carbonized, and 4s. 1d. per 1000 cubic feet of gas sold. The quantity of coal, &c., used for producing gas was 18,265 tons; the make per ton being 11,083 cubic feet, of which 10,858 cubic feet per ton were sold—or 97.93 per cent. on the make. The residuals sold per ton of coal were: Coke, 9.94 cwt.; tar, 11 gallons; sulphate of ammonia, 18 7 lbs.—the net proceeds from the sale of residuals being 73.1 per cent. on the cost of the coal. The net profit was equal to 8s. 11.89d. per ton of coal carbonized, and 9.93d. per 1000 cubic feet of gas sold. A similar analysis of the accounts of the Electricity Department shows that the returns from the sale of current were equal to 2.67d. per unit. The profit on the year's working was equivalent to 0.23d. per unit sold.

SALFORD GAS CHARGES.

The Special Meeting of the Salford Town Council to re-consider the question of gas charges was postponed from Wednesday last until tomorrow (Wednesday). It will be remembered that the Council at their last sitting rejected the Gas Committee's recommendation that the quantity of gas supplied to penny-in-the-slot consumers be reduced from 30 cubic feet to 27 cubic feet for a penny; that the charges for meter-rents be re-introduced; and that the price of gas to large consumers within and outside the borough be reduced, 1d. per 1000 cubic feet for consumers of 2,000,000 cubic feet and under 4,000,000 feet, and 2d., 3d., 4d., and 5d. per 1000 cubic feet to still larger consumers, in proportion to the amount consumed. There is every probability that the Gas Committee's proposals will be approved at tomorrow's meeting. The General Purposes Committee, which embraces the whole of the members of the Council, have already passed a resolution to this effect.

COVENTRY CORPORATION GAS AND WATER SUPPLY.

The Past Year's Working.

A gratifying result of the working of the Coventry Corporation Gas Department in the twelve months ended March 31 was laid before the Gas Committee at their meeting last Wednesday. The net profit is £18,191, compared with £2296 for the year 1908-9. It was decided to recommend that £4000 should be paid over to the general district fund in aid of the rates, that £13,000 should be set aside towards meeting the loss of capital occasioned by the abandonment of the old works, that £430 should be applied in payment of a bonus to workpeople in the department, and that the balance should be carried forward. It was also decided to recommend that the price of gas should be reduced 1d. per 1000 cubic feet to ordinary consumers, and 2d. per 1000 cubic feet to those who use prepayment meters. The Committee further recommended that the salary of the Engineer and General Manager (Mr. Fletcher W. Stevenson) be increased by £150 per annum.

The water undertaking of the Corporation has again yielded a satisfactory result on the year's working. The annual accounts just prepared show a net profit of £5577, against £2133 in the preceding twelve months. The Water Committee recommend that £3500 of the net surplus should be devoted to the borough fund in aid of the rates, and £539 transferred to capital account, representing one-fifth of the cost of promoting the Bill of 1907 by which the Corporation obtained a supplementary water supply under an arrangement with the Birmingham Corporation. The balance of £1538 is to be carried forward.

COLWYN BAY GAS-WORKS.

Suggested Improvements.

The Gas Manager of the Colwyn Bay Urban District Council (Mr. J. Smith) has presented a report on the condition of the plant, and submitted proposals for the improvement of the works and the better administration of the undertaking. He recommends methods for securing higher carbonization results, the purchase of lower-grade fuel, the provision of additional washing plant, additional steam-boiler plant, and new purifiers, the enlargement of all 6-inch connections in the works to 12-inch, the testing and sealing of the station meter, the assembling and enclosing of the gasholder valves, the provision of offices and a new weighbridge, and a better method of conducting sales of coke at the works, the treatment of residuals, the allocation of as much work as possible under a piecework system, the systematic testing of all meters, a hire-purchase system for the distribution of gas cookers, the introduction of automatic lighting for street-lamps, the registration of meters, stoves, &c., the reorganization of the distributing department, the fixing of a standard scale of pay to workmen, and the appointment of a storekeeper. The Gas Committee, he states, are at present selling gas at 2s. per 1000 cubic feet to other Council departments, and coke below the market price; and the gas and other expenditure for street lighting does not appear at its full value as a credit to the department. A true commercial return for comparison with other undertakings cannot be arrived at under these conditions; but if full credit for these items were given to the proper department, the balance would be at the disposal of the Council in a legitimate manner.

MALTA AND MEDITERRANEAN GAS COMPANY.

Small Effect of Competition.

The Ordinary General Meeting of the Company was held last Tuesday at the London Offices, No. 59-63, Gracechurch Street, E.C. —Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. A. W. Cooper) read the notice convening the meeting and the report of the Auditors; and the Directors' report and the accounts (which were noticed in the "JOURNAL" for May 31, p. 581) were taken as read.

The CHAIRMAN remarked that when the shareholders last met no one contemplated that the country was so soon to sustain the severe loss it had done in the death of the King; and it would be unbecoming in them now to transact the business before them without some brief reference being made to the sad event. Proceeding to move the adoption of the report and accounts, he remarked that he had prepared the shareholders during the last two or three years for a reduction in the amount of gas sold, in consequence of the naval establishments at Malta putting up electricity works for their own purposes, and after that in consequence of the military establishments having decided to purchase electricity from the Government at Malta, and to instal it, not only in their hospitals (which one could understand) but also in their barracks (which it was a little more difficult to comprehend, in view of the fact that economy was usually the ruling passion with such authorities). Bearing what he had said in mind, the proprietors no doubt looked for a considerable falling-off in the revenue; and yet, if they compared the balance carried over this year on the profit and loss account with that of the preceding twelve months (which was by no means a bad year), they would see that the difference between the two amounts was only about £100. Nevertheless, it was a matter of regret to a Company such as theirs that they should lose so good a customer as the military establishments had been to them in years gone by. But they had yielded to the arguments—which the Directors considered delusive arguments—in favour of the electric light. However, the controlling powers on this side would very shortly have an opportunity of making the comparison themselves, if they cared to do it, of the difference in cost of lighting the barracks by means of gas and of electricity. With regard to the profit and loss account, he might point out that, though the decrease in the cost of coal amounted to £498, the Company had used some 600 tons more. The actual cost per ton, he might mention, was 17s. 6d. last year, as against just over 19s. in the preceding twelve months; while the gas made per ton worked out at 10,718 cubic feet. Therefore they had not done so badly. The item of gas making showed an increase of £110, and that of maintenance an increase of £245. The policy of the Board had been, and always would be, to keep the works up to the highest possible pitch of efficiency. On the credit side there was a falling-off of £682 in the gas sold, expressed in sterling, and by measurement the sale was 119,562,000 cubic feet, against 122,459,000 cubic feet in the previous year. Malta was responsible for a falling off of £458 of this sum, and a decrease of 736,000 cubic feet to the general public, which worked out to rather less than 1 per cent. This was attributable to the increased competition of the electric light. He must give the electrical authorities credit for putting a tremendous amount of power into their competition. The shareholders must not think for a moment that he complained of competition. Far from it. When fairly carried out, competition was a very good thing; for it kept everybody up to the mark. Coke showed an increase of some £377; while, on the other hand, tar and pitch realized £14 less. All told, there was a balance left of £10,835. Now, as to the general revenue account, the items under this head spoke for themselves. In the general balance-sheet, the proprietors would have observed that the amortization account had attained the respectable amount of £38,000. On the other side, the investments stood at the same value in the books as the previous year; the market value of the day being also shown. With a class of securities such as the Company held (as mentioned in the accounts), he did not see any advantage in constantly changing the value in the books. The Sicilian stations—which he alluded to at the last meeting, and must refer to again now—had engaged the very close attention of the Board. Matters were now, he was happy to say, in a more healthy condition. The Foreign Office here had been good enough to state the Company's case to the Ambassador in Italy, with a view to his moving the Italian Government; and the Ambassador had shown himself not only ready to do so, but to continue doing so, in the interests of the Company. He was glad to take this opportunity of expressing the satisfaction of the Board at the value of the services which the Ambassador (Sir Rennell Rodd) had rendered to the Company. Matters, however, moved so slowly in that country that the Directors became impatient—and very properly impatient. "To-morrow" was the usual lethargic answer to anything like an appeal; and so the Board thought it desirable to despatch the Secretary, with the necessary powers, to Sicily—taking Rome on his way, so that he might see the Ambassador there. In one case in Sicily, Mr. Cooper succeeded in making arrangements with the authorities, who had so far kept to their engagement in the matter of paying up. With regard to Marsala, too, he was successful in negotiating for a renewal of the concession, to run till 1921, on such terms only as the Company were able to continue working there. Some of the conditions were of such an onerous character that the Directors could not have recommended the shareholders to continue operations there, but for what the Secretary had been able to accomplish. He was glad to tell the shareholders how much the Board appreciated the tact, energy, and ability which had enabled Mr. Cooper to bring about so good a result to the Company.

Mr. A. M. PADDON seconded the resolution. He remarked that he did not think there was anything in the statement of the Chairman with reference to the competition in Malta which need discourage a single one of the proprietors. It was following a well-worn track. The Company had regained every bit of the early loss; and this small temporary set-back he did not think had any high significance. Circumstances would certainly prove in Malta that economy was on the side of gas; and he thought this little indulgence in electric light would soon bring its lesson. Of course, in this battle with the electric light

they had to remember that the old methods would not do. The two lights were not judged on their respective merits, but by the methods employed by those who were protagonists and antagonists of the systems. The electric light well pushed would beat gas, and bad gas well pushed would beat electric light. They must show enterprise and vigour, and be prepared to spend some money. The Board were displaying all these qualities in regard to Malta; and therefore it was possible to anticipate the regaining of the small loss which had to be recorded that day.

Mr. H. R. SIBSON said they might hope and believe that the suggestion made that this small set-back was only temporary was an accurate diagnosis. If, as had been said, bad gas well pushed would beat electricity, what might they suppose that good gas—such as they could assume was supplied in Malta—would do? It should knock electricity out of the field altogether. There was one point on which he would like a little information, if the Board thought it desirable to give it. It was in reference to the large item in the general balance-sheet "Sundry debtors." He noticed that this had crept up from £14,330 in 1908, to over £17,000 in 1909, and to £19,245 in the year under review. Of course, this figure was very considerable—representing, as it did, one-half of the amortization account. Had this occurred in connection with arrears in public lighting, private lighting, or what? Items of this kind, if they continued to grow, must ultimately be regarded, he might say, with anxiety both by Directors and shareholders. He had nothing but praise for the efforts of the Board, who, in face of the competition they had had to meet, had been able to present a balance-sheet showing approximately the same result as the previous year.

The CHAIRMAN said this was the very subject he referred to when he spoke of the action of the Foreign Office here, and to the mission of the Secretary to the Sicilian stations. At these two places there were municipal debts; and the larger sum was at Trapani, where judgment had been obtained. The arrangement, however, was that the judgment would not be enforced, provided the Government would assist in the way of finding funds. This was what Mr. Cooper had negotiated for. Marsala was also a poor place; and there, again, the Secretary had succeeded in making arrangements for the meeting of the debt. However, the Company's great strength was in the manner in which the Foreign Office here had assisted them. There was not the slightest hesitation on their part on the present occasion, any more than there had been on previous occasions when their aid was invoked. The Ambassador had quite made up his mind to push the Company's claims with the financial department of the Government of Italy, so as to get them to provide the funds themselves.

The report was then unanimously adopted.

The CHAIRMAN proposed, Mr. A. F. PHILLIPS seconded, and it was agreed, that the usual dividends should be paid on the first and second preference capital and a dividend of 4 per cent., free of income-tax, on the ordinary capital, making, with the interim dividend paid in December last, 6 per cent. for the year.

On the proposition of the CHAIRMAN, seconded by Mr. JOSEPH CASH, the retiring Director (Mr. Stephenson R. Clarke) was re-elected; and, on the motion of Mr. THOMAS WILKINS, seconded by Mr. F. R. SMITH, the Auditors (Messrs. R. Hesketh Jones and Thomas Guyatt) were also re-appointed.

The CHAIRMAN then proposed a vote of thanks to the officers. They were, he said, most fortunate in their staff.

Mr. SIBSON seconded the resolution, which was heartily passed.

Mr. COOPER, in acknowledgment, remarked that he had seen the officers abroad; and a more zealous lot of men the Company could not have at any of the stations. While speaking, he would like to refer to the kindness he had received from the Ambassador in Rome, who had the Company's affairs at his fingers' ends.

Mr. CASH, in proposing a vote of thanks to the Directors, congratulated them on the excellent accounts presented, which, he thought, showed the Company to be in sounder condition than it had occupied for many years past. So far as the competition of the electric light was concerned, there need be no fear. They had had the same sort of thing in England; and gas usually came out on top. From what he heard of some of the officials, they would maintain the business of the Company in every way.

The vote was seconded by Mr. SMITH, and cordially agreed to; and the CHAIRMAN'S acknowledgment brought the proceedings to a close.

BARROW GAS AND WATER SUPPLY.

The Borough Engineer and Surveyor of Barrow-in-Furness (Mr. Arthur Race) read a paper before the Lancashire and Cheshire District Meeting of the Incorporated Association of Municipal and County Engineers at their meeting in his town the first Saturday this month. He took for his subject "Barrow-in-Furness and Some of its Municipal Undertakings," in only a few of which readers of the "JOURNAL" are specifically interested.

As to street lighting Mr. Race said: Although Barrow claims to be modern and up-to-date in most matters, it must be confessed we are considerably behind the times with reference to street lighting. The author has recently obtained considerable information from other towns and presented a report on this matter, which report is now receiving consideration at the hands of the Highways and Lighting Committee. The following particulars may be interesting:

The total number of electric lamps is as follows:

| Ordinary Arcs. | Incandescents. | Total. |
|----------------|----------------|--------|
| 78 | 149 | 227 |

The total number of gas-lamps is as follows:

| Incandescent | | | | Intensified and | | Flat Flame. |
|---------------------------|---------------|-------------|------------|-----------------|------|-------------|
| Four Lights. | Three Lights. | Two Lights. | One Light. | Other Wnds. | | |
| — | — | 2 | 63 | 27 | 1113 | |
| Total—Gas-lamps | | | | 1205 | | |
| Electric lamps | | | | 227 | | |
| Grand total | | | | 1432 | | |

The percentage of flat-flame lamps to the total number of gas-lamps in Barrow is 92.4 per cent., which compares with the percentage in 39 other towns of 21.2 per cent., or 71.2 more. In fact, only one town out of the whole number has a lower percentage of incandescent gas-lamps. On the other hand, the percentage of electric lamps to the total number of lamps (gas and electric) is 16, which compares with 10 for other towns. In 17 out of 44 towns from which replies were received, they have entirely replaced their flat-flame burners with incandescent burners. In 4 others they have almost discarded them (in no case have they more than 10); and in 5 others they are gradually replacing them.

The present flat flames consume $\frac{1}{4}$ cubic feet of gas per hour; the gas pressure being generally about 15 roths; and lamps are spaced 40 yards apart on alternate sides of the street.

A number of lamps were converted a year or two ago into incandescents; "Block" fittings of the "Domestic" type being inserted in the old lanterns, burning 6 cubic feet per hour.

The arc lamps are of the ordinary open type, erected on poles, 22 feet high and 80 yards apart, on alternate sides of the street.

At a distance of 12 feet above the street, two incandescent lamps are fixed on brackets to the lamp column; the arc lamps being turned off at 11.30. For the remainder of the lighting hours, the incandescents are burning.

As to whether gas lighting by means of incandescent lamps is more efficient for the same money than electric lighting, the opinion of the borough engineers is almost in every case in favour of gas lighting. Much, however, will depend on the respective prices of gas and electricity and other local conditions.

There does not appear to be any general type of burner which has been found quite satisfactory; but the "Kern" and the "Welsbach" appeared to be most favoured. But these are becoming somewhat out of date owing to the introduction of improved inverted types; and the author is favourably inclined to the "Dacolight" inverted regenerative lamp.

One reason why the question of street lighting has not been dealt with before is that in this particularly stormy town, owing to the old lanterns not being wind-proof, the wind plays havoc with the mantles; and there is a difference of opinion as to whether an up-to-date type of burner should be fixed in the existing lanterns, or an entirely new lamp obtained.

As regards the respective merits of the various descriptions of lamps, in Barrow copious photometric readings have been taken in the streets at various times; but the author places little practical value on such tests. From a practical test which has been taken they might roughly be classified as follows: Taking the flat flame as 1, then the 6-feet incandescents represent $2\frac{1}{2}$, and the 10-ampère arcs 6; the cost being as follows: Flat flame, £2 5s. 8d. per annum; 6-feet incandescents, £3 8s. 3d.; 10-ampère arcs, £17 10s.

We have now under observation various types of lamps for street lighting, including a 400-candle power metallic filament incandescent electric lamp.

Regarding the water supply of the town, Mr. Race said: Water is supplied by the Corporation, and, with the exception of the Duddon scheme, from impounding reservoirs of the ordinary type formed by an embankment across a natural valley. The total extent of the catchment area for the Poaka Beck, Pennington, and Harlock reservoirs is 1980 acres; and the average annual rainfall for this area is 58 inches. The drainage area above the intake for the Duddon supply is no less than 12,000 acres, and has an estimated yield of 47 million gallons per day during the three driest consecutive years; the average rainfall being about 90 inches annually.

The following statement gives the capacity of the several reservoirs.

| Name of Reservoir. | Completed. | Area in Acres. | Height Above O.D. | Greatest Depth. | Contents in Gallons. |
|-------------------------------------|------------|----------------|-------------------|-----------------|----------------------|
| | | | Feet. | Ft. In. | |
| Ireleth | .. | 1'90 | 402 | 22 0 | 3,600,000 |
| Poaka Beck. | .. | 28'75 | 505 | 44 8 | 190,300,000 |
| Pennington | 1879 | 22'50 | 505 | 37 8 | 140,700,000 |
| Harlock | 1896 | 30'00 | 610 | 57 0 | 226,800,000 |
| Seathwaite (compensation reservoir) | 1907 | 90'00 | 1230 | 80 0 | 680,000,000 |

By the scheme recently completed, the Corporation take from the River Duddon (a small river about 30 miles long, dividing Cumberland from Lancashire) water under the following circumstances: When there are 3 million gallons per day passing the intake, which is about $7\frac{3}{4}$ miles from the source, by an arrangement of automatic sluices, the Corporation take all between that amount and 5 million gallons; and when 15 million gallons per day have passed the intake, they may take an additional 1 million per day. The Corporation, however, have to guarantee a minimum of 3 millions per day to pass down the stream; and in order to do this, the level of the outlet of the Seathwaite Tarn (about $\frac{1}{4}$ miles above the intake) was raised 20 feet by means of a concrete wall. A large compensation reservoir was thus formed.

The cost of the works at the intake, copper screens, settling tanks, sluices, &c., concrete dam to the compensation reservoir, $17\frac{1}{2}$ miles of 22-inch cast-iron main, and high-service reservoir with a capacity of 2 million gallons at Barrow, was about £164,000.

The average consumption for manufacturing purposes is 11.85 gallons per head per day, and for domestic purposes 26.70 gallons. There are five service reservoirs, with a total capacity of 152 million gallons.

The management of the water-works is in the capable hands of Mr. W. Fergusson, who succeeded his father, the late Mr. W. Fergusson, as Gas and Water Works Manager, who held that position for 25 years—until 1903.

Owing to the heavy rains which have lately visited parts of Switzerland, the Lake of Zurich was in flood last week, with the result that the lighting in the lower parts of the city was affected,

ELECTRIC LIGHTING AT NEWPORT (MON.).

An Over-Capitalized Undertaking.

An inquiry was recently held at Newport (Mon.), by Mr. H. R. Hooper, M.Inst.C.E., one of the Inspectors of the Local Government Board, in respect of an application by the Corporation for sanction to borrow £31,255 for the purposes of their electricity undertaking.

The TOWN CLERK (Mr. A. A. Newman) attended in support of the application; Mr. L. H. HORNBY represented the Newport Ratepayers' Association; and Mr. T. B. R. WILSON watched the proceedings on behalf of the Gas Company.

The TOWN CLERK gave particulars of the population, rating, and indebtedness of the borough, and said the amount of loans outstanding was £1,788,387. With regard to the application, the main reason for it was that the demand for electricity had overtaken the supply. For some time there had been no profit from the concern; so the Committee called in an expert—Mr. C. P. Sparks—whose principal suggestion was that the supply should be concentrated at the Corporation Road works, and that the bulk of the plant at the Llanarh Street works should be scrapped.

Mr. H. Collings Bishop, the Electrical Engineer, presented a statement dealing with the history of the undertaking, and said that Mr. Sparks, in his report, which it had been thought undesirable to publish, so as to be the subject of newspaper controversy, expressed the opinion that the undertaking was over-capitalized, and that any future expenditure must necessarily be of such a nature as to reduce the proportion of capital to output. The proposed scheme superseded plant to the amount of £7064, outstanding capital charges, and it was expected that about £3000 would be obtained by the sale of it. As regarded the financial side of the application, there was a loss of £1460 on the working in the year 1908-9. The Corporation had not any arc lamps in the public streets; and in the side streets, where electricity was being substituted for gas, no capital moneys had been expended. A proportion of the cost was paid by the Street Lighting Department, and the remainder was paid out of the current revenue of the Electricity Department. The total amount so charged against revenue for 1908-9 was £1425. Witness gave the results of the working of the undertaking for the year 1909-10, which have not yet been presented to the Electricity Committee. He said that the total units sold were 4,012,909—an increase on the previous year of 397,126 units. In 1908-9, the total revenue was £31,275; and for 1909-10 it was £35,328—an increase of £4053. In 1908-9, the total working costs were £14,867, and they rose in 1909-10 to £16,671, or £1804 more. The gross profits were: 1908-9, £16,406; 1909-10, £18,656; increase, £2250. The interest and sinking fund charges in 1908-9 amounted to £17,876, and last year to £18,281. In 1908-9, there was a loss of £1469; but this year there was a profit of £375 arising solely from increased demands for power. As regarded the current year, he estimated that with the increased lighting charges there would be a gross profit of £23,250, and a net one of £4069. Witness then gave details of the additional plant which will be put in at the Corporation Road station; and, in answer to questions by the Inspector, he said the total capital expenditure on the undertaking up to March 31 last was £278,836, and the amount realized £278,260—the overdraft of £576 being on various loans. The amount expended on mains and services up to date was £87,929.

The INSPECTOR: We must see precisely where you stand in regard to excess expenditure before further moneys are borrowed. What do you propose to do in respect of the overdraft?

Witness: The matter is at present engaging the attention of the Committee.

The Inspector went at length into the sanctions for loans and the expenditure for several years back, and said it appeared that with the overdraft and the sum borrowed (but not expended) in excess of what had been spent, there was a suspense account of £2073 not yet dealt with. The reduction of the capital charges was going on at a very slow rate; so that it was advisable that the Corporation should not add to them more than was absolutely necessary. The interest and sinking fund charges were heavy. It was the capital charges that were killing the undertaking; for all their reduction of works costs would not amount to much unless their capital account was kept low. This was what Newport was suffering from—high capital charges. For every £100 of capital expended, only £75 was for labour and material; £25 being the moneylenders' interest.

The opposition to the application was then opened.

In answer to Mr. WILSON, witness said the amount applied for was nearly double that which Mr. Sparks recommended (£17,215); but he only dealt with a portion of the expenditure. The increased demand for electricity owing to public lighting was only trifling compared with that required for power purposes. They had since 1907 increased by 300 the number of street-lamps lit by electricity. The total expenditure for street lighting paid by the Electricity Department for 1910 was £425. This probably covered 200 lamps. About £4 per lamp was the cost of conversion; and a portion of it was paid by the Street Lighting Department. Any deficiency under this head came out of the revenue account of the department, and so, of course, out of the ratepayers' pockets. Answering further questions, witness said £3600 had up to date been expended out of capital account on street lighting; but he could not tell how much more had been charged to revenue. He could get the figures; but he objected to do so for the Gas Company.

Mr. WILSON said the Company were not there in any competitive spirit whatever; but they considered that the time had come when this question of public lighting should be brought to the attention of the Local Government Board.

In further cross-examination, witness said public lighting by electricity came to about the same as gas. The cost per lamp was about £16. In 1903, the Gas Company offered to light 144 lamps with Welsbach triple incandescent burners at £12 per lamp. This might represent a saving of £704; but he considered that more lamps would be required if gas were used instead of electricity.

Mr. WILSON put to witness certain figures which showed that while public lighting in 1892 cost £3026, in 1909 it cost £7049, or an increase

of 133 per cent.; and the number of inhabited houses rose from 8600 in 1892 to 13,819 in 1909, or 60 per cent.

Witness accepted the figures, but said there were now longer roads to light, while the lighting had been improved. Answering further questions, he said there were 1500 electricity consumers in the borough, on the mains of which £88,000 had been expended. He admitted that there had been a considerable loss on the Electricity Department, but denied that it would have been less had street lighting been left alone. The cost of production at present was 0·8d. per unit, and they were getting 1·25d. per unit for the street-lamps, which he considered was quite enough. The electricity works were rated at £1900, which he did not consider unduly low. The Gas Company were rated at £6600; and if the Electricity Department were rated on the same basis, they might have to pay £4400.

Mr. Bishop, cross-examined by Mr. HORNEY, went fully into the accounts of the Electricity Department for the present year, with the result that he showed that, owing to an arithmetical error, the net profits next March should be estimated at £2069 instead of £4069, as stated by the witness on the previous occasion. Thereupon he remarked that, regarded as an ordinary trading concern, the Electricity Department was next to bankruptcy. As the result of further questions, he put it to the witness that, even if all his anticipations as to increased revenue turned out to be correct, instead of there being a profit next March, there would be a loss of £3000. He submitted to the Inspector that this was the proper position of affairs.

The INSPECTOR: There is a debit of over £1000 on a suspense account for superseded plant; and the Council must know that this will have to be met before sanction can be given to a further loan. This appears to have been carried forward year by year since 1904. I see also there is a debit of £410 on public lighting account. I am afraid that, looking at the accounts plainly and straightforwardly, instead of a profit for 1909-10, there is a loss.

Mr. WILSON: This sum of £410 is repayable by the Lighting Committee in two instalments of £200, and so is not properly a charge against the revenue of the electricity undertaking.

In answer to the Inspector, witness explained that the work comprised putting up and fitting the street-lamps within the past few months, and the cost had been treated as a debt.

Mr. HORNEY addressed the Inspector. He said he was present on behalf of the Ratepayers' Association to protest, as they had done before, against the way in which the accounts of the different undertakings of the borough were kept. Those whom he represented contended that all the accounts should be under the control of the Borough Treasurer; whereas no books of the tramways or the electricity undertaking were inspected by him. The Electricity Committee were in the position of being buyers and sellers. They supplied electricity to themselves for public lighting and for tramways purposes, and the slightest manipulation of the accounts would suffice to show a profit for either one or the other department. As things stood at present, on the Engineer's own estimates, there would be a loss next year on the Electricity Department of at least £800—perhaps £3000. This was a very serious

matter; and the Association he represented felt very strongly that the Local Government Board should not allow the Corporation to do more with their already heavy capital on this undertaking than provide for their immediate necessities.

Mr. WILSON followed. He laid stress upon the fact that while Mr. Sparks only recommended an expenditure of £17,000, the Corporation were now applying for sanction to a loan of £31,255. Like the Ratepayers' Association, the Gas Company called attention to the way in which the Corporation accounts were being kept. Apart from these two points, except for the question of public lighting, the Company would not have been there at all. They were not there because they desired to get any advantage as a competitive body, but because they were practically the only persons in the town outside the Corporation who knew the facts with regard to the public lighting. They strongly repudiated the idea that they objected to the Corporation having facilities for competing with them; but they asserted that the public lighting could have been done by gas for considerably less than it was being done by electricity. The Gas Company offered to undertake the public lighting at £12 per lamp; but the Council adopted the electric light at £16 per lamp. This represented a difference of from £600 to £800 per year. In addition to this, there was the cost of the erection of the lamps and their conversion; and he believed that nothing was charged in respect of management expenses. Altogether, the Council had lost for the last seven years in respect of public lighting from £800 to £1000 per annum. One unique advantage the electricity undertaking enjoyed was in respect to its rating. Though they had a capital expenditure of £278,000, they were only rated at £1900; while the Gas Company, with a capital of £343,949, were rated at £6769. If the electricity undertaking had been assessed on the same basis, it would have been rated at £15,283. This at 7s. 8d. in the pound, the total rates, would have meant an additional charge of £1265 per annum. In conclusion, he said the Gas Company only desired fair and honest competition with the Corporation.

The TOWN CLERK, replying to the speeches for the opposition, said it seemed an extraordinary argument on the part of any ratepayer that the electricity undertaking was not rated high enough. They had heard a good deal about this poor "bankrupt" concern, and one could not help but feel that the undertaking was being harassed rather than assisted by those appearing in opposition. He thought the Inspector would be satisfied that, as regarded the public lighting, it had been a profitable business for the Corporation, and that they were justified in doing what they had done.

The inquiry then concluded.

The Fire at the Saltley Gas-Works.—We learn that a report has been presented to the Gas Committee of the Birmingham Corporation in regard to the recent tar-tank fire at Saltley Gas-Works (see *ante*, p. 645). It appears that the outbreak was due to the disobedience of a workman in using a fire-bucket; and he has been punished by being discharged.



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USE OF TAR FOR ROAD SURFACES.

Value of Storage—Effect on Fish Life.

On the occasion of the recent meeting of the Royal Sanitary Institute at Hereford, a paper on "Road Tarring in Districts of Small Rateable Value" was read by Mr. R. G. Gurney, the Surveyor to the Ledbury Urban and Rural District Councils. In the course of it, he made the following remarks.

It appears to be generally accepted that for tar painting to be a success it is essential that the road must have a rigid foundation; but this may just as well be said with reference to macadam or any other roads. My experience shows that an ordinary macadamized road will very soon crack and break-up during dry weather under engine and motor traffic if the foundation is not fairly strong; but if bound with tar the weak foundation will be protected and kept dry, and the tar will keep the surface down better than any known remedy. I have noticed, too, that a tar-painted surface will recover considerably more quickly if shaken by engine traffic than a water-bound road.

Tar undoubtedly has no wearing properties in itself, but it has the happy knack of prolonging the life of road metal to its utmost; and one has only to motor fast over a road that has been "darned" (say) twelve months before with tarred stone to feel how the tarred portions project from the surface after the ordinary macadam is worn down.

My experience is that the quality of tar varies considerably at different gas-works—attributable possibly to the coal used, or to the heat of the retorts when the tar is distilled. But, in any case, it should be stored in a fairly deep tank or well, to allow the ammoniacal liquor and lighter oils to separate and rise to the top, and the tar should then be pumped or drawn from the bottom. Our local gas companies have come forward and put in additional tanks to assist us; and one of my authorities has entered into a three years' contract to take all tar made at from 20s. to 25s. per ton of 200 gallons.

One reads so many times of damage to trees and fish, to say nothing of cows, from tar-painted roads, that I feel justified in mentioning one or two facts. Some two years ago, while excavating an old gravel path for converting into a tar-paved surface, the thousands of small roots from a great vine on the house adjoining were exposed, and the tarred path was placed 4 inches thick directly on them. The vine continues to flourish with not the slightest ill-results. Last year my Rural District Council decided to tar-paint about a mile of road immediately adjoining a celebrated trout stream. Notice was given by the landowner that the Council would be held responsible for any fish that might be killed; but it was decided to risk it. Just as the work was completed, a terrific thunderstorm came on, bringing the river into flood; and the newly-tarred road was flooded to a depth of 4 inches. I spent rather a restless night, and made quite an early inspection of the stream next morning, with the ostensible object of finding dead fish. I searched the stream high and low, but could not find a dead fish, nor

was there the least trace of tar-stained water. The cause of this I put down to the fact that the tar had been well boiled, and was applied at boiling-point, so that all the ammoniacal liquor and the more soluble bodies had been boiled out.

In connection with the latter remarks of Mr. Gurney, it may be of interest to reproduce from the "Daily Mail" of Tuesday last the following letter from Mr. A. J. Belcher, of Wantage: "While I was fishing in a trout stream close to this town last Thursday, a heavy thunderstorm came on, and in a few minutes hundreds of trout came to the surface of the water and died immediately. The local authorities were tar-spraying the roads at the time, and the tar was conveyed into the brook by a storm overflow-pipe. I am absolutely certain as to the cause, as there was not a fish killed above where the pipe discharged. This wholesale destruction can be avoided to a great extent if the tar is put down in fine weather, because when it is once set it does not wash off. As a proof of this, there was a heavier storm on Tuesday evening; but most of our streets were tarred the previous Friday and Saturday, and had got hard. I cannot trace a single fish being killed on this occasion. By the use of a little discretion, a great number of fish may be preserved that will otherwise be destroyed."

GAS COMPANIES AND IRONMONGERS.

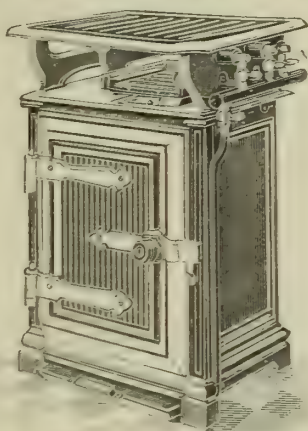
The following remarks appeared in the "Ironmonger" on Saturday.

The President of the Institution of Gas Engineers touched upon a tender spot in his address to the members assembled in annual meeting this week in London. The problem always before the eyes of managers was how to dispose of 1000 cubic feet of gas at a reasonable profit. It was now even more important than the consideration of the most economical way in which that quantity of gas could be produced. Gas companies had now, more than ever, become shopkeepers; and the work which was in the old days principally confined to ironmongers had to a large extent drifted into the show-rooms and workshops of gas companies. Was it wonderful that ironmongers should, as a rule, even now fail to appreciate the significance of the change which had taken place, when it must be acknowledged gas companies themselves had but lately learnt the lesson? Mr. Helps gave it as his opinion that the terms upon which gas companies undertook work for consumers and supplied them with apparatus and material might well, with no loss to themselves, be such as would allow any ironmonger or local tradesman who was wise enough to qualify his staff for this particular class of business to compete with a reasonable chance of profit. An exception to this principle might have to be made with regard to the maintenance of incandescent burners. In order to secure satisfaction to their consumers, gas companies must do this work on unremunerative terms, at least to the extent of giving labour free and charging only at a reasonable profit for all material used. Coming from a man occupying the

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position which Mr. Helps does, these opinions merit special attention. They confirm the view that the ebb-tide in the prices of gas stoves and cookers has turned, and that the spade work and educational policy of the companies, so far as they affect the public, have been accomplished; and they afford a hint that a time is coming when gas stoves, cookers, and fittings will have to carry their share of the expense burden and contribute to the profits. When that day arrives, the ironmongers may come into their own again.

GAS COAL POSITION IN THE MIDLANDS.

Dealing with the above-named subject last Friday, the "Iron and Coal Trades Review" made the following remarks: "Usually by this time the bulk of the business in regard to renewals of gas coal contracts has been arranged; but this year the reverse state of affairs exists. This position has largely been brought about by the increased membership of the Gas Coalowners' Association, which formerly was mostly composed of South Yorkshire collieries, but this year includes, with only a few exceptions, all the large gas-coal producing collieries in the Midlands, and it is understood that the few outside the Association will, so far as they can, work along with it. In the past there is no doubt gas coals have been sold at prices far below what would have been realized on the house coal market, and in many instances at a distinct loss to the producers, owing to the excessive competition for business, especially in the case of the large tonnage orders. The inclusion in the Association of all the large producers is to be commended, so long as no attempt is made to put values at an artificial level. It is certainly only by some combination among owners that the ruinous price-cutting policy pursued in recent years can be overcome. The agreement of the Association is that on all contracts at inland works the terms of renewal shall be 9d. per ton advance on last year's price; and at present this is generally strictly adhered to. Hence the reason for the small number of contracts renewed, buyers holding back in the hope of securing better terms. Some few contracts have been renewed at 6d. per ton advance; but these are where a smaller reduction was effected last year. Apparently it was a big mistake to give any reductions last year, especially in view of the fact that the increased cost of working under the conditions of the Eight Hours Act had not been properly tested; and it is safe to say that, had there been an Owners' Association, including the large producers as it does to-day, there would have been no real necessity to give any reductions. Early in the season it was hoped there would be a large tonnage placed in the Midlands by the London water-side gas companies, on account of the proportionate increased prices quoted by Durham collieries, who have since accepted lower rates, and which would have very considerably strengthened the sellers' position. Instead of this, however, the purchase of German coals by the London water-side companies will indirectly tend to more competition against the Midlands in regard to shipment coals."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The report of the Gas Manager—Mr. A. C. Young—for the year ending May 15 was submitted to the Arbroath Town Council on Monday. In it, Mr. Young stated that the gas manufactured amounted to 98,513,400 cubic feet, an increase of 847,700 feet over the previous year; and that the gas made per ton of coal used was 9679 cubic feet, a decrease of 173 feet. The quantity of gas sold was 92,088,332 cubic feet—an increase of 1,206,685 cubic feet. The quantity sold to ordinary consumers was 58,820,032 cubic feet—a decrease of 1,786,855 cubic feet; and the quantity sold to prepayment gas-meter consumers was 30,278,400 cubic feet—an increase of 3,414,650 cubic feet. The total revenue from the sale of gas was £13,087—a decrease of £698. The number of prepayment meters now in use is 3129—an increase of 249; and the number of ordinary and prepayment meters in use is 6359—an increase of 40. The number of cookers, grills, and rings now fixed to consumers is 4346—an increase of 343. In addition, there are 68 gas-radiators hired to consumers; and 48 gas-fires for heating rooms were sold during the year. The cost of the new gasholder, including the concrete foundations, pipes, and connections, amounted to £5651; and the cost of the new condensers, £489, together with £728 paid for the ground for the site of the holder, had been placed against the suspense account, which now stands at £6868. The new condensers had given satisfaction, and had come fully up to expectation; and the new holder had worked well, and had done most of the work of supplying the town with gas during the winter. It had stood the severe test of gales much better than the old type of standard guided holders, and had proved in every way dependable. The Gas Committee adopted the report of the Manager, and agreed that the price of gas should remain at 2s. 8½d. per 1000 cubic feet, with a rebate of 2½d. per 1000 cubic feet for gas used in engines up to 250,000 cubic feet, and of 5d. for gas-engine consumption above this figure; also that the rate for gas through prepayment meters should be 3s. 1½d. per 1000 cubic feet. A year ago, the price of gas was reduced by 2½d. per 1000 cubic feet. Bailie Smith, the Convener of the Gas Committee, moved approval of the minutes. He said they heard it stated that, although the price of gas was reduced, the bills remained the same as previously. During the past year, they had sold 92 million cubic feet, and had drawn less money than before. This proved conclusively that consumers in Arbroath were getting the benefit of the low price of gas. They expected to be able to pay £2000 of the cost of the new gasholder, and to place another £100 to the insurance fund started three years ago, bringing it up to £700. The economies they had been able to practise had enabled them to pay the interest on cost of the new holder. The minutes were approved.

The make of gas in Dunfermline during the past year was 134,823,000 cubic feet—an increase upon the previous year of 8,076,000 cubic feet, equal to 6·37 per cent. Gas accounted for amounted to 125,959,900

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cubic feet—an increase of 8,841,500 cubic feet, equal to 8.47 per cent. The estimates prepared by the Gas Engineer—Mr. A. Waddell—for the current year provided for a reduction in the price of gas by 3d. per 1000 cubic feet. Mr. T. Stewart, the Convener of the Gas Committee, in moving adoption of the minutes of the Committee, said it was matter for congratulation that the community might look forward to further benefits from the Gas Department. Last year's working had been what might be called a phenomenal success. He had no hesitation in saying that, with normal conditions as to the price of coal, they might look forward to a further substantial decrease in the price of gas. He did not think that when ex-Provost Walker took this matter in hand, he ever anticipated that in 1910 the Corporation would be able to offer gas for ordinary lighting at 2s. 3d. per 1000 cubic feet, and for power at 1s. 6d. It showed that a generous policy paid in the end. They paid £6000 or £7000 for coal, and received over £5000 for residuals. The standing charges against the works were 9½d. per 1000 cubic feet of gas sold; so that what was left for the making of gas was only the difference between 2s. 3d. and 9½d. They would see from this how necessary it was for the works to keep up the output. Happily the output was increasing. A penny per 1000 cubic feet represented a sum of £542; so that the present reduction of 3d. benefited the community to the extent of £1626. Last year consumers were relieved of meter-rents and stove hires; and this was equivalent to another penny per 1000 cubic feet, or, altogether, £2100. He had it in his mind to ask the Council to again extend their confidence to the Committee, by authorizing them to spend a considerable sum in erecting vertical retorts. Mr. Waddell had just about exhausted his inquiries regarding the benefit these would be to the gas-works; and it was now a question as to what particular sort of retorts should be adopted. A considerable saving would be effected in the manufacture of gas, and the value of residuals would be greatly increased; and, altogether, the proposal would give a distinct benefit to the community. There was a proposal to supply Torryburn with gas. There was no doubt that in the near future a large population would spring up in the Torryburn district; and he thought it might be looked upon as a certainty that if the Corporation did not step in, a private company would be formed immediately to supply the wants of the rising community. When Mr. Waddell prepared his estimates for the Limekilns and Charlestown scheme, he calculated upon a probable consumption of 2,245,000 feet during the second year. The actual consumption was 2,270,000; so that the undertaking was practically a paying concern. Mr. Waddell had estimated that 217 meters would be required; and the actual number was 240, exclusive of stoves. Dean of Guild Hoey pointed out that when Mr. Waddell entered their service, ten years ago, the price of gas was 3s. 11d. per 1000 cubic feet; it was now 2s. 3d. The amount of money involved annually by this reduction was possibly £10,000 or £11,000. Besides, they had paid off £25,000 or £26,000 of capital, improved the works, and improved the distributing system throughout the town. The consummate skill of the Manager, and the efficient supervision he brought to bear on his work, reflected the

highest credit upon him; and he deserved the thanks of the Council for what he had done during the period that he had held the position of Manager. The recommendations of the Committee were adopted; and the prices of gas were fixed at 2s. 3d. per 1000 cubic feet for ordinary and public lighting, 2s. 9d. for prepayment consumers in the town, 1s. 6d. for gas-engines, and 4s. 3d. in the districts of Limekilns and Charlestown.

The Pitlochry New Gaslight Company have just declared and paid a dividend of 3 per cent.

In the Kirkintilloch Town Council this week, Mr. W. Alexander, the Convener of the Gas Committee, stated that in the Gas Department the financial year began with a slight debit balance, and they were likely to close with a credit balance of over £1000. Among matters to which consideration would be given by the Committee were the abolition of meter-rents and a proposal to do away with the hire of gas-cookers. They wanted the consumption of gas increased; and the giving of gas-rings free last year was one of the best things the Council ever did. They would also consider the question of reducing the price of gas.

In the Hamilton Town Council this week, the Gas Committee reported that the Gas Manager's minute to them, containing the prices of coal during the past two years, showed a saving of at least 7d. per ton on the coal to be delivered at the railway siding this year.

The salaries of Mr. A. Smith, Mr. A. M'Leod, and Mr. J. Webster, the Engineers-in-Charge of the Tradeston, Dawsholm, and Provan gas-works of the Glasgow Corporation, have each been increased by £50 per annum.

In the "Scotsman" of yesterday, there appeared the following: "For some considerable time, the gas and burgh officials of Bo'ness have been concerned about escapes of gas on the roadway opposite Cadzow Crescent and Mount Pleasant. In an attempt to remedy matters, the Gas Company, at considerable expense, laid a new main from Craigmailen United Free Church to Dundas Street. No improvement has resulted; and a suggested service-pipe to dwelling houses at Mount Pleasant was subsequently renewed. While testing this pipe, the gas officials were alarmed by the whole track bursting into flame. It was then discovered that the flame resulted from an escape of natural gas from the minerals at that part. Mr. H. M. Cadell, of New Grange, applied one or two simple scientific tests, and corroborated the impressions formed by the officials on the ground. Mr. Cadell states that some time ago a mysterious outbreak of fire occurred at one of the houses at Mount Pleasant, and on quite a reasonable theory it was caused by this natural gas finding its way into the dwelling house from the ground. Experiments were made with a steel tube, which was driven into the ground, and a light was obtained therefrom, which might be burning 50 cubic feet per hour. The monetary value of the gas was considerable, and it is quite possible to accumulate and utilize it. It has been arranged that a perforated tube will be inserted, and a pipe led into a small tank, from which the gas can be conducted to a lamp-pillar at the foot of Cadzow Crescent, and burned off."



"VOLCANIC" (Powder).

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Tel. Address:
"VOLCANISM, LONDON."

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Old Broad Street,
LONDON, E.C.

LEST YE FORGET.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, June 18.

Although the market has been quiet, there has been a steady demand all through the week, and prices have been about maintained at £11 16s. 3d. per ton f.o.b. Hull, £11 17s. 6d. per ton f.o.b. Liverpool, and £11 18s. 9d. per ton f.o.b. Leith. Although there continues to be inquiry in the forward position, the firmer attitude of makers, after sales made last week, has deterred buyers, and no further important transactions have been reported.

Nitrate of Soda.

The market on spot Liverpool is easier, and quotations are 9s. 4½d. per cwt. for 95 per cent., and 9s. 7½d. for refined quality.

Tar Products.

LONDON, June 20.

Pitch has remained steady during the past week. Benzols have fallen to the extent of 1d. per gallon, and considerable business has been done at the reduced figures. Crude carbolic acid is still of very little interest, and dealings are almost impossible. Creosote remains steady, and further business is reported at present prices.

The average values during the week were: Tar, 17s. 9d. to 21s. 9d., ex works. Pitch, London, 40s. to 40s. 6d.; east coast, 38s. 6d. to 39s. 6d., west coast, 37s. 6d. to 38s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7½d.; North, 7½d.; 50-90 per cent., casks included, London, 8d.; North, 7½d. Toluol, casks included, London, 10d.; North, 9½d. to 10d. Crude naphtha, in bulk, London, 3½d. to 4d.; North, 3½d. to 3½d.; solvent naphtha, casks included, London, 1s. 3d. to 1s. 4d.; North, 1s. 3d. to 1s. 4d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 11½d. to 1s.; west coast, 11½d. to 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is quiet; and the inquiries of last week did not lead to any definite business. To-day, actual Beckton is quoted at £11 18s. 9d.; and for outside makes, upon Beckton terms, £11 10s. is asked. In Hull, £11 13s. 9d. to £11 15s. is the price; in Liverpool, £11 15s. to £11 16s. 3d.; and in Leith, £11 17s. 6d.

Messrs. F. C. Sugden and Co., of Leeds, have had orders placed with them by the Waltham Abbey and Cheshunt Gas Company, the Hoddesdon Gas Company, Limited, and the Bollington Urban District Council for settings of the Klönne regenerative type, with the Hudson patent producer. The first is a repeat order.

COAL TRADE REPORTS.

Northern Coal Trade.

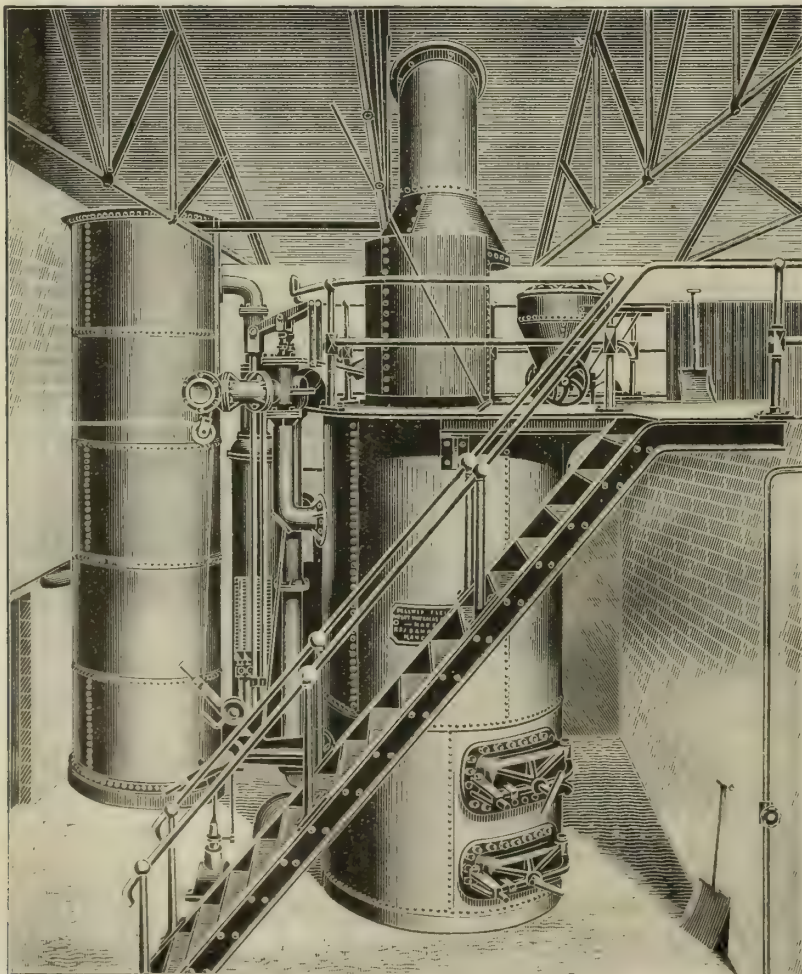
The coal trade of the north-east has been languid of late, and the prices have shown some ease, more especially for steam coals. Best Northumbrian steams have been in fair delivery; but new business has been very slow, and the prices are lower—the current quotation being from 10s. to 10s. 3d. per ton f.o.b.. Second-class steams are about 9s. 6d. per ton; and best steams from 5s. 9d. to 6s. 9d.—the demand for the latter being fairly good. In the gas coal trade, the local consumption is now at its lowest point; but the exports are full. Durham gas coals vary from 9s. 4d. to 10s. per ton f.o.b. for the usual classes, according to quality; while for Wear specials, from 10s. 6d. to 10s. 9d. is quoted. In contracts there is not so much doing. But it is believed that part of the supply for Berlin has been placed; and the statement points to prices as sufficient to leave, after the deduction of freight, &c., from 9s. 4d. to 9s. 6d. per ton for good Durham gas coals. Coke is quiet; but gas coke is in limited supply, and may be quoted at from about 12s. 9d. to 13s. 3d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Trade continues much as it was. Ell is in fair request. Splint is showing signs of improvement in demand. Steam coal is plentiful. Small sorts are finding a ready market. The prices now quoted are: Ell, 9s. 3d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. to 10s. 3d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 311,127 tons—a decrease of 48,281 tons upon the preceding week, and of 11,135 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,937,804 tons—an increase of 674,645 tons upon the corresponding period.

The Question of Books at Carlisle.—In the "JOURNAL" for the 31st ult. (p. 581), reference was made to some critical remarks by Mr. Eggleston, in the Carlisle Town Council, as to the necessity and utility of certain books in use in connection with the gas and electricity undertakings of the Corporation; and some serious charges were brought against the Gas Engineer (Mr. Harold Bloor). The charges were considered by the Committees of both undertakings, and they each passed the following resolution: "That the Committee, having fully inquired into and investigated the charges made by Mr. Eggleston, are satisfied that the same are untrue and without foundation in fact; and that the Council be recommended to call upon Mr. Eggleston to either substantiate the truth of such charges or unreservedly withdraw the same." The matter was the subject of a long discussion at the meeting of the Town Council last Tuesday, when Mr. Eggleston withdrew the charges, and expressed regret that he had used excessively strong language. The result is that the minutes of the two Committees relating to the subject with the resolutions and the reports of the Engineers thereon, will be expunged.

DELLWIK WATER GAS PLANT



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Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards offered for sale by auction, by order of Directors, new issues of gas and water capital; and they were all taken up. The first lots consisted of £5000 of the ordinary stock of the Guildford Gas Company, ranking for a standard dividend of 5 per cent. per annum, subject to the sliding-scale; the existing similar stock having for some time received 5½ per cent. It was all sold at £117 to £118 10s. per £100; £2500 of 4 per cent. perpetual debenture stock of the Company fetching from par to £100 10s. Some additional 7 per cent. stock of the Brentwood Gas Company, similar to that on which £6 6s. per cent., free of income-tax, has been paid, realized £131 to £133 10s. per £100. A small parcel of £10 new ordinary 7 per cent. shares in the Ascot District Gas and Electricity Company (similar shares carrying 5½ per cent.) fetched from par to £10 5s. each. Some £10 "C" shares and £1000 of 4 per cent. perpetual debenture stock of the East Grinstead Gas and Water Company were the last lots offered. The shares rank for maximum dividend of 7 per cent.; but £6 6s. per cent. per annum, free of income-tax, has been paid on similar shares for the last seven years. They were sold at from £12 7s. 6d. to £12 12s. 6d. each; the debenture stock being placed at par. A few days previously, Mr. W. A. Iveson (Messrs. W. & T. T. Iveson) sold at the Royal Hotel, Hexham, £2000 of ordinary stock of the Hexham Gas Company. The dividend payable on similar stock is at the rate of 5½ per cent. per annum. It was offered in £100 and £50 lots. The former fetched £110 and £111 and the latter from £55 to £55 10s. apiece.

Withdrawal of the Staffordshire Potteries Water Bill.—As will be seen from our "Parliamentary Intelligence," the Bill promoted by the Staffordshire Potteries Water Company has been withdrawn. This has been done owing, it is stated, to the opposition of the Council of the County Borough of Stoke-on-Trent. It appears that the principal object of the opposition was to get clauses inserted in the Bill to facilitate the purchase of the undertaking should the Council decide to do so at some future time; and it was also proposed to deal with the Company's charges for water.

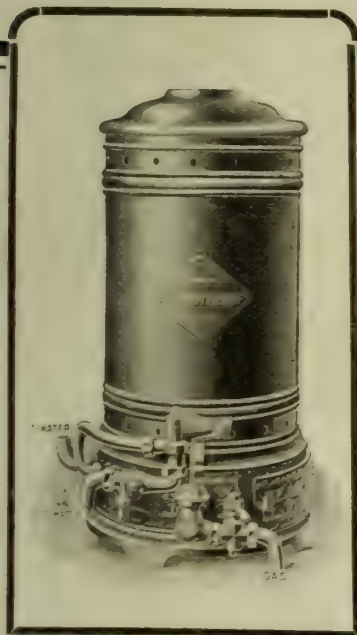
Projected Extensions at the Mansfield Gas-Works.—In presenting certain recommendations of the Gas Committee at the last monthly meeting of the Mansfield Town Council, Mr. Smith referred to the proposed extensions at the gas-works, and said the Committee had decided it was imperative that they should be put in hand immediately. The gas-works at present was operating at high pressure, and if the work was not put in hand at once the necessary extensions would not be finished by November, in which case the town might be placed in an awkward predicament for a supply of gas. The Local Government Board had been made acquainted with the urgency of the matter, and the necessity for their sanction being given as early as possible for the work to be commenced; but as yet no reply had been received to the Council's application.

Natural Gas and Oil in New Brunswick.—The "Board of Trade Journal" announces that the Imperial trade correspondent at St. John, New Brunswick (Mr. W. E. Anderson), reports that deposits of natural gas and oil have recently been discovered in Albert County, New Brunswick. Three layers of oil sands have been encountered, one at 1100 feet, another at 1320 feet, and the third at 1742 feet. The last layer is 158 feet thick. At 1050 feet rich gas-producing sands have been struck. One well produces between 200,000 and 300,000 cubic feet of gas daily from the upper layer of sand, and another nearly a million cubic feet per day.

The Recent Appointment of Gas Receiverships.—The "Financial News" last Friday drew attention to the fact that quite a series of disasters to gas and water companies has been experienced within the comparatively recent past, as shown by the appointment of Receivers in the cases of the following Companies: East Sussex, Mid Oxfordshire, Rawcliffe, Robertsbridge (practically a non-existent concern), South Luton, and Ticehurst. Our contemporary remarked: "It is not often that so persistent a run of ill-luck attends one class of enterprise. The details will be the more interesting because we are apparently on the eve of further efforts to place the capital of small gas companies."

Projected Improved Public Lighting in Fulham.—The Lighting Committee of the Fulham Borough Council have received a communication from the Chief Inspector of the Gaslight and Coke Company, suggesting that improved efficiency might be obtained and economy effected by the substitution of inverted for upright incandescent burners in the public lamps, and asking for an opportunity of demonstrating this. The Committee have consented to the fixing of six single-burner inverted lamps on Parson's Green. The experiment will be carried out entirely by the Company, and at their expense; and should the results prove thoroughly satisfactory, a scheme for the conversion of all the existing gas-lamps will be submitted for the consideration of the Committee.

Artesian Wells in London.—Dr. Collingridge, the Medical Officer of Health for the City of London, has furnished the Corporation with a report on artesian wells in the City, of which there has been a considerable increase, owing to the revised charges of the Metropolitan Water Board. Fourteen artesian wells were sunk between 1836 and 1907, and 22 between 1907 and the present time; making a total of 36. The Public Analyst reported that the waters were highly pure and soft, but somewhat saline. A large West End hotel, paying £900 a year water-rate, installed an artesian well at a cost of £800; and the total cost of running it is £200 a year. Thus an annual saving of £700 has been effected at an expenditure of £800. If, however, the yield of water later on proves insufficient for the intended service, the Water Board's supply will have to be laid on to the premises and the money sunk in the well written off as a loss. In the City alone there are 36 wells in use, all supplied from the same source. The water being very soft is better suited for domestic and manufacturing purposes than that delivered by the Board.



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It has all the advantages of a Boiler
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The PARKINSON 'HYDROTHERM' WATER HEATER

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Specially Suitable
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SUPPLY,
PUBLIC LAVATORIES
HAIRDRESSERS'
SALOONS,

&c., &c., as it requires no
manipulation

Devonport Corporation Water Undertaking.

The detailed accounts of the water undertaking of the Devonport Corporation, issued by the Borough Treasurer (Mr. H. J. Hoare), show that it is progressing in a very satisfactory manner. The transfer of the works to the Corporation took place on July 1, 1906; and at that time the number of houses supplied was 8605. In the year ending March 31 last, the supplies numbered 9226; the population having augmented in the meantime by about 4000. The average daily supply has increased still more—the total quantity having been 2,261,360 gallons in 1906, and 2,927,082 gallons last year; the growth being from an average of 32.30 gallons to 39.55 gallons per head per day. Most of this increase is in the domestic consumption, which has advanced from 19.68 gallons to 26.34 gallons per head. Six miles of new mains have been laid in the past four years; bringing up the total length to 66½ miles. On the financial side, the period has been one of heavy capital expenditure. The purchase of the undertaking cost £252,018, and in addition there was a sum of £4327 in parliamentary costs, and also a mortgage debt of £28,250 of the Water Company which the Corporation took over. Since then they have been engaged in improving and extending the works, and have spent £41,679 in this way. The capital has thus advanced from £282,383 in 1906 to £321,947 on March 31 last. In the past year the revenue was £21,283, of which £14,023 was for domestic supplies. The working expenses amounted to £6519; leaving a balance of £14,764 gross profit. Up to now, the Corporation have been practically free from the obligation to provide a sinking fund, and, with the exception of paying off the cost of obtaining the Act of Parliament, the chief liability they have had to meet on capital account has been the charges for interest, which amounted last year to £11,137. A net profit of £3265 was therefore made last year. This sum was carried to the reserve fund, which it is intended to draw upon when the payments to the sinking fund begin a year or two hence. The gross profit, it is pointed out, is equal to 4½ per cent. on the capital employed. Calculated on the basis of the number of houses supplied, income is equal to £2 6s. 2d. per house, the working expenses being 14s. 2d., and the capital charges £1 4s. 11d.; leaving a net profit for each house of 7s. 1d.

Additional Capital for the Newport (Mon.) Gas Company.—At the meeting of the Directors of this Company last Friday, tenders in respect of the issue of £16,000 of consolidated stock, which were invited in the "JOURNAL" a few weeks ago were opened, when the whole of the amount was taken up. The minimum fixed was £112 per £100 of stock, and the average price offered was £113.

Wolverhampton Water Supply.—According to the report of the Water Committee of the Wolverhampton Corporation, a profit of £4760 was earned in the past financial year, after payment of interest and sinking fund charges. A sum of £2834, which is equal to a rate of 2d. in the pound, has been appropriated in reduction of the improvement fund; and the balance (£1926) has been added to the reserve fund, which now stands at £11,878.

The accounts of the Tiverton Corporation gas undertaking, which have just been published, show that the year ended the 31st of March was the most profitable in its history. In 1896, after the gas-works had been under municipal management for twelve months, a gross profit of £1826 was shown. For the year just closed, the gross profit was £3089—an increase of £1263 in fifteen years. Compared with the year ended March 1909, the increase was £542; and the Lighting Committee have voted £400 for the relief of the rates. The turn-over of the Gas Department is nearly £9000 per annum. The capital invested in the gas-works is £32,240, of which more than half has been either repaid or put into the sinking fund out of profits. At the present rate of progress, the whole amount borrowed for capital will have been repaid in another 15 years.

APPLICATIONS FOR LETTERS PATENT.

- 13,680.—POLLOCK, C. V., "Gas-mixers." June 6.
 13,685.—NON-EXPLOSIVE GAS COMPANY, LTD., "Manufacture of gas." June 6.
 13,699.—GEWERKSCHAFT DES STEINKOHLLEN-BERGWERKS LOTHINGEN and FRIEDRICH UHDE, "Separation of ammonia from gases." June 6.
 13,728.—EASTHOPE, E., "Gas-engines." June 7.
 13,797.—DELAGE, M., and WOOG, P., "Electric lighting of gas-burners." June 7.
 13,801.—CLOUDSLEY, J. L., JUN., "Two-stroke cycle internal-combustion engines." June 7.
 13,825.—LAKE, H. W., "Compressing air or gas." A communication from H. A. Branch. June 7.
 13,881.—KOEFOED, HAUBERG, MARSTRAND, and HELWEG AKTIESELSKABET TITAN and PETER GORM-PETERSEN, "Grabs for coal." June 8.
 13,978.—BENNINGHOFF, O., "Cooling gas." June 9.
 14,013.—ROELOFSEN, J. A., "Recovering ammonia from gas." June 9.
 14,015.—HARDING, W. F. S., "Acetylene generators." June 9.
 14,017.—STILL, W. M., and SONS, LTD., and STILL, W. H., "Manufacture of mantles." June 9.
 14,072.—GILL, A., and FOSTER and FULLEN, LTD., "Lighting incandescent lamps." June 10.
 14,074.—BRYAN, L. C., "Two-cycle internal-combustion engine." June 10.
 14,084.—KENT-JOHNSTON, A. G., "Controlling the gas supply to lamps." June 10.
 14,086.—SPARKS, E., "Lighting and extinguishing gas-jets." June 10.
 14,100.—VIATOUR, C. G., "Suction gas-producers." June 10.
 14,144.—WIGLEY, P., "Incandescent burners." June 11.

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WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS MANAGER, Omagh Urban District Council. Applications by June 28.
ASSISTANT GAS MANAGER. No. 5256.
WORKS MANAGER. Apply to G. E. Woodford, Ruabon. WORKING FOREMAN. No. 5255.

Plant (Second-Hand) for Sale.

GAS METERS. No. 5251.

Patent Licences.

REGENERATING COKE-OVENS. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Stocks and Shares.

BARNET GAS AND WATER COMPANY. July 12.
BRENTFORD GAS COMPANY. June 28.
CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. June 28.
ILFORD GAS COMPANY. June 28.
PINNER GAS COMPANY. June 28.

TENDERS FOR

Coal and Cannel.

BELFAST GAS DEPARTMENT. Tenders by July 1.
EAST RETFORD GAS DEPARTMENT. Tenders by June 30.
FILEY URBAN DISTRICT COUNCIL. Tenders by June 27.
ILKESTON GAS DEPARTMENT. Tenders by July 6.
KESWICK GAS COMPANY. Tenders by June 23.
MANSFIELD GAS DEPARTMENT. Tenders by June 29.
NORTHWICH GAS COMPANY. Tenders by June 23.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by June 30.
TEIGNMOUTH GAS DEPARTMENT. Tenders by July 4.

Coal and Coke Handling Plant.

WOMBWELL GAS AND WATER DEPARTMENT. Tenders by June 29.

Gasholder and Tanks.

EGREMONT URBAN DISTRICT COUNCIL.
OLDHAM GAS DEPARTMENT. Tenders by June 29.

General Stores (Lime, Sulphuric Acid, Castings, Lead Tubing, Rubber and Rubber Tubing, Yarns, Paints, Oil, Tallow, &c., &c.).

MANSFIELD GAS DEPARTMENT. Tenders by June 29.
KEIGHLEY GAS DEPARTMENT. Tenders by June 27.
SALFORD GAS DEPARTMENT. Tenders by June 30.

Meters, &c.

EGREMONT URBAN DISTRICT COUNCIL.
SALFORD GAS DEPARTMENT. Tenders by June 30.

Pendants, Brackets, Taps, &c.

SALFORD GAS DEPARTMENT. Tenders by June 30.

Pipes, &c.

KEIGHLEY GAS DEPARTMENT. Tenders by June 27.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by June 30.
SALFORD GAS DEPARTMENT. Tenders by June 30.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 25.

Purifiers.

EGREMONT URBAN DISTRICT COUNCIL.
RHONDDA URBAN DISTRICT COUNCIL. Tenders by July 1.

Scrubber.

RHONDDA URBAN DISTRICT COUNCIL. Tenders by July 1.

Tank for Tar and Liquor.

RHONDDA URBAN DISTRICT COUNCIL. Tenders by July 1.

Tar and Liquor.

BRIERLEY HILL GAS COMPANY. Tenders by June 30.
CONGLETON GAS DEPARTMENT. Tenders by July 2.
FARNWORTH AND KEARSEY GAS COMPANY. Tenders by June 29.
HEREFORD GAS DEPARTMENT. Tenders by June 25.
KESWICK GAS COMPANY. Tenders by June 23.
MANSFIELD GAS DEPARTMENT. Tenders by June 29.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 775.

| Issue. | Share. | When ex-Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue. | Share. | When ex-Dividend. | Dividend or Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|------------|--------|-------------------|--------------------|--------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|--------------------|----------------------------|-----------------|---------------------|------------------------|
| £ | Stk. | Apl. 1 | p.c. | Alliance & Dublin Ord. | 82 84 | .. | £ s. d. | £ | Stk. | May 12 | p.c. | Imperial Continental | 177-179 | .. | £ s. d. |
| 1,474,900 | Stk. | Jan. 13 | 5 | Do. 4 p.c. Deb. | 100-102 | .. | 5 19 1 | 4,940,000 | Stk. | Feb. 10 | 3 1/2 | Do. 3 1/2 p.c. Deb. Red. | 94-96 | .. | 4 9 5 |
| 310,000 | 5 | May 12 | 7 | Bombay, Ltd. | 6 1/2-6 3/4 | .. | 3 18 5 | 1,235,000 | Stk. | Mar. 16 | 6 | Lea Bridge Ord. 5 p.c. | 122-124 | .. | 3 12 11 |
| 200,000 | 5 | " | 7 | Do. New, £4 paid. | 4 1/2-5 1/2 | .. | 5 9 10 | 195,242 | Stk. | Feb. 25 | 10 | Liverpool United A. | 219-221 | .. | 4 16 9 |
| 40,000 | 5 | " | 7 | Bourne-10 p.c. | 29-30 | .. | 5 9 3 | 561,000 | Stk. | " | 7 | Do. B. | 164-165 | .. | 4 10 6 |
| 50,000 | 10 | Feb. 25 | 15 | mouth Gas-B 7 p.c. | 16 1/2-16 3/4 | .. | 5 8 0 | 718,100 | " | Dec. 29 | 4 | Do. Deb. Stk. | 103-104 | .. | 4 10 0 |
| 311,810 | 10 | " | 7 | and Water-Pref. 6 p.c. | 15-15 1/2 | .. | 4 17 5 | 306,083 | " | Nov. 26 | 5 | Malta & Mediterranean. | 42-5 | .. | 6 0 0 |
| 75,000 | 10 | " | 6 | Brentford Consolidated | 251-254 | .. | 3 18 5 | 75,000 | 100 | Apl. 1 | 5 | Met. of 15 p.c. Deb. | 100-102 | .. | 4 18 0 |
| 380,000 | Stk. | " | 12 1/2 | Do. New | 188-190 | .. | 5 0 0 | 560,000 | 100 | " | 4 1/2 | Monte Video, Ltd. | 100-102 | .. | 4 8 3 |
| 300,000 | " | " | 9 1/2 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 0 | 250,000 | 100 | " | 4 1/2 | Newcastle & Gateshead Con. | 123-13 | .. | 5 7 8 |
| 50,000 | " | Aug. 12 | 5 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 | 541,920 | 20 | May 27 | 3 1/2 | North Middlesex 7 p.c. | 91-93 | .. | 3 15 3 |
| 206,250 | " | June 10 | 4 | Brighton & Hove Orig. | 214-217 | +1 | 5 1 5 | 1,775,892 | Stk. | Feb. 25 | 3 1/2 | Orlental, Ltd. | 134-133 | .. | 5 1 10 |
| 220,000 | Stk. | Mar. 16 | 11 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 529,435 | Stk. | Dec. 29 | 3 1/2 | Portsmouth, Ltd. | 138-140 | .. | 5 14 4 |
| 246,320 | " | " | 8 | British | 44-45 | .. | 4 14 8 | 55,940 | Stk. | Apl. 27 | 8 | Portsea Island A. | 6-6 1/2 | .. | 6 8 0 |
| 460,000 | 20 | Apl. 1 | 10 1/2 | Bromley, A 5 p.c. | 118-120 | .. | 5 0 0 | 300,000 | 5 | Feb. 25 | 13 | Do. B. | 134-136 | .. | 5 1 0 |
| 109,000 | Stk. | Feb. 25 | 6 | Do. B 3 1/2 p.c. | 88-90 | .. | 5 0 0 | 60,000 | 53 | " | 13 | Do. C. | 126-128 | .. | 5 1 7 |
| 105,700 | " | " | 4 1/2 | Do. C 5 p.c. | 105-107 | .. | 5 2 10 | 31,800 | 50 | " | 12 | Do. D and E. | 119-121 | .. | 4 19 2 |
| 82,278 | " | Dec. 29 | 3 1/2 | Do. 3 1/2 p.c. Deb. | 87-89 | .. | 3 18 8 | 60,000 | 50 | " | 10 | Primitiva Ord. | 71-73 | .. | 4 13 4 |
| 51,000 | " | Oct. 14 | 7 | Buenos Ayres (New) Ltd. | 98-100 | .. | 4 0 0 | 100,000 | 50 | " | 7 | Do. 5 p.c. Deb. | 58-58 1/2 | .. | 4 8 11 |
| 500,000 | 10 | Dec. 29 | 4 | Do. 4 p.c. Deb. | 98-100 | .. | 4 0 0 | 114,800 | 50 | " | 4 | Do. 4 p.c. Pref. | 97-99 | .. | 4 0 10 |
| 250,000 | Stk. | Dec. 29 | 4 | Cape Town & Dis., Ltd. | 34-44 | .. | — | 398,490 | 5 | Apl. 29 | 7 | River Plate Ord. | — | .. | — |
| 100,000 | 10 | " | — | Do. 4 1/2 p.c. Pref. | 54-64 | .. | — | 796,980 | 100 | Jan. 27 | 5 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 100,000 | 10 | " | — | Do. 6 p.c. 1st Mort. | 49-50 | .. | 6 0 0 | 488,900 | 100 | June 1 | 4 | San Paulo, Ltd. | 153-153 1/2 | .. | 5 14 3 |
| 50,000 | 50 | May 3 | 6 | Do. 4 1/2 p.c. Deb. Stk. | 89-91 | .. | 4 18 11 | 1,000,000 | 10 | Oct. 14 | 8 | Do. 6 p.c. Pref. | 113-124 | .. | 4 18 0 |
| 100,000 | Stk. | Dec. 29 | 4 1/2 | Chester 5 p.c. Ord. | 109-111 | .. | 4 10 1 | 312,650 | 10 | " | 6 | Do. 5 p.c. Deb. | 508-512 | .. | 4 17 1 |
| 157,150 | Stk. | Feb. 25 | 5 | Commercial 4 p.c. Stk. | 107-109 | .. | 4 15 5 | 250,000 | 10 | Apl. 1 | 9 | Do. 5 p.c. Deb. | 508-512 | .. | 4 17 1 |
| 1,513,280 | Stk. | Feb. 25 | 5 1/2 | Do. 3 1/2 p.c. do. | 103-105 | .. | 4 15 3 | 62,500 | 50 | " | 6 | Sheffield A. | 232-234 | .. | 4 5 5 |
| 560,000 | " | " | 5 | Do. 3 p.c. Deb. Stk. | 81-83 | .. | 3 12 3 | 125,000 | Stk. | Jan. 3 | 5 | Do. B. | 232-234 | .. | 4 5 5 |
| 475,000 | " | Dec. 29 | 3 | Continental Union, Ltd. | 95-97 | -1 | 5 3 1 | 135,000 | " | Mch. 16 | 10 | Do. C. | 232-234 | .. | 4 5 5 |
| 800,000 | Stk. | June 10 | 5 | Do. 7 p.c. Pref. | 135-137 | .. | 5 2 2 | 209,984 | " | " | 10 | South African | 11-11 1/2 | -1 | 6 1 9 |
| 200,000 | " | " | 7 | Derby Con. Stk. | 121-123 | .. | 4 9 5 | 583,500 | 10 | May 27 | 7 | South Met., 4 p.c. Ord. | 120-122 | .. | 4 9 7 |
| 492,270 | Stk. | " | 5 1/2 | Do. Deb. Stk. | 104-105 | .. | 3 16 2 | 70,000 | Stk. | Feb. 10 | 5 1/2 | Do. 3 p.c. Deb. | 80-82 | .. | 3 13 2 |
| 55,000 | " | " | 4 | East Hull 5 p.c. Ord. | 96-98 | .. | 5 2 0 | 6,429,895 | " | Jan. 13 | 3 | South Shields Con. Stk. | 157-158 | .. | 5 1 3 |
| 145,995 | " | Apl. 1 | 12 | European, Ltd. | 243-244 | .. | 4 17 0 | 1,895,445 | Stk. | Mar. 16 | 3 | 5th Suburban Ord. 5 p.c. | 121-123 | .. | 4 12 0 |
| 486,090 | 10 | Jan. 27 | 12 | Do. £7 ros. paid. | 183-184 | .. | 4 16 0 | 209,822 | Stk. | Feb. 25 | 5 1/2 | Do. 5 p.c. Pref. | 121-123 | .. | 4 12 0 |
| 354,660 | 10 | " | 12 | Gas 4 p.c. Ord. | 103 1/2-104 1/2 | .. | 4 9 3 | 605,000 | " | " | 5 | Do. 5 p.c. Deb. Stk. | 122-124 | .. | 4 0 8 |
| 16,158,670 | Stk. | Feb. 10 | 4 1/2 | light 3 1/2 p.c. max. | 88-90 | .. | 3 17 9 | 60,000 | " | Jan. 13 | 5 | Southampton Ord. | 110-112 | .. | 4 9 3 |
| 2,699,000 | " | " | 3 1/2 | and 4 p.c. Con. Pref. | 104-106 | .. | 3 15 6 | 117,058 | Stk. | May 12 | 5 | Tottenham A 5 p.c. | 133-135 | .. | 5 1 9 |
| 4,002,235 | " | " | 4 | Coke 3 p.c. Con. Deb. | 81-83 | .. | 3 12 3 | 502,310 | Stk. | Feb. 10 | 6 1/2 | and B 3 1/2 p.c. | 113-115 | .. | 4 13 6 |
| 4,531,796 | " | Dec. 29 | 3 | Hastings & St. L. 5 p.c. | 93-95 | .. | 5 5 3 | 120,000 | Stk. | " | 5 1/2 | Edmonton 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 258,740 | Stk. | Mar. 16 | 6 1/2 | Do. do. 5 p.c. | 117-119 | .. | 5 9 3 | 453,940 | " | Dec. 29 | 4 | Tuscan, Ltd. | 9-9 1/2 | .. | 4 19 0 |
| 62,500 | 10 | Apl. 29 | 11 | Hongkong & China, Ltd. | 17-17 1/2 | .. | 6 5 9 | 149,470 | " | Jan. 3 | 5 | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 19 0 |
| 70,000 | 10 | Mar. 16 | 7 | Ilford A and C | 145-147 | .. | 4 15 3 | 182,380 | Stk. | Feb. 25 | 5 | Tynemouth, 5 p.c. max. | 113-115 | .. | 4 6 11 |
| 131,920 | Stk. | " | 5 1/2 | Do. B | 108-110 | .. | 5 0 0 | 236,476 | Stk. | " | 6 1/2 | Wands-1 B 3 1/2 p.c. | 139-141 | .. | 4 14 0 |
| 65,783 | " | " | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 255,636 | Stk. | Dec. 29 | 3 | worth 3 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |
| 65,500 | " | Dec. 29 | 4 | | | | | 79,416 | " | " | 3 | | | | |

Prices marked * are "Ex div."

OXIDE OF IRON.**O'NEILL'S OXIDE**

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S**"VOLCANIC" FIRE CEMENT.**

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old
Broad Street, London, E.C. "Volcanism, London."

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PUBLICATIONS, "MERCHANDISE MARKS
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grams: "Patent London." Telephone: No. 243 Holborn.

WARNER & VAN DER BIESEN,

ZWOLLE, HOLLAND.

DIGGERS AND SUPPLIERS OF THE

FINEST DUTCH BOG-ORE.

(Natural Oxide of Iron.)

Best Percentages. For lowest Quotations to any Port,
Station, or direct into Works, please apply to—
LONDON OFFICES: 6, LEATHER LANE, E.C.

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.

Correspondence invited.

SULPHURIC ACID.**SPECIALLY prepared for Sulphate of**

AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, AND STAFFORD.

Address Correspondence and Inquiries to OLDBURY, WORCS.

Telegrams: "CHEMICALS, OLDBURY."

HYDRATED OXIDE OF IRON.**PREPARED from Pure Iron.**

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, AND WAKEFIELD.

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND

CONTRACTORS,

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Telegrams:

Telephone:

"DAGOLIGHT LONDON,"

2886 HOLBORN.

KRAMERS AND AARTS WATER-

GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

89, VICTORIA STREET, S.W.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, AND WAKEFIELD.

TAR WANTED.

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS,

Albert Chemical Works, BRADFORD,
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
Naphtha, Carbolic, Sulphate of Ammonia.

J. E. C. LORD, Ship Canal Tar Works,
Waste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

J. & J. BRADDOCK (Branch of Meters
Limited), Globe Meter Works, OLDHAM, and
54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT
METERS, STATION METERS, AND GOVERNORS.
[REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
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"BRADDOCK, OLDHAM," and "METRIQUE, LONDON,"

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

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DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,

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"HALLITE" Asbestos High-Pressure

Sheeting.

HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street, LONDON, E.C.

JOHN RILEY & SONS, Chemical Manu-

facturers, Hapton, near Accrington, are MAKERS
of Special SULPHURIC ACID, for Sulphate of Am-
monia Making. Highest percentage of Sulphate of
Ammonia obtained from the use of this Vitriol, which
has now been used for upwards of 50 Years. References
given to Gas Companies.

F. BOYALL, Contractor for Painting

GASHOLDERS, OIL-TANKS, ROOFS, and all
kinds of LOFT and other PAINT WORK.

70, Balcorne Street, Well Street, HACKNEY, N.E.

BRISTOL RECORDING GAUGES

AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

AMMONIA.

Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, SUNDERLAND, AND WAKE-
FIELD.

"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West
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Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.

Telegrams: "DORIC," Newcastle-on-Tyne. National

Telephone No. 2497.

CAST-IRON Pipes. Spigot and Socket

or Flanged. Special Quality—9 feet or 12 feet
Lengths. When buying, Write us.

A. Lowcock, Limited, SHREWSBURY.

AMMONIA Waste Liquor Disposal.

Purification Plant.

Results Guaranteed. No Working Costs.

JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

IT is Worth Your While to Buy Direct.

The RELIANCE LUBRICATING OIL COMPANY
supply the best value in NON-CORROSIVE LUBRI-
CANTS—viz., Motor Wagon Oil, 1s.; Motor Car Oil,
2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil,
10d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;
650 T Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas
Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;
Renowned Engine Oil, 11d.; and Astral Disinfectant,
2s. 6d. per gallon. Barrels free, carriage paid. Solidified
Oil, 25s. cwt.

THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20, Water Lane, Tower Street, LONDON, E.C.

GAS PLANT for Sale—We can always

offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.

SULPHURIC ACID.**SPECIALLY prepared for the Manu-**

facture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD.

86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.

GAS-WORKS requiring Extensions

should Communicate with FIRTH BLAKELEY,
SONS, AND CO., LIMITED, Dewsbury, who make a
Specialty of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
faction Guaranteed.

GAS OILS.**MEADE-KING, ROBINSON, & CO.**

Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

APPOINTMENTS.—Ambitious Men of

Parts invited to write—

HERBERT GRETOREX,

APPLICATION SPECIALIST,

BEECHWOOD, MATLOCK.

Specimen of many results:—

"Have got the job. Quite a good start.

To you the credit is due, and I think you

fee the best investment I ever made."

BUSINESS IS REVIVING. WRITE NOW.

CITY and Guilds Examinations in Gas

Engineering and Gas Supply. Students who
have done badly at the recent Examinations should join
Mr. Cranfield's Correspondence Classes for next Session.
Assistance ample, individual, and private.

Write at once, 11, Avondale Place, HALIFAX.

WANTED, a Works Manager for Dol-

gelly, North Wales. Make, 6,000,000 Cubic
Feet. Coal Trade. Wages, 35s., with House, &c.

Apply, with copies of recent Testimonials, stating
Age, number in family, &c., to G. E. WOODFORD,
RUABON.

WANTED, for a 100 Million Works, an

ASSISTANT GAS MANAGER. Must be

Technically Qualified.

Applicants are requested to give full Particulars of
their Training and Qualifications, and to send Copies
of not more than Three recent Testimonials, to No.
5256, care of Mr. King, 11, Bolt Court, FLEET STREET,
E.C.

REQUIRED, a Working Retort-House

and Yard FOREMAN, experienced in Working
Carburetted Water-Gas and Sulphate of Ammonia
Plants. Works near London, 80 Million. House on
Works.

Apply, by letter, enclosing copies of Testimonials,
stating Age, Salary expected, and when Disengaged,
to No. 5255, care of Mr. King, 11, Bolt Court, FLEET
STREET, E.C.

THE UNIVERSITY OF SHEFFIELD.

APPOINTMENT OF LECTURER IN APPLIED
CHEMISTRY.

THE Council are about to appoint a

LECTURER IN APPLIED CHEMISTRY.

Salary, £150 per Annum.

Applications must be sent in by July 9.

Further Particulars may be obtained from

W. M. GIBBONS,

Registrar.

THE Omagh Urban District Council

require the Services of a Competent GAS
MANAGER, who will be required to keep a plain set
of Books.

Salary, £120 per Annum, with free House, Coal, and Gas.

Applications, with copies of Testimonials, must be

lodged on or before Tuesday, the 28th inst.

WM. J. COCKER,

Clerk to the Council.

Urban Council Chambers, Omagh,

June 9, 1910.

FOR SALE—Good Second-Hand Dry

Tin-Cased GAS-METERS, made by the Gas
Meter Company, Limited. One 300-Light; Two 200-
Light; Four 100-Light; One 50-Light. Just been dis-
placed by Electricity.

Apply, by letter, to No. 5251, care of Mr. King, 11,
Bolt Court, FLEET STREET, E.C.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSS
MOUNT IRON-WORKS, ELLAND.

GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap for
immediate Sale.
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

THE Directors of the Keswick Gas Com-
pany invite TENDERS for the Supply of 2000
Tons of Best Screened GAS COALS or NUIS, to be de-
livered at Keswick Railway Station between the 1st day
of July, 1910, and the 1st day of July, 1911, in such
Quantities and at such times as may be required.
Tenders, stating Price per Ton, endorsed "Tender
for Coal," to be sent to the undersigned not later than
the 23rd inst.
The Directors do not bind themselves to accept the
lowest or any Tender.
No Form of Tender supplied.

J. H. BRODIE,
Secretary.

Main Street, Keswick,
June 10, 1910.

THE Directors of the Keswick Gas Com-
pany invite TENDERS for their Surplus TAR
and AMMONIACAL LIQUOR for Twelve Months from
the 30th inst., at per Ton delivered into Contractors'
Tanks at Keswick Railway Station.
Tenders, endorsed "Tender for Tar," or "Tender for
Liquor," will be received by the undersigned up to Four
p.m. of Thursday, the 23rd inst.; but the Directors do not
bind themselves to accept the highest or any Tender.
Forms of Tender are not supplied.

J. H. BRODIE,
Secretary.

Main Street, Keswick,
June 10, 1910.

KEIGHLEY CORPORATION GAS-WORKS.
THE Gas Committee invite Tenders for
the Supply of the following MATERIALS re-
quired during the Twelve Months commencing on the
1st of July next:—
CAST-IRON PIPES and OTHER CASTINGS.
B. O. VITRIOL.
LIME.

Also for the Purchase of SPENT OXIDE during the
same period.
Particulars and Form of Tender can be obtained on
Application.

Tenders to be sent in on or before the 27th inst.
W. BAILLIE,
Engineer.

Gas Offices, Cook Lane,
Keighley, June 11, 1910.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

**NEW STEEL TAR AND LIQUOR TANK,
SCRUBBER, AND TWO PURIFIERS—CONTRACT**
No. 49.

THE Council are prepared to receive
TENDERS for a STEEL TAR AND LIQUOR
TANK, SCRUBBER, and Two PURIFIERS, for their
Porth Gas-Works.

Plans and Specification may be seen, and Forms of
Tender obtained, upon Application to Mr. Octavius
Thomas, the Engineer and Manager, Gas and Water
Offices, Pentre, Rhondda, upon depositing the sum of
One Guinea, which will, after the Council have entered
into a Contract upon the Tenders received, be returned
to the Tenderer, provided that he shall have sent in a
bona-fide Tender, and shall not have withdrawn same.

The Contractor will be required to pay the Standard
Rate of Wages recognized in the District.

Tenders to be addressed to the Chairman of the Gas
and Water Committee, endorsed "Contract No. 49,"
and delivered at my Office not later than 10 a.m. on
Friday, the 1st day of July next.

The Council do not bind themselves to accept the
lowest or any Tender.

WALTER P. NICHOLAS,
Clerk to the Council.

Public Offices, Pentre, Rhondda,
June 17, 1910.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE Council are prepared to receive
TENDERS for the following:

1.—The Supply from the 1st of July, 1910, to the
30th of June, 1911, of 18,500 Tons of Through
and Through GAS COAL and 1500 Tons of
CANNEL, delivered at the Porth and Ystrad
Gas-Works.

2.—For the Supply and Delivery of CAST-IRON
PIPES required from the 1st of July, 1910, to
the 30th of June, 1911.

Specifications and Forms of Tender can be obtained
on Application to the Engineer and Manager, Mr.
Octavius Thomas, Gas and Water Offices, Pentre,
Rhondda.

The Contractors will be required to pay the Standard
Rate of Wages recognized in the District.

Tenders to be addressed to the Chairman of the Gas
and Water Committee, endorsed "Tender for Gas
Coal," "Cannel," or "Cast-Iron Pipes," as the case
may be, and delivered at my Office, not later than
Thursday, the 30th day of June, 1910.

The Council reserve to themselves the right to divide
the Quantity into two or more Contracts, and do not
bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,
Clerk to the Council.

Public Offices, Pentre,
Rhondda, June 16, 1910.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas
Company invite TENDERS for the Supply of
about 7000 Tons of GAS COAL during the Year ending
June 30, 1911.

Full Particulars and printed Form of Tender may be
had on Application to the undersigned.

Tenders, endorsed "Coal," are to be sent in addressed
to the Chairman, by Thursday, June 23, 1910.

SAM'L S. MELLOR,
Manager and Secretary.

Gas-Works, Northwich.

BOROUGH OF EAST RETFORD.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Cor-
poration are prepared to receive TENDERS for
the Supply and Delivery at the Sidings of the Great
Northern or Great Central Railway Companies, Ret-
ford, of 8000 Tons of Best Screened GAS COAL or
NUTS during the Year ending June 30, 1911.

The Coal must be Freshly Worked and free from
Bats, Bind, or other objectionable matter.

Sealed Tenders, Specifying the quality of the Coal
and the name of the Pit from which it is raised, to be
sent in on or before June 30, 1910, addressed to the
Chairman of the Gas Committee, endorsed "Tender
for Gas Coal."

Forms of Tender and any further Particulars may be
obtained from the undersigned.

J. B. FENWICK,
Engineer and Manager.

Gas and Water Office,
Retford, June 9, 1910.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

THE Gas Department of the above
Council invite TENDERS for the Supply of
4000 Tons of Best Durham or other good GAS COAL,
Screened or Unscreened. The same to be supplied to
the requirements of the Council between the 31st day
of July, 1910, and the 30th day of June, 1911.

The Coal must be fresh Wrought and free from all
impurities.

No Special Tender Form will be issued.

Tenders must be accompanied by a full Description,
and Practical Working Analysis of the Coals quoted
and may be either l.o.b. at port of shipment, Teign-
mouth Harbour, l.o.r. Teignmouth Railway Station, or
delivered into the Gas-Works Store.

Sealed Tenders endorsed "Gas Coals," to be addressed
to A. Percival Dell, Esq., Clerk to the Council, Town
Hall, Teignmouth, and delivered not later than Mon-
day, the 4th day of July, 1910.

The Committee do not bind themselves to accept the
lowest or any Tender.

By order,
J. ALEX. GRAY,
Gas Manager

Gas-Works, Teignmouth,
June 11, 1910.

FILEY URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE Council invite Tenders for the
Supply of 1800 to 2000 Tons of GAS COAL, in the
Twelve Months ending the 30th of June, 1911.
Delivery to be made at the North-Eastern Railway
Company's Depot, Filey.

The Coal must be of good quality, suitable for Gas
Making, and free from Bats, Pyrites, and other Refuse.

The Tender may be for Screened, Unscreened Coal,
or Nuts.

Payments will be made Monthly.
The following are the approximate Monthly Quan-
tities required:—

| 1910. | 1911. |
|----------------------|--------------------|
| July . . . 160 Tons. | Jan. . . 170 Tons. |
| Aug. . . 250 " | Feb. . . 140 " |
| Sept. . . 200 " | March . . 140 " |
| Oct. . . 200 " | April . . 110 " |
| Nov. . . 160 " | May . . 110 " |
| Dec. . . 190 " | June . . 100 " |
| 1120 | 770 |

Tenders to be addressed to the Chairman, Urban
Council, Filey, and to be sent in on or before the 27th
of June, 1910.

HENRY TOBEY,
Engineer.

Malton.

MANSFIELD CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL, CANNEL, AND LIME,

AND

TENDERS FOR SURPLUS TAR.

COAL.

THE Gas Committee are prepared to
receive TENDERS for 1000 Tons of CANNEL
and 12,000 Tons of Best Screened GAS COAL, Delivered
at Mansfield Station for One Year from the 1st of July,
1910, to the 30th of June, 1911.

LIME.

For the Supply of about 150 Tons of Best Hard
Pickled LIME. Delivered as above.

TAR.

TENDERS for Surplus TAR made from the 1st of
July, 1910, to the 30th of June, 1911.

Tenders, endorsed "Coals," "Lime," or "Tar," as
the case may be, to be sent to J. Harrop White, Esq.,
Town Clerk, Mansfield, on or before June 23, 1910.

Particulars and all other Information from the under-
signed.

NOTE: No Special Forms of Tender provided.
The Committee do not bind themselves to accept the
lowest or any Tender.

ARTHUR GRAHAM,
Engineer and Manager.

Gas-Works, Mansfield,
June 8, 1910.

BOROUGH OF CONGLETON.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for
the Purchase of Surplus TAR and AMMONIACAL
LIQUOR for the Twelve Months ending June 30, 1911.

Forms of Tender and Conditions may be obtained
from the undersigned.

Tenders, endorsed "Tar and Liquor," to be delivered
at the Office of E. A. Plant, Esq., Town Clerk, Congle-
ton, on or before Saturday, July 2, 1910.

The Committee do not bind themselves to accept the
highest or any Tender.

JOSEPH T. BROUGHTON,
Engineer and Manager.

Gas-Works, Congleton,
June 13, 1910.

BRIERLEY HILL DISTRICT GASLIGHT COMPANY.

TENDERS FOR SURPLUS TAR.

THE Directors invite offers for the
Surplus TAR made at their Brierley Hill and
Kingswinford Works, to be taken between July 1 next
and June 30, 1911, delivered into Buyer's Boats.
Quotations to be based on the rate of 200 Gallons to
the Ton.

The Directors do not bind themselves to accept the
highest or any Tender.

Sealed Tenders, to be addressed to the Chairman
and endorsed "Tender for Surplus Tar," not later than
the 30th inst.

HENRY M. JACKSON,
Secretary.

Board Room, Gas-Works,
Brierley Hill, June 14, 1910.

EGREMONT (CUMBERLAND) URBAN DISTRICT COUNCIL.

THE Council are prepared to receive
TENDERS for the Extension of the Gas-Works.
Contract No. 2.—GASHOLDER TANK and GAS-
HOLDER.

Contract No. 3.—FOUR PURIFIERS.

Contract No. 4.—STATION METER.

Full Particulars and Copy of the Bill of Quantities
may be obtained from the Engineers' Messrs. Thomas
Newbigging and Son, 5, Norfolk Street, Manchester, on
deposit of One Guinea, returnable on receipt of a *bona-
fide* Tender.

The Drawings and Specifications may be seen at the
Engineers' Office or at the Gas-Works, Egremont.

The lowest or any Tender not necessarily accepted.

By order,
JOHN BOWLEY,
Clerk to the Council.

Town Hall, Egremont,
June 14, 1910.

WOMBWELL URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENTS.)

COAL AND COKE HANDLING PLANT.

THE Gas and Water Committee of the
above Council invite TENDERS for the Supply,
Delivery, and Erection of a COAL and COKE HAND-
LING PLANT, at the Gas-Works, Wombwell.

Full Particulars may be had on Application to the
undersigned.

The Council do not bind themselves to accept the
lowest or any Tender.

Tenders, endorsed "Coal and Coke Handling Plant,"
addressed to the Chairman of the Gas and Water Com-
mittee, to be delivered here on or before Wednesday,
June 29, 1910.

Signed, P. D. WALMSLEY, B.Sc.,
Engineer and Manager.

Gas-Works Wombwell,
June 17, 1910.

COUNTY BOROUGH OF SALFORD.

THE Gas Committee invite Tenders for
the following MATERIALS, in such Quantities
as may be required during the Thirteen Months ending
the 30th of September, 1911: GAS-METERS, CAST-
IRON MAIN PIPES and CONNECTIONS, IRON

CASTINGS, GAS and STEAM TUBING and SUNDRY
FITTINGS, IRON and STEEL, GUN-METAL METER
and LAMP TAPS and METER KEYS, BRASS
FITTINGS for METERS, BRASS PENDANTS and
BRACKETS, LEAD PIPE, ROPES, TARRIED and
SPUN YARN and TWINE, OILS and TALLOW,
PAINTS, BRUSHES, INDIA-RUBBER TUBING,
SHEETING, &c., TIMBER.

Forms of Tender and all Information may be ob-
tained, and Samples seen, on Application to Mr. Wm. W.
Woodward, Gas Engineer, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Stores," ad-
dressed to the Chairman of the Gas Committee, Town
Hall, Salford, to be delivered to me not later than
Three p.m. on Thursday, the 30th of June, 1910.

L. C. EVANS,
Town Clerk.

Salford.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

GAS-WORKS EXTENSION.

PERSONS desirous of Tendering for
the Supply (a) of CAST-IRON PIPES and
SPECIALS and (b) WROUGHT-IRON TUBES and
FITTINGS are requested to send their names and
addresses to Messrs. Corbet Woodall and Son, Palace
Chambers, Bridge Street, Westminster, S.W., not later
than Saturday, the 25th day of June, 1910, together with
a deposit of £3 3s. (by cheque) for copy of Specification,
Schedule of Quantities, and Form of Tender.

The Deposit will be returned on receipt of a *bona-fide*
Tender.

The lowest or any Tender will not necessarily be
accepted.

Contractors should State in their Application whether
they require Specifications "A" or "B."

JOHN D. FIDLER,
Clerk to the Council.

Council Offices, Sutton-in-Ashfield.

CITY OF HEREFORD.
(GAS DEPARTMENT.)**TENDERS are invited for the Surplus**
TAR produced at these Works, during the Twelve Months ending June 30, 1911.

Sealed Tenders, addressed to the Chairman of the Gas Committee, should be delivered at the Town Hall on or before the 25th inst., endorsed "Tender for Tar,"
W. W. TOWNSEND,
Engineer and Manager.

Gas-Works, Hereford,
June 16, 1910.

CITY AND COUNTY BOROUGH OF BELFAST.

THE Gas Committee of the Corporation
invite TENDERS for a Supply of 105,000 Tons of best Screened GAS COAL, to be delivered free, and trimmed, in barges at Belfast Harbour, between the 1st of October, 1910, and the 30th of September, 1911.

No Tender for less than 10,000 Tons will be considered.
Particulars as to the Quantity required each Month, &c., may be obtained at the Gas-Works.

Tenders on Office Forms, endorsed "Tender for Coal," should be lodged in the Office of the undersigned not later than Ten a.m. on the 1st of July, 1910.

The lowest or any Tender not necessarily accepted.
R. MEYER,
Town Clerk.

BOROUGH OF ILKESTON.
(GAS DEPARTMENT.)**THE Gas Committee invite Tenders for**
11,000 Tons of Screened GAS NUTS or PEAS to be delivered at their Siding on the Midland Railway, as required for the Year ending July 31, 1911.

Sealed Tenders, endorsed "Tenders," on Forms to be had on Application to the undersigned, to be delivered to Wright Lissett, Esq., Town Clerk, Ilkeston, before July 6.

The Committee reserve the right to divide the Quantities offered and do not pledge themselves to accept the lowest or any Tender.

F. C. HUMPHREYS,
Engineer and Manager.

Gas-Works, Ilkeston,
June 17, 1910.

FARNWORTH AND KEARSLEY GAS
COMPANY.**THE Directors are prepared to receive**
TENDERS for their Surplus Make of TAR and AMMONIACAL LIQUOR for a Term of One Year commencing the 1st of July, 1910.

Sealed Tenders to be addressed to James Fletcher, Esq., J.P., Chairman, Gas Offices, Cross Street, Farnworth, near Bolton, and delivered not later than Wednesday, the 29th of June next.

Forms of Tender and any further Information required may be obtained from Mr. H. Pickford, Manager.

W. BROMLEY,
Secretary.

Gas Offices, Farnworth,
June 10, 1910.

SALES BY AUCTION OF GAS AND WATER
STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
**CHIGWELL, LOUGHTON, AND WOODFORD
GAS COMPANY.**

NEW ISSUE OF
£2000 CONSOLIDATED ORDINARY STOCK AND
£1000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, June 28, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

BRENTFORD GAS COMPANY,
PINNER GAS COMPANY,
ILFORD GAS COMPANY.

MESSRS. A. & W. RICHARDS will
SELL BY AUCTION, at the Mart, E.C., on
Tuesday, June 28, at Two o'clock, in Lots, Stocks and
Shares in the above Companies.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

By order of the Directors of the
**BARNET DISTRICT GAS AND WATER
COMPANY.**

NEW ISSUE OF £10,000 "D" CAPITAL WATER
STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, July 12, at Two o'clock, in
Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the
TRANSFER BOOKS of this Company, relating
to DEBENTURE STOCK ONLY, WILL BE
CLOSED on the 17th inst., and RE-OPENED on July
1, 1910.

By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

68, Chancery Lane, W.C.,
June 16, 1910.

THE Proprietor of the Patent No.

19,146 of 1906, for "IMPROVEMENTS IN RE-GENERATING COKE-OVENS," is desirous of entering into Arrangements by way of LICENSE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.

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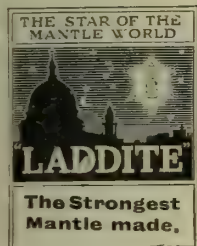
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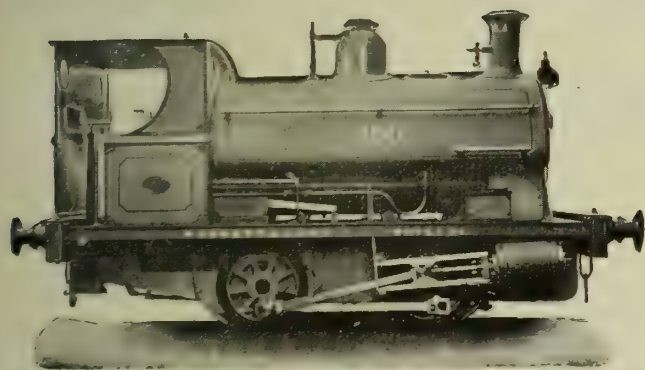
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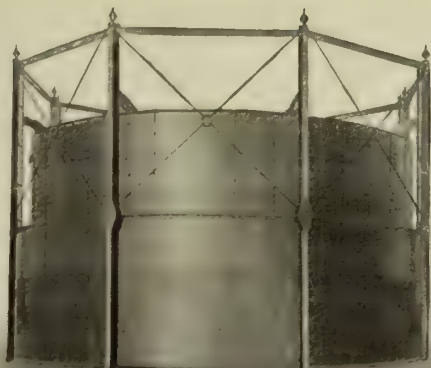
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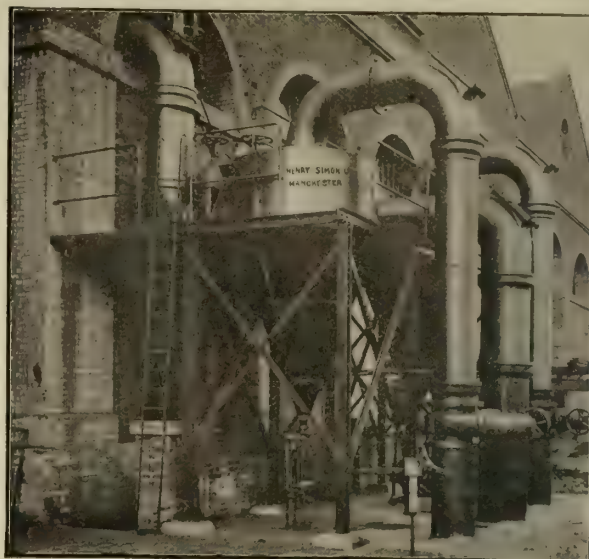
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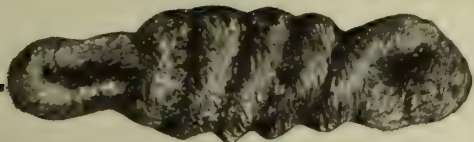
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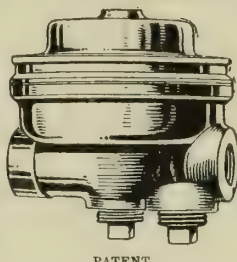
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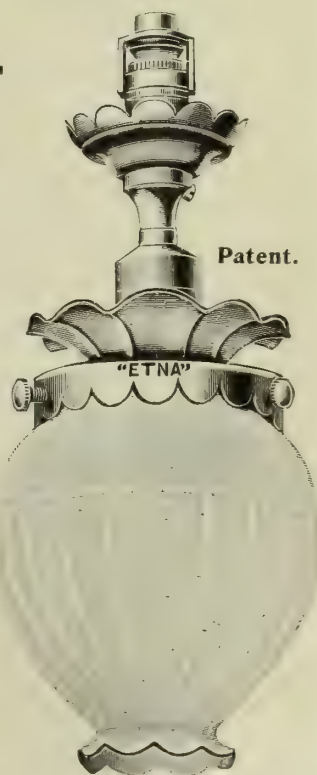
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Patent.



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Patent.

No. 4.



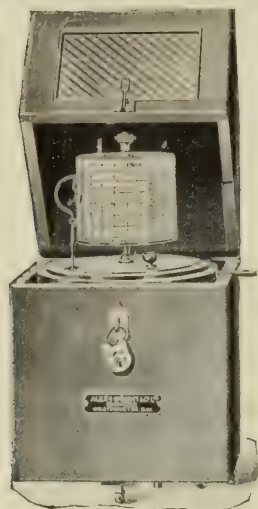
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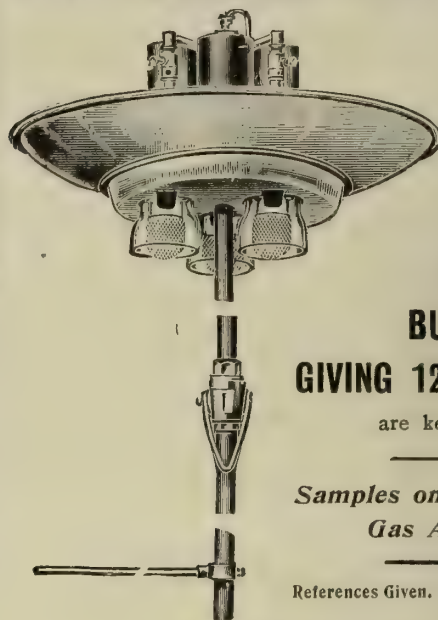
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Gas Engineers' Agents for **METERS, FIRE-CLAY GOODS**, and all other Gas Apparatus.

"LUX" PURIFYING MATERIAL and **NATURAL OXIDE.**

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Gasholders, Purifiers, Condensers,
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MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER FOR
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**OVER 600
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IN COMMISSION.

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ARTESIAN BORED TUBE WELLS,

Norton's Patent "Abyssinian" Tube Wells.
Deep Well Pumps and Patent Air Lift Pumps.

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ARROL-FOULIS

Stoking Machinery

HYDRAULIC COKE PUSHERS

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WILL DISCHARGE A RETORT IN ONE OPERATION
LARGE NUMBERS IN USE.

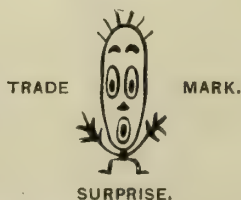
Full Particulars may be obtained from the Sole Makers,

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[See Illustrated Advertisement, June 14, p. 728.]

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SPECIAL NOTICE.

See that every Pendant
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On the Strache System.

STEAM-CONTROLLER for Water-Gas-Plants

RAISES the Calorific Value up to 3000 Calories.
REDUCES the CO₂ Contents to 2 per cent.
INCREASES the Capacity of the Unit-Time.
DIMINISHES the Steam Consumption.
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AUTOLYSATOR

Apparatus for Use in Heating-Plants of All Kinds, registering
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Apparatus serving to Find out the Leakage in Gas-Mains.

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SILICA MACHINE MADE RETORTS.

TRADE "C.O." MARK.
REGISTERED.

THE NEW RETORT

Will withstand high temperatures and is **Guaranteed**
not to Contract or Soften under Heat.

GREATER CONDUCTIVITY THAN ANY
FIRE-CLAY RETORT.

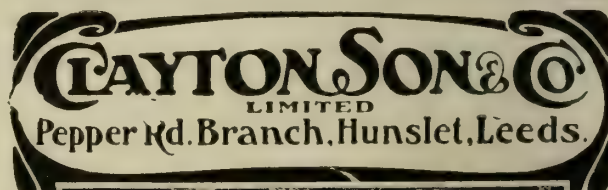
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JOSEPH MORTON, LTD.,

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Telegrams: ESTABLISHED 1783. **HALIFAX.**
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Interior View of Works
Employed in the Manufacture of
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CAST-IRON PIPES FOR GAS, WATER, & STEAM,

also VALVES of all descriptions.

ALLIANCE FOUNDRY, 147, MILTON STREET, GLASGOW,
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Brierley Hill, GASHOLDER SPECIALISTS

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ALL KINDS of ROOFS, PURIFIERS, TANKS, PLANT
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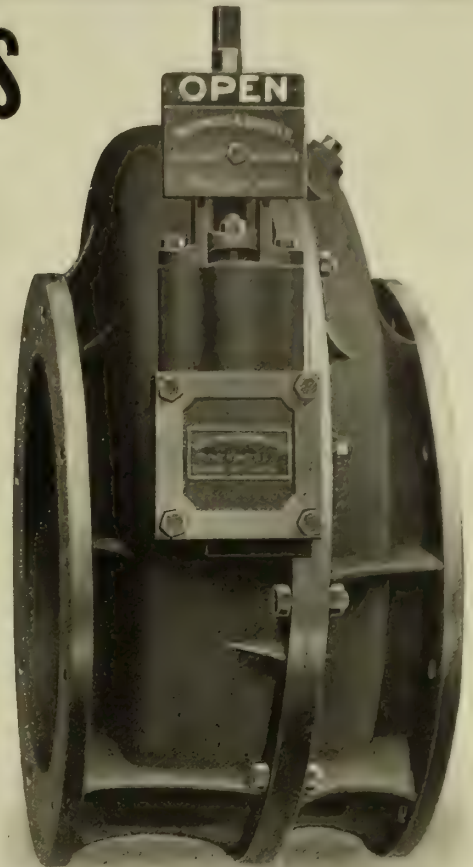
CONSTRUCTIONAL IRON AND STEELWORK.



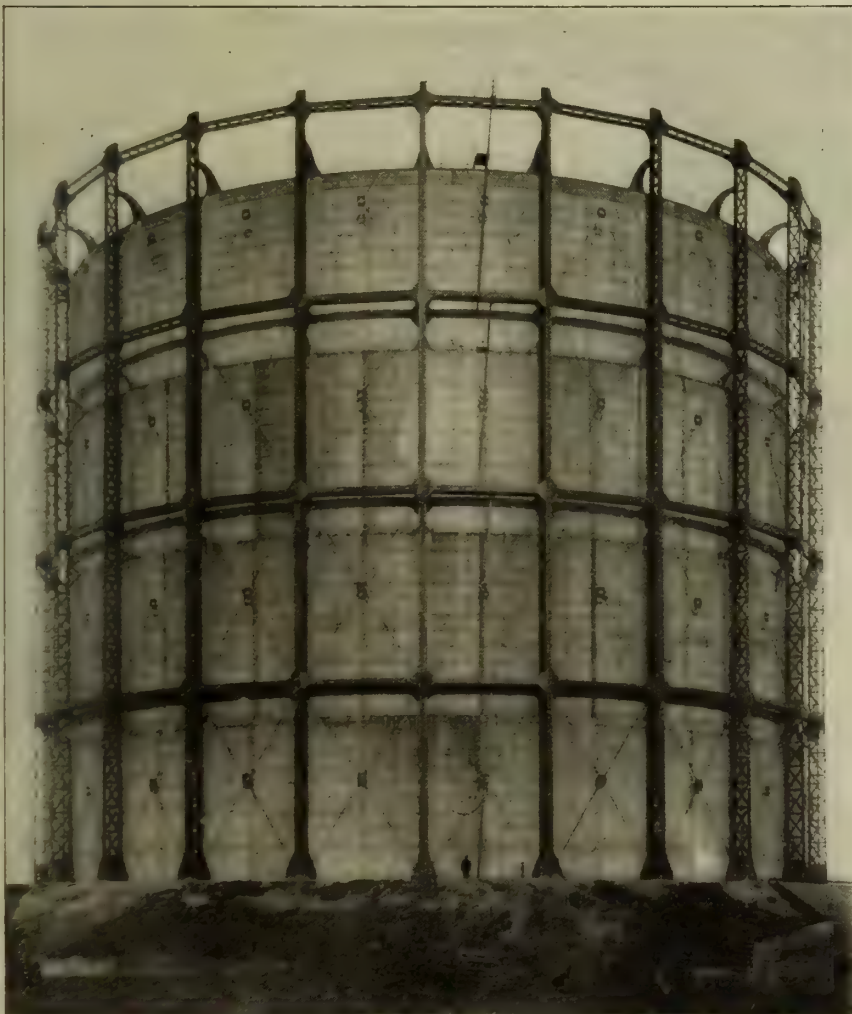
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PATENT DETACHABLE FACES FOR MOUTHPIECES.



Four-Lift Gasholder, 199 ft. 6 in. dia. x 42 ft. 0 in. deep, erected at the East Ham Gas-Works.

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The MOST RELIABLE
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AUTOMATIC FASTENINGS
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RETORT MOUTHPIECES.

PRESSURE RELIEVERS
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FURNACE AND OTHER
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CORT'S COKE CUTTING MACHINES.

The Value of the Coke is
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We believe they are indispensable
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MARSH AND THORP'S SPECIALITIES.

Carbonizing Foremen with anxiety to show good yield of Gas frequently increase the suction on the Retorts—Result: Air or Air and Furnace Gas is mixed with the Coal Gas. The Gas Manager with one of our Registers sees the game **AT ONCE**, and nips it in the bud.

Arranged as **EXHAUST**, or **EXHAUST** and **PRESSURE**, or as **PRESSURE** **REGISTERS**.

PRICES.

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|-------------|---|---|---|----|----|---|
| 6 in. RANGE | - | - | - | £8 | 10 | 6 |
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| 12 in. „ | - | - | - | 10 | 10 | 6 |
| 15 in. „ | - | - | - | 11 | 10 | 6 |
| 18 in. „ | - | - | - | 13 | 13 | 0 |
| 24 in. „ | - | - | - | 16 | 16 | 0 |
| 36 in. „ | - | - | - | 20 | 0 | 0 |
| 50 in. „ | - | - | - | 22 | 10 | 0 |

Deficiency of Pressure and variation of Pressure are the most fruitful source of Consumers' complaints.

A Portable Register at once enables you to locate your difficulties.

PRICES.

| | | | |
|---|----|----|---|
| For 4 in. or 6 in. Pressure, 24 hours diagram | £7 | 0 | 0 |
| „ „ „ „ 7 days „ | 7 | 10 | 0 |
| „ 9 in. Pressure, 24 hours diagram - | 9 | 0 | 0 |
| „ 12 in. „ „ „ - | 10 | 10 | 0 |

No Engineer can have thorough control of his Water-Gas Plant who has not a Cycle Recorder to show what his attendants are doing.

Marsh and Thorp's Cycle Recorder (Patented) shows duration of Runs, Blows, Time of Coking, Time of Clunkering, and Extent of Carburation.

It will increase the life of your Generators and Reduce the Cost of Purification.

PRICE - - - £18 18 0

SPECIAL REGISTERS for use with Retort House Governors.

DIFFERENTIAL REGISTER Showing Loss of Pressure from Inlet or Outlet of Plant.

ENQUIRY INVITED:

THE
GAS & MECHANICAL SPECIALTY CO.
LIMITED,

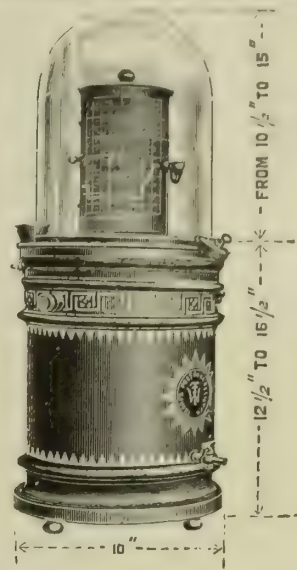
1, Mawson Chambers, 28, Deansgate,
MANCHESTER.

Telephone No. 5029 CITY.
Telegraphic Address: "ROTARY, MANCHESTER."

T. G. MARSH, Managing-Director.

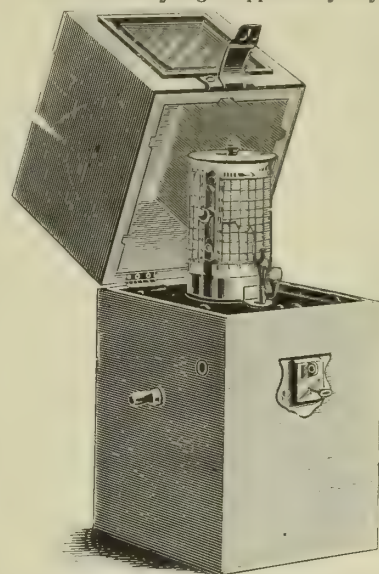
Exhaust Register.

"A little neglect may breed great mischief."



Portable Register.

"What is done by night appears by day."



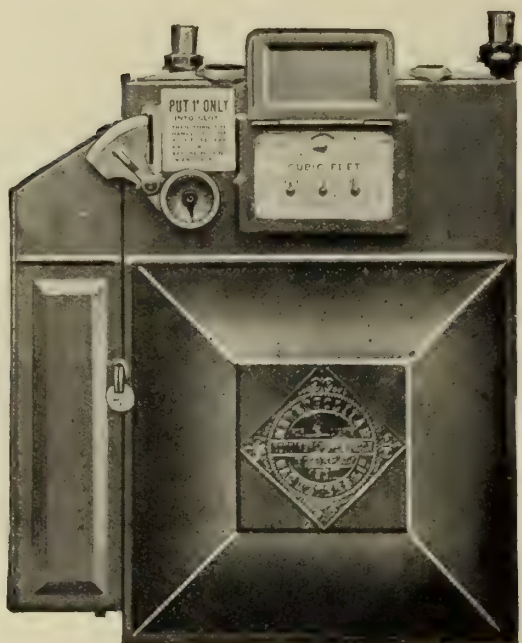
Water-Gas Cycle Recorders.

"Let each part of your business have its time."



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The **SPECIAL FEATURES** of this Meter are that without Removing the Meter you can, by merely unlocking padlock of money box and lifting up the flap at the side, **CHANGE** the price.

| | |
|--------------------------------|--|
| NO seals to hack out. | NO bent coins can be inserted in the mechanism. |
| NO screw head to find. | |
| NO reaching over meter. | NO second coin can be inserted until previous one released by turning the handle. |
| NO numbers to look for. | |
| NO re-screwing. | |
| NO re-sealing. | |

AUTOMATIC GAS LIGHTER AND EXTINGUISHER.

Some of its **Special Advantages** are:—

1. It is instantaneous in Lighting and Extinguishing without shock to Mantle, and can be set to its pre-determined times in a few seconds.
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3. **THE VALVE.**—As this never leaves its seat, and the gasways being away from the seating, no impurities can collect between the valve and the seating, and by simply removing a small cap, the gasways can be freed of Naphthalene or any other matter.
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6. The "Simplex" Clock has a Lever Escapement.

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Telephone: 204X NOTTINGHAM.

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MALT ST., OLD KENT RD., S.E.

Telegraphic Address: "GASOMETER LONDON."
Telephone: 2044 HOP.

Telephone No. 1982.

Telegrams. "VERTICAL, LEEDS."

WORKS AND HEAD OFFICE,

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LEECH, GOODALL & CO.

ENGINEERS AND CONTRACTORS.

BEING AN AMALGAMATION OF
GRAHAM, MORTON & CO.,
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AND
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PARTNERS.

CLAYTON, SON & CO., LTD., LEEDS.
WILLIAM J. B. LEECH,
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MAKERS OF
ELEVATING & CONVEYING MACHINERY,
ROOFS, BUNKERS,
COLLIERY SCREENING PLANTS,
PICKING BELTS,
PIT HEAD GEARS, HEAPSTEADS,
HAULAGE GEARS.

BUILDERS OF
GAS RETORT INSTALLATIONS,
ON THE
HORIZONTAL, INCLINED,
OR
VERTICAL SYSTEMS.

Gentlemen,

We have pleasure in informing you that
an amalgamation has been arranged between
the firms of

GRAHAM, MORTON & CO., of LEEDS,
whose speciality work is the manufacture of
Elevating and Conveying Machinery, Roofs,
Bunkers, Steel Structural Work, etc.; also
Builders of Gas Retort Installations on the
Horizontal, Inclined and Vertical Systems, and
R. H. LONGBOTHAM & CO., Ltd., of WAKEFIELD,
makers of Colliery Screening Plants, Picking
Belts, Heapsteads, Pit Head Gears, Haulage
Gears, etc., and that in future the business
will be continued under the style or firm of

LEECH, GOODALL & CO.,
at the above address.

Whilst thanking the many clients of the
two firms for past favours we trust that
they will place our name on their Books and
that we shall receive a continuance of their
esteemed orders, to which every attention
will be given both as regards quality of
material and good workmanship, together
with satisfactory working and results.

Yours faithfully,

Leech, Goodall & Co.

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HEAT INSULATION SPECIALITIES.

"THERMALIT" Fireproof Material.

Moulded into circular segments and bricks.

Can be exposed directly to dry heat of 2000° F. Spec. Gravity = '3. Heat Saving capacity = 97.4 per cent. Chiefly used for lining the setting of Water Tube Boilers, Coke Ovens, Retorts, &c., in order to economise heat and protect the brickwork against destruction caused by atmospheric cooling action; for lagging of superheated steam and plant using very high temperatures.

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Moulded into circular segments, slabs, and bricks.

Spec. Gravity = '25. Waterproof. Largely used in building on account of lightness and high capacity to confine or exclude heat, for encasing ironwork as a protection against fire, lining iron roofs, building partition walls, and lagging Steam Plant and Cold Water Pipes.

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Spec. Gravity = '3. Frost and water proof. A specially prepared "Emulgit" for insulation and storage of Cold, also for lagging Refrigerator Plant.

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GLASGOW.

KING BROTHERS (STOURBRIDGE), LTD., STOURBRIDGE, ENGLAND.

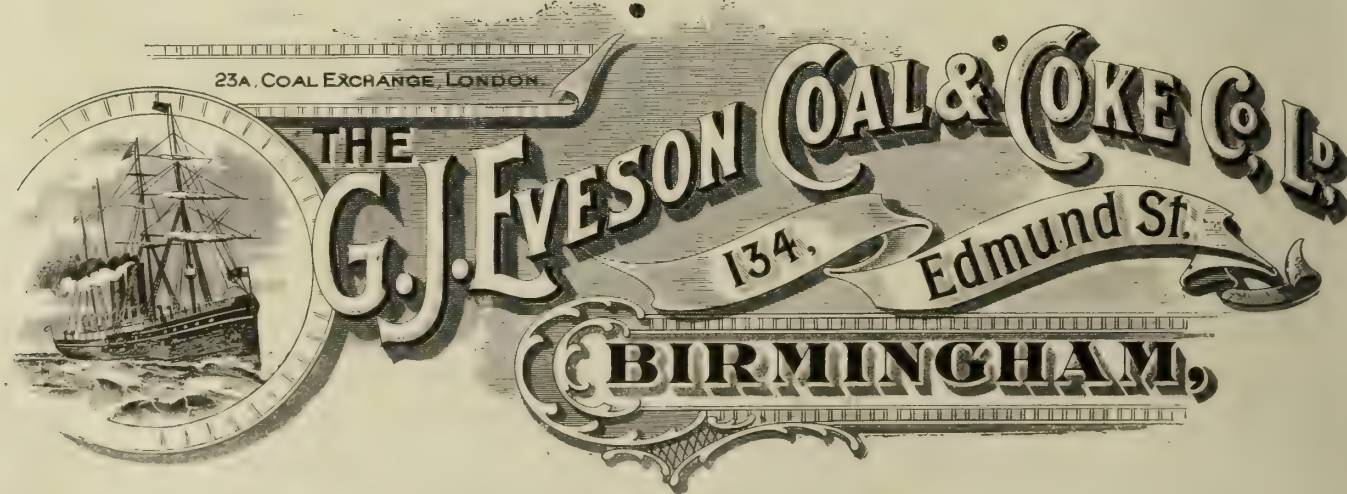
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BEST FIRE BRICKS, TANK BLOCKS, GLASSHOUSE FURNACE
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COKE-OVEN BRICKS A SPECIALITY.

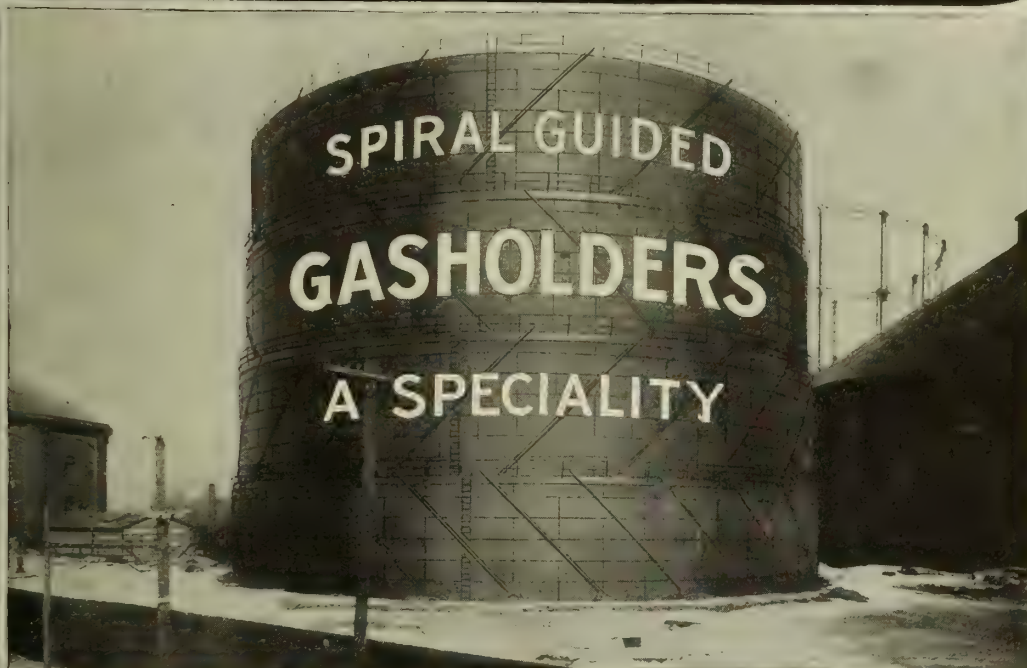


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CLAYTON SON & CO., LTD.

HUNSLET, LEEDS.

Makers of the first
SPIRAL GUIDED HOLDER (1889)



Four-Lift Spiral Guided Gasholder, erected at Montreal (Canada), capacity 1,000,000 cubic feet, fitted with "Clayton and Pickering's" Patent Guides.—The Strongest ever invented. The above Holder was completed in October, 1908, and has worked with perfect satisfaction, amid the trying conditions of a Canadian Winter.

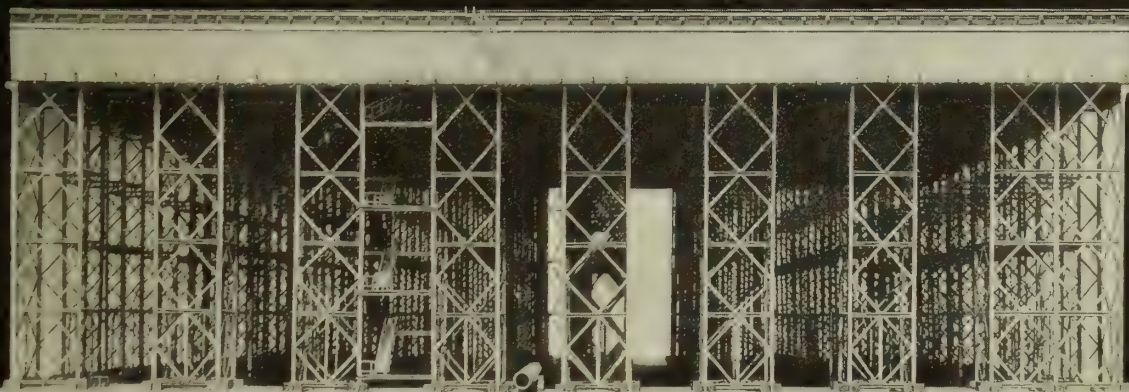
STEEL WATER MAINS A SPECIALITY.

21 Miles—33 inches diameter—just completed for the Leeds Corporation.

PHOTOGRAPH OF THE MODEL OF THE ELEVATED RESERVOIR.

To be Made and Erected by **CLAYTON, SON, & CO., LTD.**, for the CORPORATION OF CALCUTTA, at their TALLAH WATER-WORKS.

To the Designs of W. B. MacCABE, Esq., M.Inst.C.E., F.I.C., Chief Engineer to the Corporation.

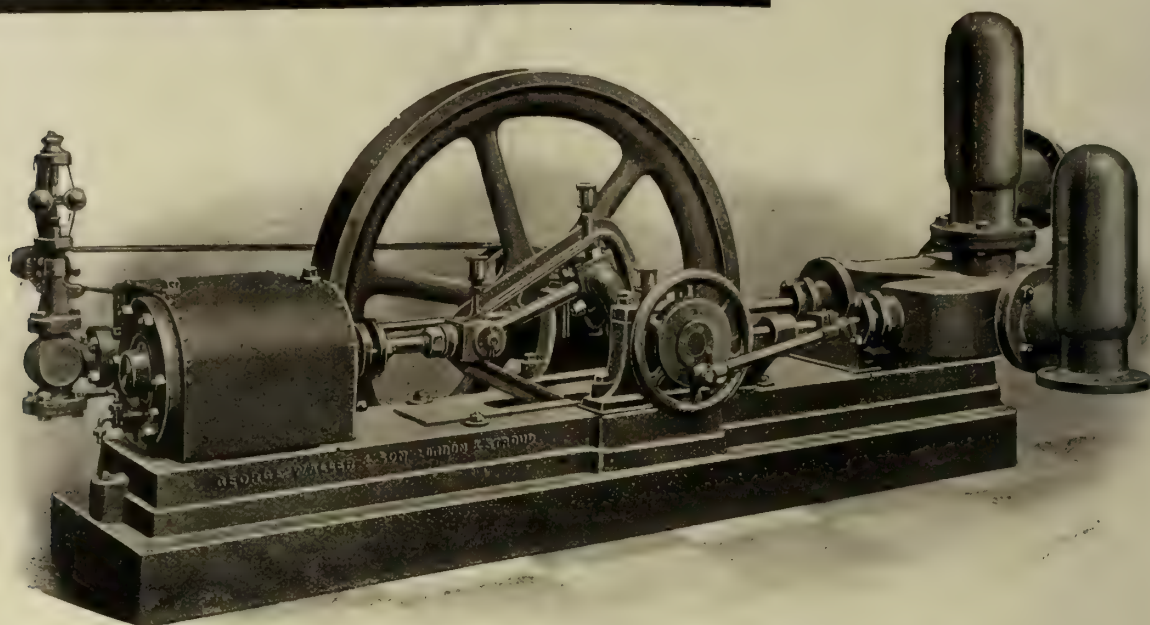


The Reservoir will consist of a Steel Tank, 16 feet deep, 321 feet square, supported on Steel Stanchions, the height from the top of tank to ground level being 110 feet. The tank will have a capacity of 9,000,000 gallons, weighing about 40,000 tons. The tank will be divided into four compartments which can be used independently of each other. The steel comprised in this huge structure will amount approximately to 7,000 tons.

Telegrams, "GAS, LEEDS." London Office, 60, QUEEN VICTORIA ST., E.C.

PUMPS

For GAS-WORKS PURPOSES,
Specially Designed for
TAR, LIQUOR, or WATER.



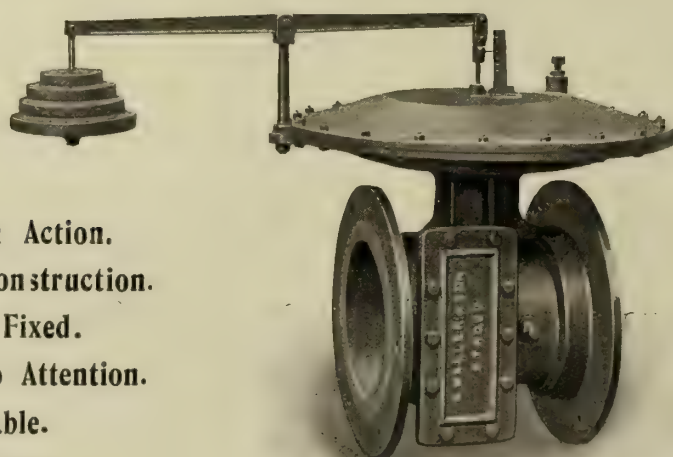
WALLER'S "PHOENIX" DOUBLE ACTING STEAM PUMP,

Specially designed for Ammonia Liquor, Tar, and Thick Fluids; made in sizes from 3" x 2" x 3" to 12" x 9" x 18"

"Cameron" type (single & double) Steam Pumps. Piston Valve Pumps with Reversing Gear for Tar.
Batteries of Pumps.
Gas Engine Driven Pumps. Electrically Driven Pumps. Belt Driven Pumps.

THE "REESON" PATENT RETORT-HOUSE GOVERNOR.

(MADE IN ALL SIZES.)



Perfect in Action.
Simple in Construction.
Easily Fixed.
Requires No Attention.
Durable.
Low Price.

No Cylindrical Valves to
get Clogged with Tar.

No Bells of Sheet Metal
to Corrode.

No Water Tanks to
Keep Filled.

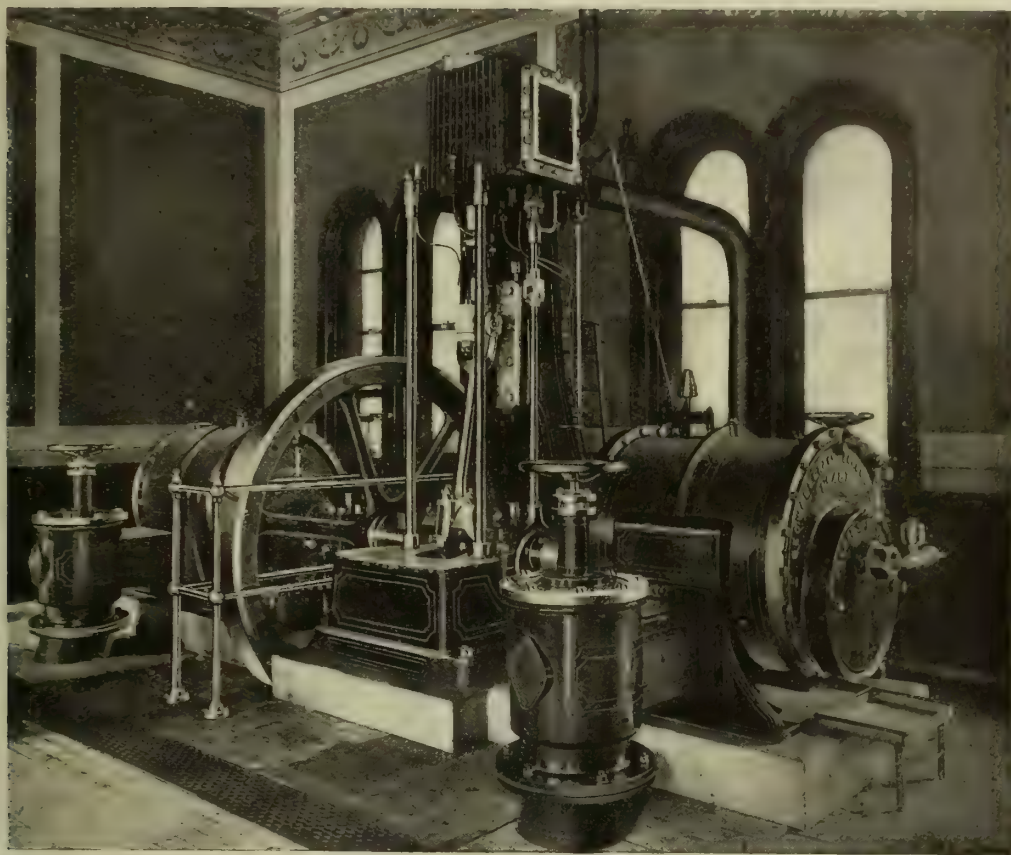
This Governor is arranged for being fixed in the Foul Main in the usual position, or on a Bye-Pass, and can be adjusted immediately. All parts are at once accessible, and readily removed, if desired. Governors of this type have been in constant use for over Two Years, giving perfect Registers.

Write for Prices and Full Particulars—

GEO. WALLER & SON, **STROUD, GLOUCESTERSHIRE.**
(D. M. NELSON & CO., 53, Waterloo Street, Glasgow—Agents for Scotland.)

Phoenix Iron Works,

EXHAUSTING MACHINERY.



125,000 cubic feet Exhausters and Vertical Engine. Twin Set, Dv Type.

WALLER'S PATENT

3 AND 4 BLADE EXHAUSTERS OVER 1400 SUPPLIED.

All Sizes from 500 to 500,000 Cubic Feet per hour. Maintain a steadier Gauge and require less Steam than any other Type.

GAS PRESSURE RAISING PLANTS.

(GAS, STEAM, AND ELECTRIC DRIVEN).

GAS VALVES of all Sizes and for all Purposes.

PINKNEY GAS ENGINES small power units. High Efficiency $\frac{1}{4}$ to 3 B.H.P.

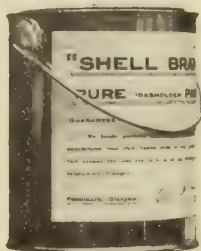
COKE BREAKERS WITH OR WITHOUT Elevators, Screens, Storage Hoppers, &c.

ROTARY WASHER SCRUBBERS. LIVESEY WASHERS.

Sole Makers of **"KERR" STEAM TURBINES.**

GEO. WALLER & SON, PHŒNIX IRON WORKS, STROUD, GLOUCESTERSHIRE.

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GUARANTEED PURE "SHELL BRAND" GASHOLDER RED.

As used by EIGHTY PER CENT. of the Gas-Works in SCOTLAND as well as many in England and Ireland.

- † Supplied in 7 or 3 cwt. Casks, 10 Gallon Tins or 7 and 14 lbs. Lever Lid Tins with Handles (as illustrated). We recommend the latter Packages for use when quantities of One cwt. or less are required, as the Tins are free and do not require to be returned and are handy for use as Paint Pots.
- † We guarantee this Paint to be Pure Natural Oxide of Iron, ground and prepared with Pure Linseed Oil and American Turpentine only (no substitutes).

A. H. HAMILTON & CO., POSSIL PARK PAINT WORKS, **GLASGOW.**

GASHOLDERS

With Guide Frames or Spirally Guided.

**CARBURETTED
WATER GAS PLANT.
STEEL TANKS.
STEEL PIPES.**

Gas-Works
Plant of
every
kind.

SAML. CUTLER & SONS,
Providence Ironworks, Millwall, London, E., and 39, Victoria Street, Westminster, S.W.

Telegrams:
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Telephone:
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**ROOFS,
STEEL
BUILDINGS,
CONDENSERS,
PURIFIERS,
JÄGER PATENT GRIDS.**

Contractors to the
VERTICAL GAS RETORT SYNDICATE, LD.

THE SILICA FIRE-BRICK COMPANY,
BOUGHTIBRIDGE.

RADIATE MORE HEAT

BY USING

SILCO BRICK RETORTS.

SILCO BRICKS prevent all settling of setting.

SILICA BRICKS for Combustion Chambers, any shape.

Brilliance, Diffusion, Economy,

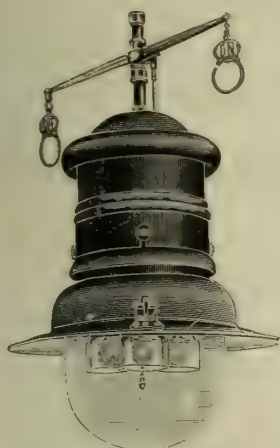


Fig. 623. Welsbach Inverted Storm-Proof Arc Lamp, giving 400-Candle Power. Price 52/6.

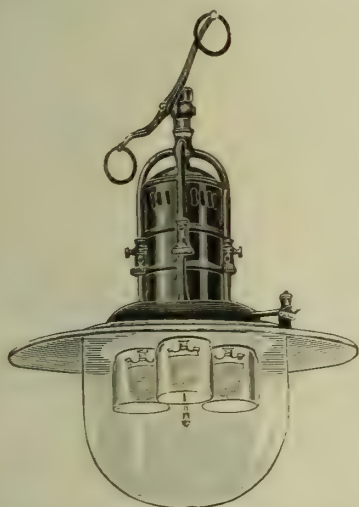


Fig. 624. The Welsbach Inverted Lamp for Interior Lighting, giving 400-Candle Power. Price 37/6.



The New Model Welsbach-Kern Inverted Burner gives 80-Candle Power for 3 feet of Gas per hour. Price 4/-.

The prettiest as well as the most efficient Inverted Burner on the Market. Complete as shown. Price 4/10 $\frac{1}{2}$.

¶ are the Tests of the Efficiency of Modern Lighting Systems. Applied with thoroughness they leave Welsbach Lamps and Mantles in a position of pronounced and indisputable superiority.

¶ The life of the Welsbach Mantles is the Standard of Duration, the Type of prolonged Effective Service, and the Fittings are Patterns of Finish and Excellence.

¶ Welsbach Mantles are a perfect combination.

¶ No Black Shadows darkening the remoter parts of a Room or depriving Goods of the Light that Sells in Shop or Show-Room.

¶ Welsbach Lighting exemplifies reliability absolute and unqualified. The Retailer has to Offer no excuses. Satisfaction is spread by dealing in the Goods as the Goods themselves spread light—in uniform Quality and Quantity.

The Welsbach Mantles are "C," "CX," and "Plaissetty," Price 4 $\frac{1}{2}$ d. each, 4/3 per dozen; Inverted, 6d each, 5/- per dozen.

All Prices subject as usual.

HEAD OFFICES AND SHOW-ROOMS:

THE WELSBACH INCANDESCENT GAS LIGHT COMPANY, LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH, LONDON."

Telephones: 2410 North (four lines).

THE CHEMICAL ENGINEERING CO.

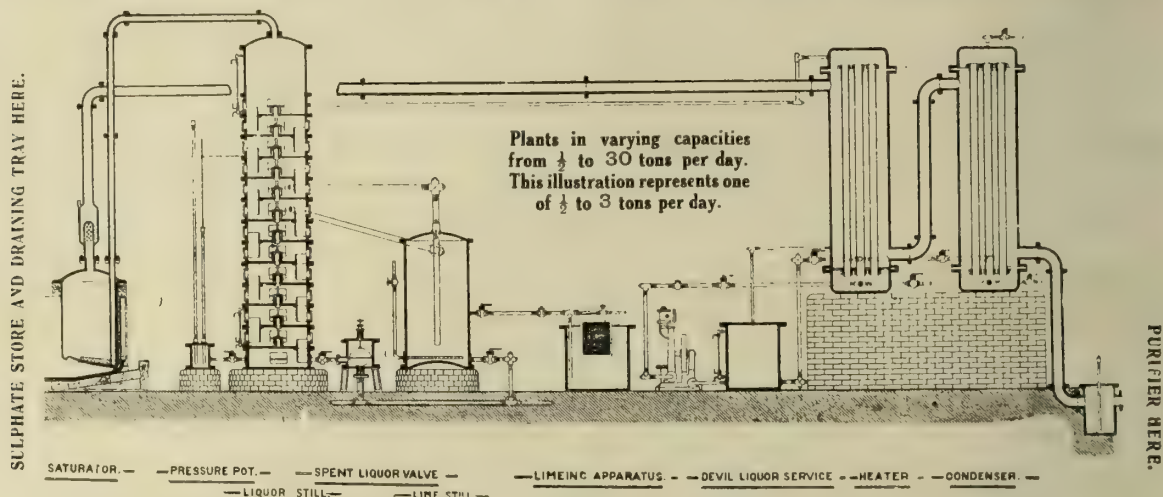
79, Mark Lane, London, E.C.

Works: MIDLAND RAILWAY GOODS STATION, HENDON.

MR. GEORGE WILTON,
Managing Director,
Late of the Gaslight and Coke Company.

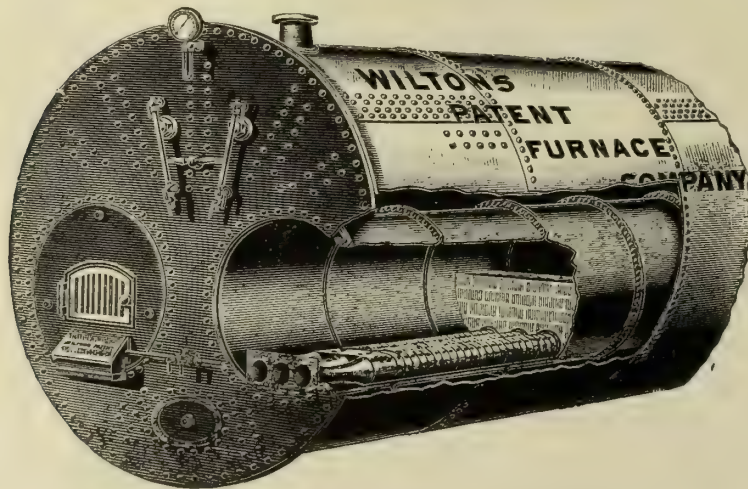
Telephone No. 2669 AVENUE.
Telegrams—"EVAPORATOR LONDON."
Telephone—2866 P.O. HAMPSTEAD.

WILTON'S SULPHATE OF AMMONIA PLANT.



Recent Orders from Gas-Works :

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| GENOA. | CROYDON. | PORTLAND. | NEWTON-ON-AYR. |
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| COPENHAGEN. | NEW SOUTHGATE. | CARNOUSTIE. | VILLANEUVA. |
| CUPAR. | CAMBUSLANG. | MITCHAM. | EAST COWES. |
| BLANDFORD. | COWDENBEATH. | WOKINGHAM. | |

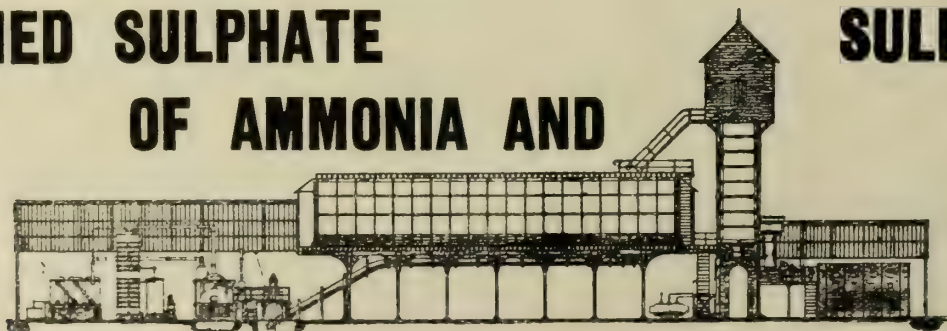


Contractors for the Supply and Erection of

OVER 10,000 IN USE,
of which more than 1500 of these
Furnaces are fitted in
GAS-WORKS
burning Coke Breeze and
Pan Breeze.

COMBINED SULPHATE OF AMMONIA AND

SULPHURIC ACID PLANT.



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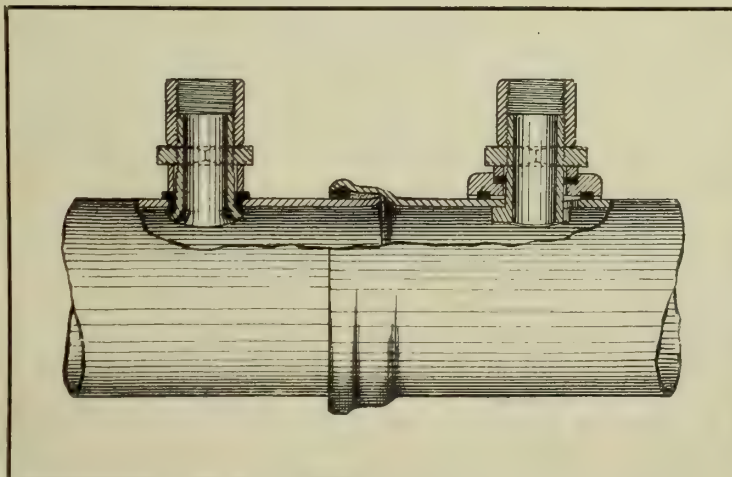
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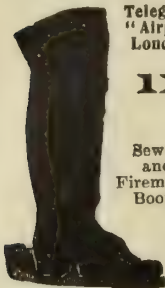
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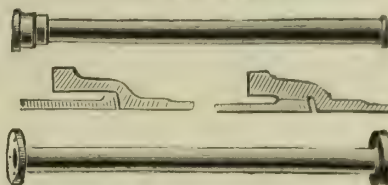
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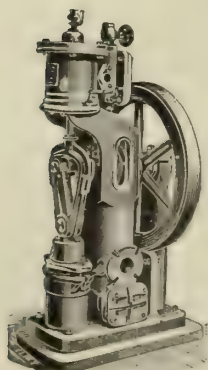


Fig. 705. "SINGLE RAM" STEAM-PUMP.

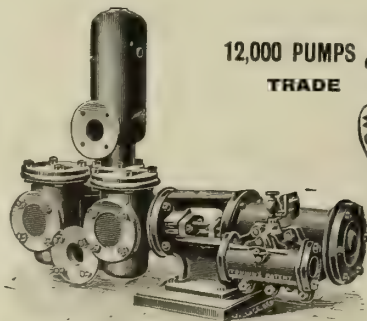


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

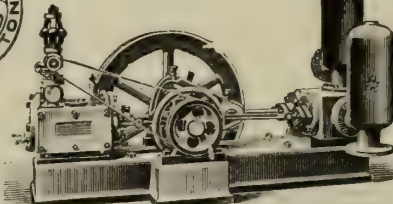


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

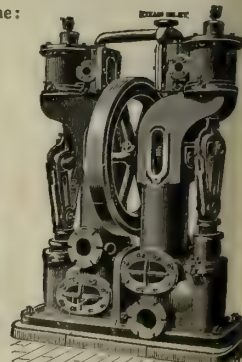


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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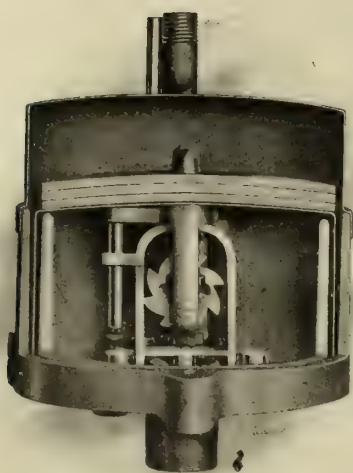
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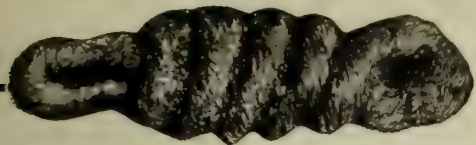
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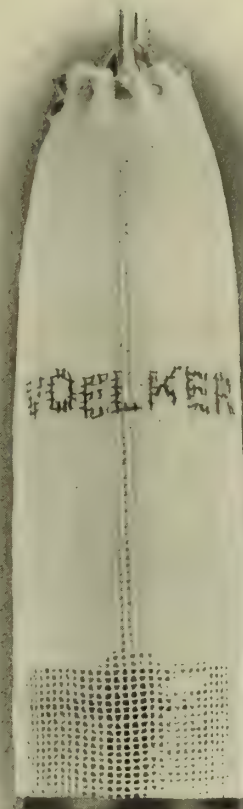
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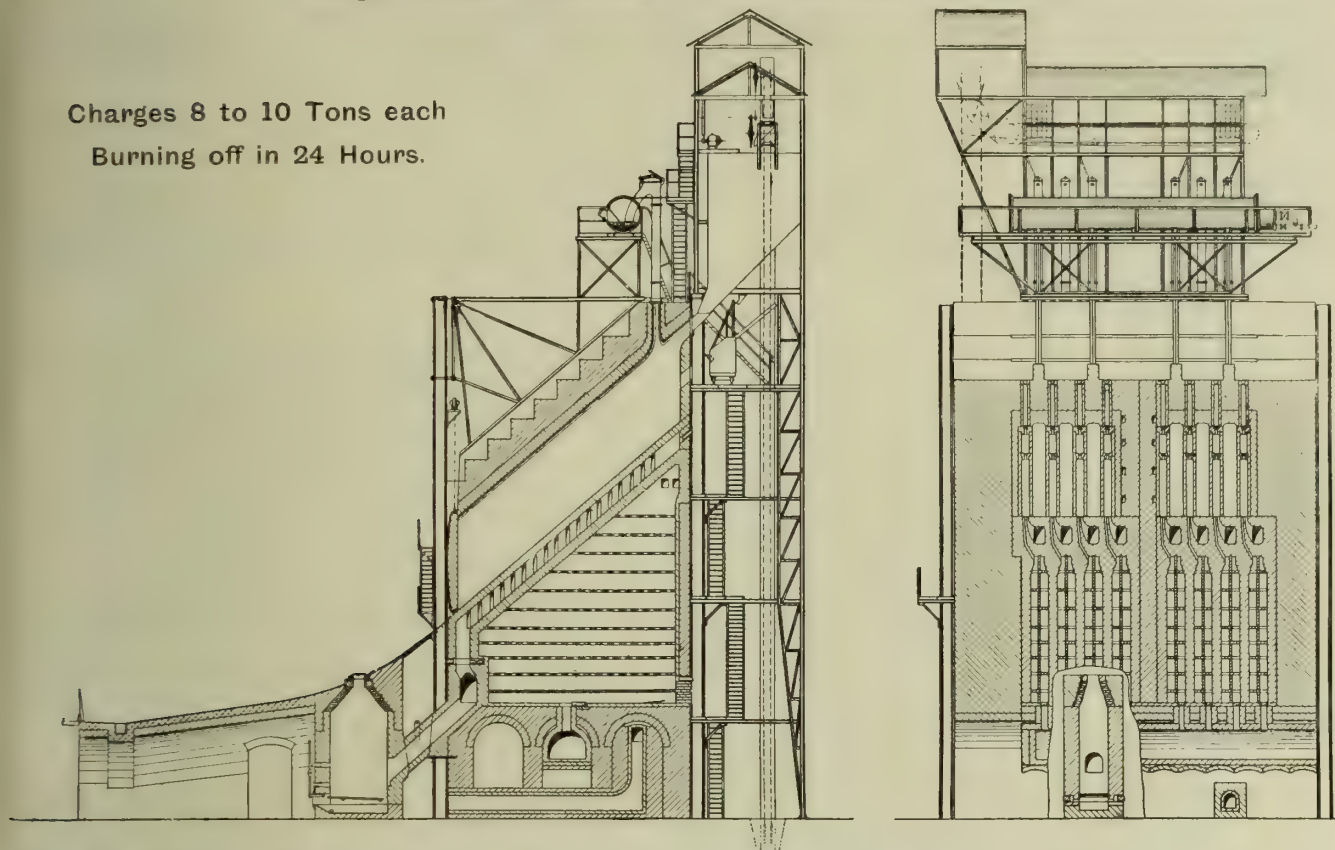
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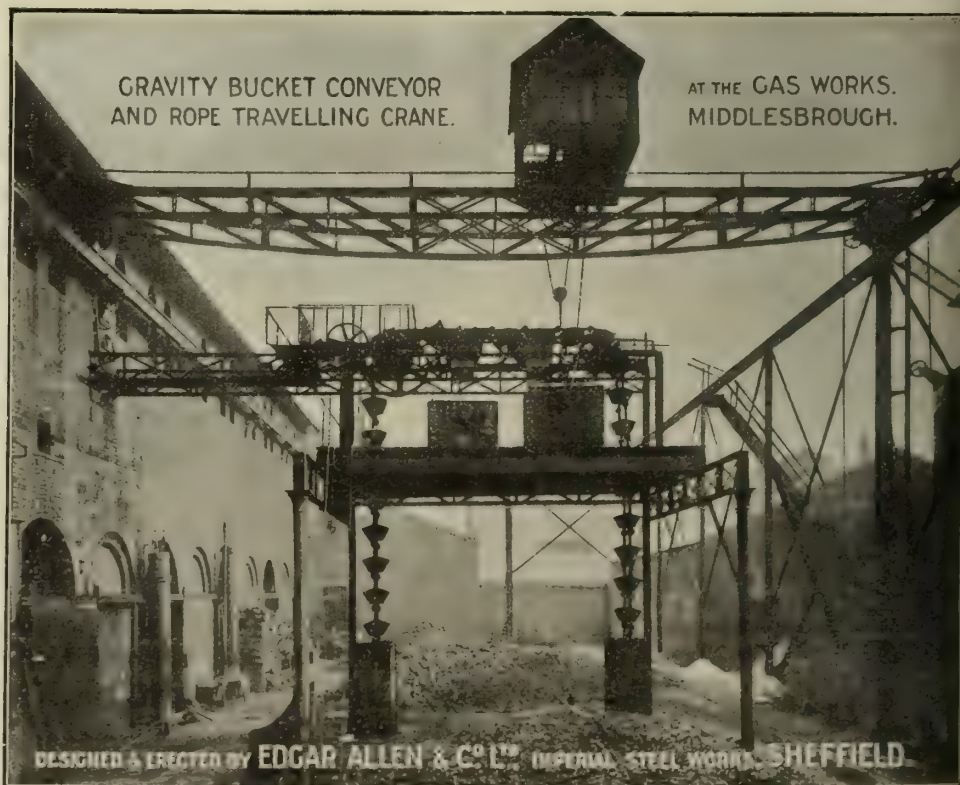
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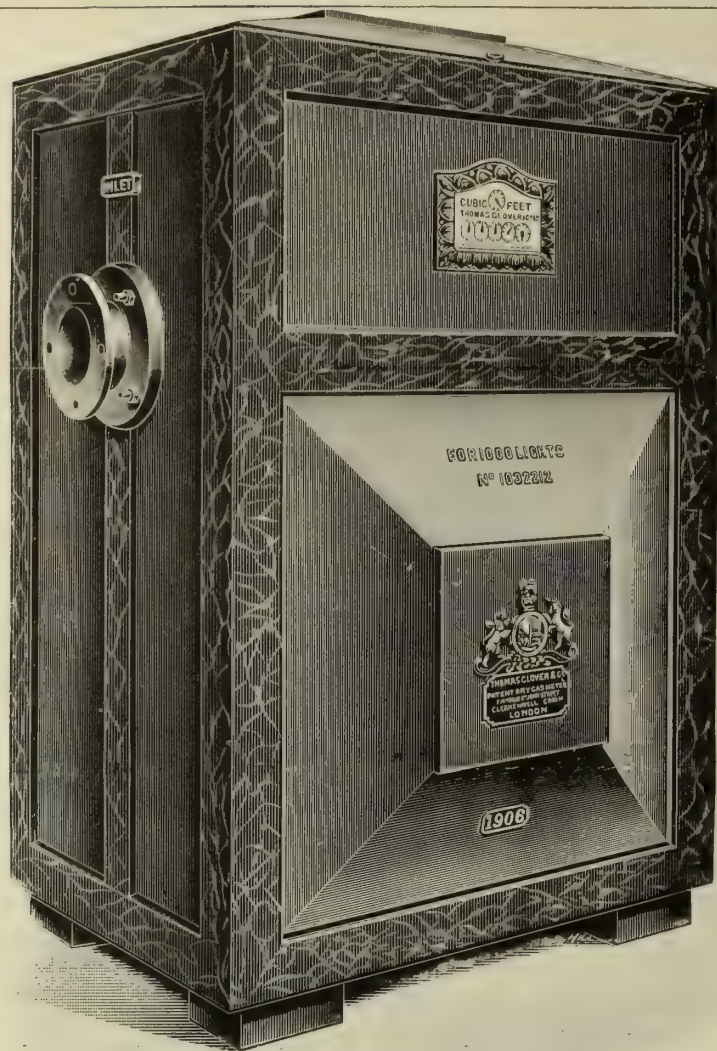
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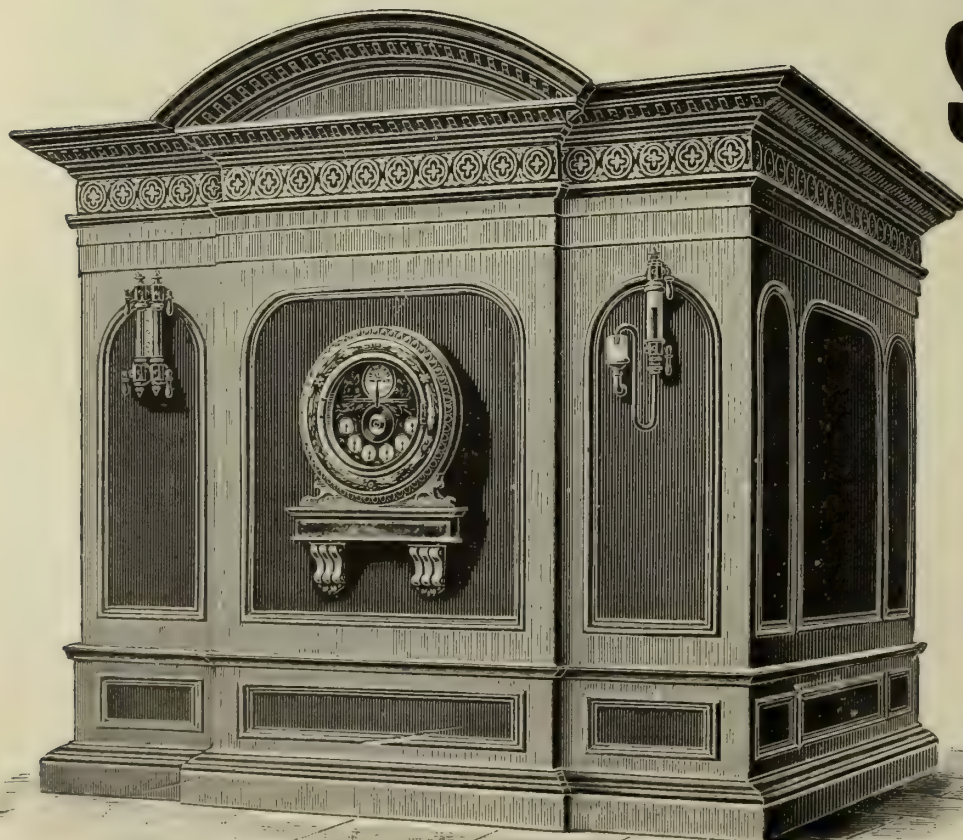
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EDITORIAL NOTES—GAS, &c.

Standard Burner Bills—Second Reading Carried.

THE local authorities who made such strenuous efforts to overthrow the Standard Burner Bills in the House of Commons on the second reading have done the gas industry an immense service, for which they are hereby most heartily thanked. They have succeeded not in convincing the House that Parliament has been befooled over the past five or six sessions, that the new standard burner is the evil thing in its effects that they have represented it to be, and that any injustice is being done to any single community or its interests (through inadequate opportunity for the presentation of their individual cases) by the joint promotion of these three Bills, but in showing that not one single contention submitted by them has the sympathy of a majority of the House, that the Government are absolutely in favour of industrial progress, and against the shackling of industry by the perpetuation of the application of old conditions to changed circumstances, and that the Government are in favour of the co-ordination through the country of the standard testing instruments applied to gas. And, moreover, the local authorities, through their action on second reading, have supplied a greater encouragement to gas undertakings than they have ever had before to persist in bringing about, as rapidly as possible, uniformity in the matter of the test-burner. The opponents have really to be thanked for the mistake they have made—a mistake in keeping with the errors and blunderings, and misconceptions and misrepresentations, that have marked the whole course of the hostility to these Bills from their inception; and we suppose will continue to do so to the end of the Committee stage, owing to the difficulty of driving home the truth through stubborn resistance to its reception and through the interested motives of competitors.

But, as we say, the promoters have, on second reading of the Bills, done good service to the industry; for the industry has now a better insight than it had before of the strength of the high-placed support that is behind it in this matter of the adoption of the "Metropolitan" No. 2 burner. With all the beating up that members of Parliament have had, with all the priming constituted of hypothesis and sentiment that members have received from the principal movers in this attempt to obstruct the gas industry's progress, there was a comparatively thin House when the Bills were, according to notice and order, introduced for second reading. The largest number taking part in the divisions on Nos. 1 and 2 Bills (the opposition on second reading to No. 3 Bill has since been withdrawn) was 152, excluding the tellers; so that this does not show any striking interest in the House as the result of the activity and agitation of the opposing forces. And in this small House, No. 1 Bill was sent forward by a vote on division of 80 to 61; No. 2 Bill by a vote of 96 to 56. This, again, is a proof that the declamatory misrepresentation that took place in the House was properly assessed at its true value, and had little weight. An analysis of the list of those who pronounced in favour of second reading shows that the voting was distinctly on non-party lines; but the amount of support the Bills received from the Government must have been just as much a shock to the opposition as it is a pleasure to the promoters. What have the local authorities to say to the Right Hon. John Burns, the President of the Local Government Board, declaring in favour of the Bills? In addition, the Government, and the various Government Departments, were represented by the Right Hon. Lloyd George, the Right Hon. A. Birrell, the Right Hon. Thomas Burt, the Right Hon. Alfred Emmott (the Chairman of Committees), the Right Hon. Walter Runciman, the Right Hon. H. L. Samuel, the Right Hon. Alex. Ure, and Mr. Percy H. Illingworth, of the Board of Trade.

Such unanimous support on the part of the Government may be variously regarded. It may be contended by the

opponents of the measures that it merely indicates the preference of the Government for Bills of this special nature being adjudicated upon by a Committee who can consider the matter in dispute in all its bearings. If that were the only reason for their support, we should be abundantly satisfied. But there are other reasons. Throughout the debate, the supposititious detriment to public interests of joint promotions of this kind was one of the strings vigorously played upon by members who were the mouthpieces of the opposition; but the attitude of the Government is sufficient assurance that they do not share in those views, which have only been framed and presented in the effort to secure a defeat on a side-issue. The effort has failed. There is another obvious reason; and it is that the Government have determined to support the Board of Trade in this matter of the standard burner; and the Board of Trade on their part intend to abide by the judgment of their scientific advisers. Mr. Percy Illingworth, representing the Board of Trade, in his speech on No. 1 Bill, said that the Board in this matter took up an attitude of benevolent neutrality; but he counselled that the Bills should be sent forward to Committee. In Mr. Illingworth's speech on No. 2 Bill, however, we get set forth the view of the Board of Trade. The honourable member remarked: "The Board of Trade view is that it is desirable, in place of the various 'test-burners now in use, to adopt the burner which has 'been recommended by their own scientific advisers, in 'order to secure an absolute standard of uniformity in regard to gas in all parts of the country, and to make comparisons possible in the interests of economy and usefulness of the article produced." The gas industry wants nothing more than this declaration to encourage them to persevere in bringing about what the Board of Trade consider desirable; and, the Board of Trade so considering, there is presented a very good reason why the Bills should have obtained, as they did obtain, the united support of the members of the Government in the House at the time of the divisions. Before leaving the question of the support that the Bills received, the signal services rendered by Sir Daniel F. Goddard, Sir Fortescue Flannery, Mr. Ryland Adkins, and Mr. J. F. L. Brunner, in placing the true facts before the House, ought to be mentioned. Among the names, too, of members who voted for the Bills are noticed those of Mr. W. H. Cowan and Mr. J. H. Duncan, one of the Directors of the Otley Gas Company.

In palliation of their defeat, the opponents may urge that the withdrawal from opposition of the Liverpool Corporation to the second reading had the effect of lessening the extent of their support. Examination of the voting-lists, and of the speeches made on behalf of the hostile authorities, does not lend colour to the submission. Liverpool at the eleventh hour adopted the very sensible attitude (and the promoters took steps before the motions for second reading came on to place all other opponents in practically the same position as Liverpool) of agreeing to withdraw from opposition on second reading if an Instruction were given to the Committee on the Bills to consider, on the request of any of the petitioners, the expediency of further dividing the measures, in order to remove any difficulties that might, in their opinion, be proved to exist (by reason of the inclusion of several companies in the Bill) in the submission separately of any of the cases in opposition—the idea being, if thought desirable by the Committee, to detach from the Bills any companies with special circumstances attaching that require independent consideration, and place them in a Bill apart. It is almost certain that Liverpool will be so dealt with. But this provision notwithstanding, the hostility to second reading was persisted in, which shows clearly that the local authorities would have preferred to overthrow the Bills in this fashion rather than go again before a Committee with the loosely woven and unsubstantial case they were able to present to the Lords Committee.

We will not occupy time or space dealing here with the

extravagant statements, misconceptions, and misrepresentations to which the House was treated during the debate by those who spoke for the opposing local authorities. Practical considerations and not theoretical and hypothetical ones, common sense and not silly appeals to sentimentality concerning the poor (who have the means of one domestic economy in the incandescent burner), succeeded, and allowed the measures to emerge triumphantly from the second reading. Parliament and the Government have declared in favour of the gas industry's progress, and in favour of economical legislation as exemplified by this joint promotion for a common and wise purpose.

The Meeting of the Société Technique.

THE two weeks which have just closed will stand out prominently in the year's record of the progress of the gas industry. Scarcely had the members of the Institution of Gas Engineers brought their meeting to a close, than their colleagues in France and Germany opened theirs. The proceedings of the German Association are dealt with elsewhere. Here we have only to notice those of the French Society. The meeting was held in Paris, under the presidency of M. Godinet, of Lyons; and it opened on Monday last week—a day earlier than usual, to allow of the week end being spent in Brussels, on the invitation of the Belgian Association of Gas Managers, whose President is M. Prisse, to visit the exhibition and inspect some of the gas-works of the city. The invitation was accepted by about eighty members. A similar one was addressed to the Institution of Gas Engineers; and the President (Mr. Alexander Wilson), the Past-President (Mr. James W. Helps), and Hon. Secretary (Mr. S. Y. Shoubridge), accompanied by Mr. P. Holmes Hunt, the President of the Victorian Association of Gas Managers, joined their Belgian and French colleagues. It will be seen, from the account of the proceedings—necessarily much condensed—which appears elsewhere to-day, that the welcome accorded to the members of both organizations was of the very heartiest character.

Turning to the business at the meeting of the Société Technique, the morning of the first day was, as is usual, devoted to routine matters. There was a good addition to the lists of both members and associates, the total of which, with the 22 honorary members, is now 798. The roll has grown to such an extent of late years, that a change in the constitution of the Society became necessary; and a feature of the first morning's proceedings was a proposal by the Committee to increase their number to 21, and to have three Vice-Presidents. The feeling of the members on this matter was shown by their unanimous adoption of the proposal. The new Committee was then elected; and at a subsequent stage of the proceedings it was announced that M. Godinet's successor in the presidency would be M. Marquisan, whose name may be remembered by some readers in connection with his paper on "Vertical Retorts," read first before the Society of Civil Engineers of France, and subsequently submitted to the Société Technique. The paper was noticed in the "JOURNAL" at the time. A great part of the afternoon was occupied with the distribution of the medals and awards by the Government and the Society; but time was left for some technical business, and what was the chief communication dealing with carbonization was submitted by M. Parsy. It was a discourse on the Klönne chamber ovens, and was specially interesting from the fact that the author showed that these settings are applicable to small works.

It is unnecessary to refer in detail to the papers, of which there were about twenty, some, of course, quite short—as the subjects dealt with are indicated elsewhere. Especial mention may, however, be made of one by M. Bonnet, on a new form of gasholder tank, for which patents have been taken out by the Maschinenfabrik Augsburg-Nürnberg. It evoked some criticism from M. Leclair, who gave what was very much like another contribution on the subject. M. Grebel read two papers—one on a new system of condensation, and the other on a reflector for economizing light. An interesting communication was submitted by M. Greyson de Schodt, on his system of lighting by means of incandescent burners set at an angle. M. Vanderpol discoursed on the advantages of the pre-mixing of gas and air for obtaining perfect combustion of coal gas. M. Bromham, of Brussels, directed attention to a sulphate turbine. The other papers are mentioned in the review of the proceedings appearing elsewhere. An innovation during the past few years has been the setting down of subjects for discussion. One of

these was on the means to be employed in order to prevent the fouling of gas in holders; and it will probably come up again next year.

During the week visits were paid to no less than five gas-works—two in Paris and three in Brussels—at all of which the members were very cordially received. The new works at Gennevilliers presented many points of interest, especially the installation of Munich inclined chamber settings; and at the works of the Société du Gaz de Paris at Le Landy the members saw a combination of the old and the new in gas-works construction. At the Forest works of the Imperial Continental Gas Association (under the supervision of Mr. Henry Salomons) the old is gradually being converted into the new, and extensions are about to be undertaken. The Jette-St.-Pierre works of the St. Josse-ten-Noode Gas Company—constructed in a remarkably short space of time—and the Brussels Municipal Works at Schaerbeek both possessed features which made their inspection instructive to the visitors.

This notice of the meeting must not close without reference to the generous hospitality displayed by the Belgian Association of Gas Managers to those whom they had invited to Brussels. These included members of the Council of our own Institution, the new President of which—Mr. Alex. Wilson—referred in felicitous language to the beneficial effect of such international gatherings, as strengthening the bonds of union in the gas fraternity. Further opportunity for doing this will be afforded on the occasion of the meeting of the Dutch Association of Gas Managers in Brussels early next month. Altogether, if the congress of the Société Technique for 1910 did not produce any technical literature of a striking character, it will be recalled with very pleasant recollections by many who attended it.

Meeting of the German Gas Association.

IT is a curious fact that, throughout the first fifty years of its existence, the German Association of Gas and Water Engineers had not held its annual meeting in either of the two important towns bordering on the Baltic coast—viz., Dantzic and Königsberg—though practically every other town of equal size in the Empire, and some outside it, had been visited at least once during the half century. For its fifty-first meeting, however, which was held last week, the far-east town of Königsberg was chosen, mainly no doubt on account of the interest which attaches to a gas-works which has developed so rapidly as that owned by the Corporation of the city under the able management of a Gas Engineer of such striking individuality and originality as Herr Kobbert. It will be seen from the report of the proceedings at the meeting (by our Special Representative) in another column of to-day's "JOURNAL," that the comparatively isolated position of Königsberg was responsible for a relatively small attendance of members. Notwithstanding this, the technical proceedings were of considerable interest though the brilliancy of the social functions necessarily paled before that of those of the celebration of the jubilee of the Association at Frankfort last year.

In many respects the most interesting portion of the technical programme of the meetings is now the report of the work carried out at the Instructional and Experimental Works of the Association at Karlsruhe. The matter of most interest in the report presented last week on that work—to English gas engineers at least—will be the announcement that a systematic investigation of the gas-making qualities of the more important varieties of English gas coals is to be undertaken with the exhaustiveness which has characterized the investigations already made at the experimental works on the principal descriptions of German gas coals. A provisional statement of the results of the laboratory analyses, which are made as a preliminary to the gas-making trials, is given on another page of to-day's "JOURNAL," and refers to a considerable number of well-known typical English gas coals. The final report will be awaited with interest by all English gas engineers, especially if the investigation is extended to some of the coals which, though not generally regarded as gas coals, the recent modifications in the requirements as to the quality of gas have rendered available for gas manufacture.

The papers presented at the meeting included two of minor importance on processes for the purification of gas, and an interesting communication by Herr Max Mayer, on some investigations on the variation in the efficiency of incandescent burners with changes in the calorific power of

the gas consumed. He concludes that M. St. Claire Deville's much-debated proposition, that the illuminating power of a mantle is proportional to the calorific power of the gas used, is true only within somewhat restricted limits of variation of the calorific power. These limits, it is true, include most of the gas at present supplied from works in this country; but it is not improbable that gas of a lower calorific power than 480 B.Th.U. net per cubic foot (which is Dr. Mayer's lower limit) will shortly be very commonly supplied. Readers of the "JOURNAL" may be reminded in this connection that even now the Gaslight and Coke Company are entitled to supply gas of only 450 B.Th.U. net without incurring a forfeiture. Dr. Mayer shows fairly conclusively that the illuminating duty, under the mantle, of such comparatively poor gases is, relatively to their calorific power, greater than that of rich gases, which is a point of extreme importance in regard to the quality of gas supplies in the future. Abstract translations of Dr. Mayer's interesting paper, and of the two papers on purification, are given in to-day's "JOURNAL."

Others papers read are more briefly referred to in the report of our Special Correspondent on the Proceedings, and abstract translations will be published in due course. Two papers dealt mainly with the question of the proper allowance for depreciation and interest charges in respect of plant on, in particular, municipal gas-works. They were written rather from the German standpoint; but nevertheless will be worth the attention of gas engineers, and of others concerned with problems of municipal trading. A valuable paper by Dr. E. Schilling, of Munich, contained a pretty exhaustive summary of the applications of gas at the present time to industrial purposes, and of the descriptions of apparatus employed therefor. A paper by Dr. K. Bunte gives a number of conclusions at which he has arrived (from his experience as Superintendent of the Association's Experimental Works) as to the assessment of the quality of gas coals from the results of analyses and gas-making trials. The paper, of which a translation is given elsewhere to-day, is of a suggestive and valuable character.

Readers of the "JOURNAL" will hear with regret that the father of the last-named author—Geheimrat Professor H. Bunte—was too ill to attend last week's meeting; and they will join in the wishes for his speedy recovery which were expressed by those present. A number of other leading gas men of the Continent who are almost invariably found at these gatherings were unfortunately unable to attend the Königsberg meeting last week. Though the technical proceedings lost considerably in interest on this account, they were, on the whole, on as high a plane as is customary; and the business of the sittings was carried through with a promptitude and order which were highly creditable to Herr Heinrich Prenger, the Manager of the Cologne Gas, Water, and Electricity Works, who, as President of the Association, occupied the chair throughout the sittings.

Examinations—An Unfortunate Resolve.

THERE exists a good deal of heart-burning among the successful candidates at the recent examinations, over the resolve of the authorities of the City and Guilds of London Institute not to in future supply the pass-lists to the press. The warning that this would be the case, has been given to the press before this year; but this is the first occasion that the lists have been positively refused. As mentioned last week (p. 776), the explanation given for this change is extreme pressure of work in the office and other reasons. What those "other reasons" are, we have not the faintest notion; but as it may be assumed that the strongest of all reasons has been vouchsafed in the "pressure of work" in the office, the "other reasons" cannot be of much account. The main one is subject to easy and inexpensive rectification; and, as a matter of fact, we have offered, on a past occasion, to save, so far as we are concerned, the additional work involved in the preparation of the pass-lists if the authorities would permit us to send and make out a copy of the passes for our own use and publication. But there has not been a satisfactory reply to this suggestion.

We do not want to in any way set ourselves in antagonism with the City and Guilds of London Institute. But we do not think they have regarded this matter sufficiently from the standpoint of the candidates themselves; and we would plead with them to reconsider their decision from that point of view. The knowledge that there will be independent publication of their successes without themselves having to announce the fact, is a great encouragement to students;

and it must be in cases one of the inducing factors to presentation for examination. In an industry such as that of gas, the publication of successes is a distinct advantage to the young men who are qualifying for higher positions; and the publication has often proved a guide, in the matter of junior appointments, to senior members of the gas profession. On all hands, publication is an advantage; and we do sincerely regret the decision of the authorities of the City and Guilds of London Institute. We fear if they persist in withholding the pass-lists, that it will damage somewhat the popularity of the examinations. This, strong supporters as we are of all educational work that is of advantage to the industry, we should greatly regret. Meanwhile, the only means of obtaining a complete list of passes is for those who have been successful in the examinations to send us their names, mentioning the divisions—"Gas Engineering" or "Gas Supply," and Honours or Ordinary—and the class of certificate obtained; and we will from the responses compile a list. If the City and Guilds of London Institute continue to adhere to their present—and we think most unfortunate—decision, this suggestion may be taken to apply not only to this year but to the future. It is the only way out of the difficulty.

Prediction, Result, and Cause.

IN discussing the question of the necessity for an extended base for the Institution of Gas Engineers, as has been suggested by the ex-President of the Institution (Mr. James W. Helps), as well as in these columns, facts have to be looked fairly and squarely in the face. The first question that it is necessary to ask one's self is, Why is it the Institution is not accorded by the gas undertakings of the British Isles a greater measure of support? By those who give it consideration, two answers may variously be offered to the inquiry, though both may not be correct. The one is that the Institution has not shown itself worthy of the support of gas undertakings; and the other that the administrations of British gas undertakings have not been sufficiently educated to see the need of financing co-operative work to the general behoof of the industry. We incline distinctly to the latter view, though there may be others—and many of them—who may construe Mr. Corbet Woodall's remarks, in proposing a vote of thanks to the President for his address at the recent meeting, to mean that the Institution have not proved themselves worthy of the support of the gas undertakings of the country. Mr. Woodall, we think, would be the first to regret the placing on his words of any such interpretation. To recall what he said on this head, let us quote his remarks: "He felt sure if the Institution was able to show by the work it did that it was worthy of carrying on the widely extended usefulness to which the President had referred, there would be no considerable difficulty about finding funds. If it could be shown that the Institution was equal to the duty which had been suggested, he thought Directors and others would appreciate it; and the money would be forthcoming. He should be sorry to think that the gas industry of England fell behind their friends in France and Germany, where the amount of money placed at the disposal of institutions similar to their own was vastly greater than it was with us."

These words cause the mind to revert to the annual dinner of the Southern Association on March 21, 1907, when the Council of the Institution were striving to get the administrations of gas undertakings to subscribe to the Special Purposes Fund, in order to enable the Institution to grapple, by concerted action, with the numerous technical problems that were awaiting, and still await, investigation and solution. At that dinner it was said: "If the work undertaken was likely to be productive of good, there would be no lack of funds to carry it on." He (the speaker) "was sure there was patriotism among, and camaraderie enough between, the gas companies and the gas corporations of this country to cause them to join heartily in any such work for the benefit of the whole industry." The speaker was Mr. Corbet Woodall. Three years and three months have elapsed since those words were spoken; and the period has not proved Mr. Woodall's prognostications of 1907 to have been well founded. There is no question now as to the likelihood of the work undertaken being productive of good; it has (within its limits) been so productive. But nevertheless the administrations of the gas undertakings of the country have shown a poor desire to give the Institution the opportunity of engaging in the extended work for the general good of the gas industry that was in contemplation

in 1906-7, and so they have virtually declined to allow the central professional organization to fully display its worthiness for being entrusted with the funds for still further enlarged work for the industry. It is truly a curious idea to put chains to the heels of the Institution, and then to say: "Now by the measure of activity you show, we shall be able to judge your fitness and worthiness to undertake extended work for the industry in future." What was the result of the special appeal, of all the writing, and of all the talking that took place in 1906 and the early part of 1907 respecting the creation of a Special Purposes Fund? The magnificent sum of £566 17s. 9d.! And in the three succeeding years the contributions have been: 1907, £446; 1908, £390; and 1909, £404. As one looks at these sums, a certain amount of bitterness cannot be repressed over the apathy and the spirit of indifference that are so extensively found in the only quarters from which the necessary funds can emanate; and yet all gas undertakings enjoy the benefits that accrue from the work—restricted though it be—in which limited funds enable the Institution to engage. From the work accomplished in connection with gas heating, and from the refractory materials inquiry, every gas undertaking in the country will reap advantage, though the expense of the researches has been borne by the few. The total of the four sums named—most of which money represents four annual subscriptions by the same undertakings—is only £1806; whereas if the 790 statutory gas undertakings of the British Isles had contributed merely £5 a year each, the sum in the four years would have reached £15,800, or an average per year of close upon £4000. Or if the 790 statutory gas undertakings had contributed only 1s. per million cubic feet of gas sold, the income would have amounted to £8700 a year, or in the four years to £34,800.

Why has encouragement been so largely withheld? It is not because the Council have not shown the desire to engage in, nor a want of capacity for organizing and supervizing, useful solid work for the industry. If this is not the cause, then there is another. Mr. Woodall must not measure all gas directorates and committees by the men with whom he is frequently brought into contact, and who so largely rely upon his mature judgment in gas affairs, and agree to his advice to contribute to those things that appeal to him as being for the common good of the industry. His generous nature prompts a generous belief in his contemporaries in gas administration. We ask him to consider the figures we have quoted; and likewise the time that has elapsed since the Southern dinner speech. And we feel certain that, when he has done so, he will be prepared to put his hand forward to assist in the removal of the real cause that stands in the way of greater financial contribution to co-operative work. That there is a cause, no one can deny. The remedy is to be found in the proper education as to needs, and in the creation of a sense of community of interest, in the administrative quarters of the industry. The point will be enforced by appropriating the heading to an article that appeared in one of our daily contemporaries only recently: "Educate! Educate!! Educate!!!"

Difference in the General Gas and Electricity Acts.

Acts of Parliament are made for guidance; but their numerous obscurities, and the consequent misconstructions, supply a large proportion of the litigation that occupies the Law Courts. But there seems little reason for the Leicester Corporation—and this applies to other local authorities who are not innocent of also acting *ultra vires*—misinterpreting their powers and rights respecting electric wiring and fittings supply and fixing. They have been following this business for nearly twenty years; and they have only just been pulled up by a case submitted to Mr. Justice Neville, in which the Attorney-General, at the relation of a Mr. Utley (who is a ratepayer of Leicester), moved for a declaration that the Corporation are not entitled to carry on the business of electrical contractors, and for an injunction restraining them from pursuing the business. As readers are aware, there has been a bitter struggle between municipal authorities who engage in fittings business and electrical contractors, who are averse to the former doing this sort of thing unless the work is executed through a contractor. We suspect that the modern recognition of the local contractor in granting wiring and fittings powers to municipalities is really the secret of the Leicester Corporation (instead of going to Parliament to put themselves right) preferring first to defend their long-standing course of procedure in the Law Courts, in the hope

that ingenuity of argument might perchance secure to them the continuity of the liberty that they have so far enjoyed, and keep them free from the trammels of the private electricity trader. But unless the Corporation now appeal and succeed, their defence in the Courts has not served them in the first instance well; for in regard to both declaration and injunction, Mr. Justice Neville is against them.

His Lordship's view appears to be the rational one; that placed before him as the view of the Corporation, while ingenious, an irrational one. The Corporation have no express powers to carry on an electric wiring and fittings business; and their whole assumption as to rights in the matter seems to break down, and does in Mr. Justice Neville's opinion, when it is considered that other authorities, before entering upon the business, have obtained specific powers in their Special Acts or Provisional Orders, and that the matter was specially dealt with in the General Electricity Supply Act passed last year. On the face of it, if the Leicester Corporation under their existing powers possess the right of trading in this way as an ancillary business to that of the supply of electrical energy, it is obvious that other municipal authorities would have held the same right, and there would not have existed any necessity for dealing with the matter by any special legislation whatsoever. Moreover, there are not to be found in the General Electricity Acts any provisions similar, in respect of this matter, to those in the Gas-Works Clauses Act of 1871, or to the special clause in the Model Gas Bill; and that the absence is a deliberate one appears to be evinced by the inclusion of section 18 in the Act of 1882 which disentitles the electricity suppliers from prescribing any special form of lamp or burner, or in any way controlling or interfering with the manner in which electricity supplied by them under the Act, and any Licence, Order, or Special Act, is used. There was an attempt to set up an analogy between the Acts relating to gas and electricity, as indicating the intention of the Legislature to bestow upon the undertakers under the Electricity Acts powers with regard to the supply of electrical fittings and apparatus similar to those allowed by the Gas Acts. But this entirely failed.

It was ingeniously argued by Counsel, on behalf of the Corporation, that, if there is no express power in their Acts, they are authorized to carry on the fittings sale and work as being incidental to the undertaking of electricity supply—that, in other words, supply continues right up to the point of consumption; for until it reaches there the supply is not complete. If this be so, then everything that is used for getting to the place of consumption is part of, and necessary to, the supply. But the folly of the contention is disclosed by the position in which it would place a householder. It is within his right, under certain terms, to demand a supply of electricity; and if the contention had been upheld, where would his demand for the provision have terminated—at the meter or lamps? Mr. Justice Neville, however, inclined to the view that there is a distinction between supply and use; and that the acts complained of are referable to use not to supply. The only thing for the Leicester Corporation to do, unless they successfully appeal, is to obtain special power; but their lateness in applying for this will bring them under the modern form of provision, which will compel them to carry on the wiring and fittings business in such a manner that there is no loss (as there has been in the past) upon it; and, further, there is that—to electricity suppliers—objectionable feature as to the work being done through contractors. This is a case in which there is no alternative; so that what has to be done is quite clear. And the bitterness of it must be swallowed.

Coalite at Plymouth.

Sir Joseph Bellamy's references, at the annual meeting of the Plymouth and Stonehouse Gas Company last week, to the operations of the British Coalite Company will not do much towards reassuring those who invested money in coalite. His remarks were not unfriendly, nor even critical. The attitude of the Plymouth Gas Company to their partners has been one of steady loyalty. The coalite people have had a practically free hand. If there have been difficulties, they have not been of the Gas Company's creating. Subject to the obligation to supply a certain quantity of gas, the Coalite Company have been allowed to experiment as much as they pleased. Apparently they have availed themselves of the opportunity to the full. Since its installation two or three years since, the plant has undergone an

almost complete transformation. A year ago one of the three batteries, then newly erected, was being taken down, with a view to its being rebuilt on improved lines. At that time difficulty had been experienced in discharging the vertical stills, or in removing the coalite, owing to the fact that the batteries were so constructed that the discharging chamber was situated centrally underneath the setting, and therefore not easily accessible. This trouble has been overcome by rebuilding the batteries with the openings for the discharge of the coalite on the outside of the setting. To effect this improvement, it has been necessary to rearrange the conveyors; and this part of the plant has been remodelled, and the distance traversed considerably shortened. Another change which has been made is in the erection of a conveyor for the supply of fuel to the generators. These alterations have considerably modified the appearance of the plant. Possibly they have tended in the direction of a reduction in the number of men employed, which, on the occasion of a visit of inspection by a party of gas engineers, was commented upon as excessive. What other experiments have been made is not clear, and perhaps is not important, for apparently the plant is to undergo another modification, if not complete supersession. Sir Joseph Bellamy spoke of a "new plant" shortly to be put in, "by which it is hoped to economize 50 per cent. on the charges hitherto made." This is a truly wonderful prospect; and with its realization the patient shareholders will hope the old hope—that the period of experiment has at length ended.

The Gas Company's Bargain.

So far, happily, the Gas Company have had no reason to complain of their bargain. Sir Joseph told the shareholders that they had no cause to regret having entered into the partnership, which may be taken as evidence of the wisdom with which the partnership deed was drawn, and perhaps of the straits to which the Coalite Company were reduced before they found a Gas Company prepared to listen to their proposals. What the precise gain to the Gas Company is has not transpired. The Chairman spoke of "a saving in manufacturing charges brought about by . . . the proportion of gas made there by, and received from, the British Coalite Company." This is an indication that the Coalite Company are supplying gas to the Plymouth Company at a price at which the Gas Company cannot make it. This much might have been anticipated; for on no other ground, is it possible to imagine the Coalite Company being allowed a footing in the gas-works. The amount of the saving is not known. From the Gas Company's balance-sheet, it appears less coal has been carbonized, and the wages bill in the manufacturing department has been rather less than last year. But as there is no statement as to the quantity of gas sold, the figures are not of much use for purposes of comparison. Information on this point would be interesting both to those engaged in gas manufacture and to the shareholders of the Coalite Company.

Coalite Sales Prospects.

We can imagine, too, that those who are looking for profit from their investments in coalite would like to know something about the kind of market which Plymouth affords for the sale of that article. Plymouth is a place where coal is comparatively dear, and gas very cheap. There is, thus, a big consumption of gas; and, as the climate is mild, a small demand for coal for domestic use, except during a month or two in the midst of winter. It is more than likely, therefore, that coalite is not in much request, especially as it seems to be offered at a price which exceeds that of coal. In Exeter—one of the places to which the Plymouth product is exported—coalite is now being advertised for sale at 15s. for "ten large sacks," which it is said "equals in bulk, and almost equals in lasting power, one ton of coal." The actual weight of the "ten large sacks" can only be equal to half-a-ton of coal, as we do know that a ton of coalite occupies as much space as two tons of coal. Till quite recently it was the practice of the Coalite Company to exhibit in the window of its order office in Plymouth, a sack of coal and a sack of coalite, each containing 1 cwt., with the object of demonstrating that coalite is about double the bulk of coal. While the summer price of coalite in Exeter seems, therefore, to be about 30s. per ton, house coal is being advertised in the same city at 18s. 9d. and 19s. 9d. per ton by the truck load—a price which ought to permit of delivery in ton lots at from 21s. to 25s. Coalite may possess all the advan-

tages its friends claim for it; but we doubt whether there will be a rush to purchase it at the price at which it is offered in the Devon city. As, however, a profit cannot be made on the gas, the Company naturally look for a return from the coalite.

A Cheap Gas Supply.

The reduction of the price of gas in Plymouth and Stonehouse to 1s. 8d. per 1000 cubic feet, breaks, as Sir J. Bellamy said last week, the record for the Company. For many years, Plymouth gas has been at 1s. 9d., with occasional fluctuations (owing to coal market troubles) to 1s. 10d., 1s. 11d., and once, for quite a short period during the late South African war, 2s. The general price, however, has been 1s. 9d. And if there have been increases, they have been only temporary; and the price has quickly come back to the old level. With the reduction to 1s. 8d., new ground is now entered upon. Some years ago, Sir Joseph spoke of an ambition he had to see the price of gas reduced to 1s. 6d. If there had been no municipal electric light undertaking as a competitor, the aspiration might have been realized before this, to the manifest advantage of the inhabitants of Plymouth. However, the present reduction is splendid evidence of what the Company are capable of achieving. It is the second reduction of a penny in successive half years; and as a penny represents a sum equal to the yield of a municipal rate of 2d. in the pound, Plymouth people have abundant reasons for satisfaction with the management of the gas undertaking. Mr. P. S. Hoyte, the Engineer and Manager, and his staff are to be heartily congratulated on the excellent results achieved, and the gas consumers of Plymouth on the possession of one of the cheapest supplies in the country. The Company are able to break new ground on the south side of the Cattewater estuary; and though this is not likely to yield any great amount of immediate profit, it is an enterprise which will no doubt in time meet with due reward.

Gas Matters in Manchester.

In another part of this issue there appears the summary which it is our custom to publish somewhere about this period of the year of the annual report of the Manchester Corporation Gas Committee, and the accounts of the department, for the twelve months ending March, which have been received from the Superintendent, Mr. F. A. Price. To begin with the point which is no doubt generally first looked at in connection with documents of this character—the output—it is stated in the report that the quantity of gas transmitted from the works shows a decrease of 1·29 per cent.; and this follows upon a decrease the previous year of 2·41 per cent. But these two slight set-backs are not hard to understand, when one considers all the circumstances of the case. Industrial conditions have doubtless in Manchester, as elsewhere, been somewhat short of what would have been desired; and the department has, Alderman Gibson (the Chairman of the Gas Committee) points out, felt to some extent the competition of the electricity undertaking. Brighter times may be confidently expected to bring with them greater demands; but in any case the falling off, such as it is, that has been experienced, affords no cause for despondency—more particularly when one remembers, as was stated a year ago, that the decrease follows upon the heels of increases of 3·36 per cent. in 1908, just over 5 per cent. in 1907, and nearly 6½ per cent. in 1906. And while the figures with regard to consumption may thus be looked upon with equanimity, there are other aspects of the present report which are of a distinctly gratifying character. While coal, cannel, and oil cost nearly 1s. less per ton carbonized than in the preceding twelve months, the make of gas per ton was higher—11,034 cubic feet, as against 10,962 cubic feet—and the net profit has gone up from £89,873 to £121,191. The fact that the Committee were able to buy their coal on better terms was, of course, responsible for some part of this improvement in profits; but Alderman Gibson makes the pleasing statement that the improved result in this respect was to a still greater extent due to economies of management and administration.

Some of the Figures.

To take some of the other figures given in the report, the percentage of unaccounted-for gas, it will be noticed, is on the present occasion practically the same as the previous year—the figure being 3·34 per cent., compared with 3·24 per cent. There is again recorded an increase in the number of consumers; the gain this time being 4200, making a total of 178,490. The number

of prepayment meters in use at the end of the financial year was 61,046, or an increase of 3005; and the consumption by this class of consumers—539,757,000 cubic feet—was practically $2\frac{1}{2}$ per cent. more than in the preceding twelve months. The inspection of automatic meters takes place once every five weeks; and the amount taken from them last year was £75,304—represented by 18,072,966 pennies, weighing nearly 161½ tons. The proportion of the consumers who enjoy the free use of a cooker or grill still continues to increase; the figure having now reached about 45 per cent. The quantity of gas consumed by cookers in the past twelve months is estimated at no less than 656 million cubic feet—or an increase of $6\frac{1}{2}$ per cent. over the previous year's figures. The number of engines in use again shows a falling off; but the quantity of gas for which this source of consumption was responsible amounted nevertheless to the large figure of 378½ million cubic feet, which was a decrease, however, of about 3 per cent. when compared with the year before. To sum up the results of the operations, the present accounts show a gross profit of £167,892, as against £140,022; while, as already mentioned, the net profit is £121,191, compared with £89,873. Of this net profit, £50,000 has been paid over to the city fund in aid of the rates, in place of the special sum of £60,000 the previous twelve months. The total appropriations for the year exceed the net profit by £8553; and towards this £149, the balance of the reserve fund, has been applied, leaving a deficit of £8404 to be carried forward. The income on the present occasion is £750,700, against £761,363 last year; the expenditure is £582,808, compared with £621,341.

Continuous Vertical Retorts for Japan.

Japan must be up to date; nothing else will satisfy. And in the matter of vertical retorts on the continuous system for the production of gas, Japan will, for the time being, occupy first place in the largeness of the productive capacity of any single installation that has yet been contracted for. The contract has recently been placed by the Tokio Gas Company with West's Gas Improvement Company, Limited; the system favoured being the Glover-West. The plant (which will be capable of producing approximately 2 million cubic feet of gas per 24 hours) will comprise 56 complete retorts, with coal and coke handling machinery, together with a suitable retort-house building. The retorts, it is understood, are to be of the same section and size as those being erected at Manchester, Rochdale, and St. Helens. The decision of the Tokio Company to adopt the Glover-West system has been arrived at after a very thorough investigation of its working by Mr. T. Uyeta, the Engineer of the Fukagawa (Tokio) Works, who has just returned to Japan after a visit of upwards of six months' duration in this country and on the Continent.

The Question of the Rates.

Another useful body of officials, in the shape of the Institute of Municipal Treasurers and Accountants, have been holding their annual gathering, and have been ventilating some subjects of importance to themselves and the communities which they serve. The President is Mr. Jabez Beckett, who, in the course of an interesting address, dealt with some topics which are at the present time the subject of wide discussion. Perhaps we may place foremost among these the question of local taxation and the increase in rate pressure, on which the President made some useful remarks. Agreeing that the onward and unchecked march of local taxation for both local and extra local services is a menacing problem, which cannot be treated any longer with indifference, he proceeded to examine the causes of this increase, for which purpose he had collected the experience of sixteen representative cities and boroughs, to ascertain: (1) The extent of the growth of rate-burdens during fourteen years, from 1895 to 1909; (2) the extent of rate-relief from gains of municipal undertakings and other sources in the first and last years of that period; and (3) the sums derived in the cases chosen from the three chief sources of rate-aid—viz., tramways, electricity, and gas undertakings. The result shows the average rates levied in 1895 were 6s. 5'64d. in the pound; in 1902, the year preceding the introduction of the Education Act, 7s. 3'34d. in the pound; and in 1909, 8s. 4'68d. in the pound—or an increase of 1s. 11d. in the fourteen years. On the other hand, the average rate-aid was in 1895 6'21d. in the pound; in 1902, 6'66d. in the pound; and in 1909, 7'14d. in the pound. If the rate-aid is added to the rates actually levied, it is found that the average in 1895 was 6s. 11'85d.; in 1902, 7s. 10d.; and in 1909, 8s. 11'82d.—or an increase of 2s.

in the fourteen years. Of this increase, no less than 9'18d. is attributable to education—elementary and secondary combined. These facts, Mr. Beckett points out, lead to the conclusion that "local self-government now consumes approximately one-third of the produce of property, and will, at the present rate of progress, shortly become a grievous and insufferable burden"—an expression of opinion in which he will have no difficulty in finding others to side with him.

And Municipal Trading Contributions.

The inadequate periods fixed in many cases for debt redemption purposes was commented on by Mr. Beckett in the course of his address; and he then dealt with the subject of State aid for local authorities performing State duties. Lastly, there was a lengthy review of the vexed question of rate-relief from gains of municipal trading, and some quotations from the Salford and Glasgow Bills. Adopting the statement that the balance of advantage of a local authority raising money compared with companies formed to supply gas, water, electricity, &c., was about 1½ per cent. per annum, he inquired whether there was any sound economic or social reason why gains from trading applied to rate-relief should exceed this limit; and also why the protection against loss from any cause should not be provided by doubly useful reserve funds. To his mind, the answers to these questions are deciding factors. "I have long," says Mr. Beckett, "held the view that the extent of advantage measured by credit should control the rate-relief; and I have seen no reason to change that opinion. I am unable to ascertain on what grounds of social justice the consumer of monopoly commodities should be subjected to a system of unrestricted appropriation of trading profits for rate-aid in common. Let the ratepayer be compensated by all means (though experience shows that public credit costs him nothing); and let him be protected by a substantial buffer—if you will, in the form of ample reserve funds, which will be available when required, and productive when not required. But his claims end here. It is true that, where the strain on the funds of a district is severe, the relief from this form of return may be highly opportune; but this contention does not carry us into the merits of the matter."

GAS ENGINEERING AND SUPPLY EXAMINATIONS.

More Successful Students.

FURTHER referring to this subject (*ante*, p. 776), we learn that Mr. Thomas Glover, of Norwich, the Examiner in "Gas Engineering," has written to Sir Philip Magnus, of the City and Guilds of London Institute, expressing regret that the results of the recent examinations cannot be published. Mr. Glover points out that great interest is being taken in these examinations by gas engineers, whose junior assistants are encouraged to pass both grades, and that the spirit of emulation is aroused by the publication of the results, which is looked for all over the country. He submits that if the results can be published as hitherto, a benefit will be conferred on the whole of the gas industry.

We have received from Mr. Robert Beynon, the Engineer and Manager of the Torquay Gas Company, the following list of students in connection with a small class conducted by his Assistant, Mr. W. E. Dean, who were successful in passing the last City and Guilds of London Institute Examinations in Gas Engineering and Gas Supply.

TORQUAY TECHNICAL SCHOOL.

City and Guilds of London Institute Examinations, 1910.

GAS ENGINEERING.

Ordinary Grade, First Class.

| | |
|----------------------|----------------------|
| Bearne, Paul O. | Collings, William V. |
| Beynon, Frederick H. | Gorwyn, Cecil L. |

Ordinary Grade, Second Class.

Samuels, Edward
GAS SUPPLY.

Ordinary Grade, First Class.

Gorwyn, Cecil L.

Ordinary Grade, Second Class.

| | |
|---------------------|-----------------------|
| Doidge, Percy J. | James, William H. |
| Foster, John W. | Mansfield, Charles F. |
| Hamer, Frederick M. | Vallance, Arthur S. |

Mr. Alex. Smith, the Manager of the Tradeston Gas-Works, writes giving the names of three of the young men in his works who did very well in the "Gas Engineering" examinations—viz.:

| | |
|---------------------------|------------------------|
| William Blair | First Class Honours. |
| Arthur M'Donald | First Class Ordinary. |
| John Craig | Second Class Ordinary. |

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 974.)

BUSINESS on the Stock Exchange last week was about on a par with what ruled the previous week as regards persistent inactivity. But there was a marked improvement in the tone, and the firm leading markets really seemed to be leading as they should. The more speculative lines, too, were in better favour than they had been; but they did not exercise so dominating an influence. The opening day was inactive; but here and there signs of life were apparent. Government issues were mostly firm, railways were strong, and the Foreign Market good. Business on the Tuesday continued at low power. But the general tendency was cheerful, and there was a fair demand for high-class investments. Wednesday was a bit doubtful at first, but strengthened later on. Governments were good, and Consols had a nice rise. Rails maintained their position; and the rest were quiet and mostly firm. This improving tone continued on Thursday, and Consols had a further advance. On Friday, there was a move to secure profits; and realizations had the effect of putting Consols down $\frac{1}{2}$. There was some irregularity in other markets. Business was very quiet on Saturday. The tone was much the same as the preceding day; and prices accordingly closed rather lower. In the Money Market there was a very fair demand; but discount rates continued to ease away. Business in the Gas Market was only moderate, scarcely up to the level of the week before. Few quotations made any change; but the general tendency was very firm, and two or three important issues advanced their figures. In Gaslight and Coke, the ordinary was not quite so active, but quite strong; and, after one small bargain had been marked at $103\frac{3}{4}$ free, it hardened from 104 up to $104\frac{3}{4}$ —a rise of $\frac{1}{2}$. In the secured issues, the maximum realized $89\frac{5}{8}$ and $89\frac{3}{4}$, the preference from 105 to $105\frac{7}{8}$, and the debenture 82 . A couple of transactions in South Metropolitan ordinary at $121\frac{1}{4}$ and $121\frac{3}{4}$, and one in the debenture at 82 , were all. In Commercials, there was only one in the 4 per cent. at $108\frac{1}{2}$. Among the Suburban and Provincial group, there were dealings in Alliance and Dublin at $82\frac{3}{4}$ and $83\frac{1}{4}$, Brentford old at $253\frac{1}{2}$, ditto new at 189 , British at from $43\frac{3}{4}$ to $44\frac{1}{2}$, Hastings and St. Leonards $3\frac{1}{2}$ per cent. at $93\frac{1}{2}$, and South Suburban at $121\frac{1}{2}$. In the Continental companies, Imperial was rather quiet, but strong, at from 178 to 179 (a rise of 1), European fully-paid made $24\frac{3}{4}$, and Union 94 —a fall of 1. Among the undertakings of the remoter world, Bombay realized $6\frac{1}{2}$ and $6\frac{1}{4}$, ditto part-paid $4\frac{15}{16}$, Monte Video $12\frac{1}{2}$ and $12\frac{3}{4}$, Primitiva from $7\frac{1}{4}$ to $7\frac{5}{8}$, ditto preference from $5\frac{3}{8}$ to $5\frac{1}{2}$, ditto debenture from $97\frac{1}{4}$ to $98\frac{3}{4}$, and San Paulo $15\frac{5}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Municipalities and the Electrical Industry—Depreciation—Free Lamps—Basis of Charge—Exhaustion of the Gas Industry as a Competitor—Flame Arc Lamp Fumes and Shop Windows—Lightning Effects.

THE Incorporated Municipal Electrical Association has held its annual meeting under the presidency of Mr. W. W. Lackie, of Glasgow. His presidential address was variegated in subject-matter. It treated of the vexed questions of municipal supply, depreciation, lamp renewals, and charges. For municipalities, the President claims that they have done much to advance the electrical industry. This depends on the municipalities to whom he is referring. They are not all like the Glasgow Corporation. If we look back at the mad rush in the eighties and early nineties on the part of local authorities to enter into electricity speculation—a rush that has had in many cases disastrous results to the ratepayers, and to those manufacturing firms who were dazzled by the fictitious security created by the magnificent temporary demand for plant that came rolling to them—then we can admit as true that municipalities have done much to advance the electrical industry to a long succession of lean and profitless years, the end of which is not yet within sight. Regarding depreciation, Mr. Lackie holds that depreciation of value is met by the sums set aside for sinking fund, if—much value is there in an “if”—properly calculated. Decreased efficiency, however, should, he submits, be met by depreciation if the ordinary maintenance chargeable to revenue is not sufficient to keep the plant in its first state of efficiency. Obsolescence is not true depreciation; but it is quite possible that a prudent authority owning works might look to the advantage which would be gained by installing present-day plant, and so getting greater efficiency than would be obtained from antiquated plant. Such an authority would annually lay aside a sum for this purpose, and might be found dispensing with old plant in favour of something more up to date, even although the latter might not have reached the end of its usefulness. Such a course, however, is not compulsory under the Electric Lighting Acts, nor is it legal to create a deficit by setting aside a sum either in the name of depreciation or reserve.

Turning from these matters of administrative policy to others in the commercial category, the President is found taking extreme views. We are often having electricians butting at indifferent lighting by incandescent burners through the neglect of consumers. This is one of their old business-getting dodges. But here is Mr. Lackie telling us that “frequently” bad electric lighting is found

to be entirely due to using defective lamps. The “frequently” and the “bad” should be written large, seeing that “much could be said in favour of the supply authority providing the consumers with lamps.” There is no question about the President being struck with the seriousness of the position in regard to electric lamp neglect and renewals; for he concludes his argument on the point, satisfied that in the end it would be for the best welfare, not only of the supply undertaking, but of the wiring contractors, if the lamps were left to the supply authority, either to be furnished and the price included in the charge per unit, or be sold direct to the consumer by the authority. If the former method were adopted, Mr. Lackie suggests that one lamp might be given for every 100 or 200 units used; and if the latter the price would be at most net cost.

On the general question of charge, it has for many years been a complaint in the electrical industry that the unit on which prices are based is so small that there is not the same flexibility in the matter of variation in charge that there would be if the basis of charge were of greater magnitude. Therefore we have Mr. Lackie saying that the time may be approaching when, instead of charging a rate per unit, the charge will be at so much per ten units. This would enable fractional reductions to be made smaller than the minimum possible reduction of $\frac{1}{4}$ d. per unit with the existing method of charge. The present rates in Glasgow vary from $3\frac{1}{2}$ d. to $\frac{3}{4}$ d. per unit; so that, if Mr. Lackie's basis of ten units were adopted, the price would work out at 2s. 11d. for light and $7\frac{1}{2}$ d. for power. If such a change comes about, the gas industry must take care that the public are not misled into thinking that ten units of electricity for domestic lighting are the equivalent of 1000 cubic feet of gas used in the incandescent burner—inverted or otherwise. There will be absolute agreement with Mr. Lackie in saying that the first duty of a supply undertaking is to see that all classes of consumers pay their due share of standing charges on capital expenditure necessary to provide plant to supply them. Under the shelter of that useful creation the “load factor,” how often is the “first duty” abused by electricity suppliers!

Among the papers read were two respectively by Mr. A. C. Cramb, of Croydon, and Mr. H. Collings Bishop, of Newport, Mon., on that ever-absorbing subject business development. But there does not appear to be about the papers anything striking one as original. It is thought by Mr. Cramb that the commercial methods of electricity undertakings have been altogether inadequate; and he advocates the provision of a sales staff that would about wipe out the profits of many an undertaking fortunate enough to have any. He is a little envious of gas companies. The prosperity of these is, of course, a thorn in the side of the electricians; but Mr. Cramb would have us believe that his envy is due to another cause. It is obvious that he does not know the gas industry, in which there is a continual working to produce reductions of price; for he accuses the companies of using large sums of money that should go to the public in reduced prices for fitting up houses free, or nearly so, and in doing a great deal of work for the public with a view to keeping out the electric supply undertakings which generally have not such powers. Mr. Cramb does not appreciate the importance gas companies attach to the lowest possible price of gas, nor how much the dividends of many gas companies depend on low prices. He says nothing about the powers of electricity companies, nor of the liberty in the matter of electricity prices that municipalities possess, and gas companies do not; and there is no mention of the fact that the greater number of houses fitted up free by gas undertakings come under the prepayment system, charges in connection with which are allowed to be made to cover the capital costs incurred in installation.

But why should Mr. Cramb complain, when Mr. Collings Bishop (whose undertaking at Newport, Mon., has not an enviable record of financial prosperity) says that gas competition “does not exist to nearly the same extent that it did a few years ago. It is now strenuous fighting on the part of our rivals to prevent consumers migrating to a really healthy illuminant.” “The competition, too, in street lighting is dead.” “One is also able now to attack that stronghold of the gas company—heating.” May Heaven defend the gas industry! And yet, by-the-by, we saw Mr. Thomas Canning, the Engineer of the Newport Gas Company, smiling the other day, and looking as though he had not a single care on his shoulders. In contrast with the volatile Mr. Bishop, Mr. Alderman J. Crowther and Mr. C. H. Wordingham are not so foolish as to attempt to underestimate the strength of gas competition. The former, in the discussion of the papers, said he considered gas competition as likely to be more severe; and that in Sheffield the price of gas was likely to fall as low as 11d. per 1000 cubic feet. Mr. Wordingham, too, felt that vigorous efforts on the part of electricity suppliers were required to secure custom. It is refreshing to meet such a fine specimen of an exuberant optimist as Mr. Bishop must be; but really it is not good policy ever to undervalue the strength of one's competitor. The puerile utterances of Mr. Bishop have attracted the attention of the “Evening Post” published in Newport; and in noticing them editorially, it is remarked: “We hold no brief for the Gas Company. But we have some concern for truth and for facts; and Mr. Bishop is living in a fool's paradise if he really believes gas competition is dead, or even dying.” Wrinkles may be taken from a competitor. It perhaps is worth noting that Mr. F. Ayton, of Ipswich, always works hand in hand with house agents, in order to keep in touch with removals and new tenants, as he

finds much custom is obtained by being on the ground before the gas people. From which one gathers that, should unfortunately the gas people be first, the electric people stand a poor chance. A further note might be made of Mr. Cramb's information that national advertising schemes are being considered by the London Joint Publicity Committee, and something will shortly be done in this direction.

Flame arc lamps are objectionable things to use inside shop windows; and, in our opinion, elsewhere. Their concentrated brilliance is a drawback; their giddy behaviour is annoying. But used in shops, the fumes evolved by the carbons cause a deposit on the windows, which one man has tried to remove by using various acids and alkalis. But all to no purpose. The deposit (if such it can be called) sticks fast. In his trouble he recently addressed a letter to the "Electrical Review," inquiring if anyone else has been similarly worried, and whether discovery has been made of some means of effecting a cure. There has not been a rush of information on the subject, either because people do not like talking of the defects of their goods, or because in many places arc lamps are giving place to metallic filaments, and people see no reason for troubling about things that are already falling into desuetude. But one correspondent says he does not think carbon deposit has anything to do with the matter; it is more likely the fluorine gas emitted from the carbons attacks the glass, actually etching the surface. "If a clear globe is used with these lamps, practically the whole of the interior very soon becomes frosted. This is a serious objection to the flame arc lamp, as, in order to maintain its efficiency, globes must be frequently renewed." Another correspondent thinks that what various acids and alkalis will not accomplish, "Monkey Brand" soap will. He finds this good for cleaning the globes of arc lamps; and he advises a trial of it on the windows. But suppose the surface has been "etched" or "frosted"—how will "Monkey Brand" avail?

Lightning has a bad reputation among incandescent electric lamps. A correspondent in the same paper tells the story of how "several" consumers in his district had the filaments of their lamps broken during one of the heavy thunderstorms lately. The supply is on the three-wire direct-current system with middle wire earthed at the station, and the voltage 230. In one case lightning struck the front garden of the house, and overthrew some heavy rockery; and although the lamps were not alight at the time, it was found upon going to light them, that the filaments of two of them were badly broken, but no fuse had blown. In another case three lamps failed, although not alight; and in one of them the leading-in wires were twisted out, so that they almost touched the glass. In this case also, no fuse had blown. A third and very similar case occurred in quite a different part of the town. In neither case did damage result to flexibles or other parts of the installations. Happenings like these are rather disconcerting.

NOTES FROM WESTMINSTER.

The Standard Burner Bills Pass their Second Reading.

ALL eyes interested in gas at Westminster were on the House of Commons last Thursday, when the Standard Burner Bills were up for second reading; and the long anticipated discussion took place. The restricted interest taken by honourable members in the matter was shown by the comparatively thin House during the discussion, and the smallness of the figures representing the voting on the motions for the second reading of the measures. The debate is reported in "Parliamentary Intelligence" to-day, and comment is made on it in the leader columns. All that it is necessary to say here is that Bills Nos. 1 and 2 were read the second time on separate divisions; and on Friday the opposition to the second reading of No. 3 Bill was withdrawn. An instruction, however, is to be given to the Committee who will deal with the Bills (in accordance with a motion by Sir Daniel F. Goddard) that, on the request of any of the petitioners, consideration is to be accorded to the question of the expediency of dividing the Bills, in order to remove any difficulty that may, in their opinion, be proved to exist. It is thought, for instance, that the Liverpool Gas Company might, owing to their special circumstances, be dealt with independently; and, as a matter of fact, Mr. Holt, who had on the paper a motion for the second reading of the Bill being deferred to "that day three months," withdrew his opposition on that understanding. The Board of Trade rather favoured this separate treatment of Liverpool. It will, however, be seen from remarks made by Mr. Illingworth—particularly those made just before the House divided on No. 2 Bill—that the Board of Trade distinctly approve of the No. 2 burner, "in order to secure an absolute standard of uniformity in regard to gas in all parts of the country, and to make comparisons possible in the interests of the economy and usefulness of the article produced." We are obliged to the opponents of the Bills for securing for the gas industry, from the Government Department chiefly concerned in the matter, this important pronouncement. It is probable that this week the Committee will be selected to whom the Bills will be referred, and that an early date will now be named for consideration of the measures.

Second House Oppositions.

A group of Bills have been referred to a House of Lords Committee, with the Duke of Bedford as Chairman. Among them is the Glasgow Corporation Bill, which in the House of Commons

had its gas part so altered that the gas undertaking is to be run for the benefit of the consumers in the area of supply and of the gas undertaking generally; while those ratepayers who do not contribute to the making of profit are not to participate in the enjoyment of it. There is justice in this. The opposition that the Bill will have to meet in the Lords is not likely to be very severe—the most contentious matters having been disposed of in the House of Commons; and the Corporation having wisely submitted to the situation then created. The Brighton and Hove Gas Company's Bill is in the same group; and here the local authorities are opposing through their dissatisfaction with what they obtained in the Commons. Like the celebrated Oliver, they want more; and it is their greed that is going to impose some additional expense—and we firmly believe some fruitless expense—on the ratepayers of the district. The policy of electricity-owning municipalities like the Brighton Corporation appears just now to be to inflict as many disadvantages as possible upon their gas competitors. Besides not allowing them any favour, they will not permit them to have a fair field. The hearing of the case in regard to this Bill commenced on Friday; but reference to the proceedings may be deferred for a week.

A Territorial Question. There has been but a small amount of interest, until the past week, in the Committee rooms since the recess that a much-harassed Parliament badly needed, which recess unfortunately was prolonged by the national calamity. Proceedings have since been of a spasmodic character. Only one matter prior to last week requires notice, to maintain continuity of record here; and that has been already reported in our "Parliamentary Intelligence." It is the success of the Shirebrook and District Gas Company in annexing fresh territory for gas supply; but it has only been done by arrangement (on as yet unknown terms) with the Mansfield Corporation, who have held powers of supply in Warsop. There was dispute over the area that it was desired to take in. Part of it is also within the defined limits of supply of the Bolsover Gas Company. But neither the Mansfield Corporation nor the Bolsover Company had taken steps to furnish gas to the parts that the Shirebrook Company are willing and anxious to take in hand. The Warsop local authority thought that they could supply themselves, on the Shirebrook Company pointing out to them that the Warsopians lacked, and grievously felt the need of, a supply of gas. The fact had never been made so plain before; and thereupon the local authority moved to get possession of powers of supply for themselves by way of Provisional Order—visions possibly of big profits rising before them. But after a Local Government Board inquiry, the powers that be at Warsop were informed, as politely as the Board could do it, that they could not for Warsop run a separate gas-works economically, and so their application must be refused. Thus the Shirebrook Company, subject to the arrangement with Mansfield, get their district extension.

Gas-Works and Smoke. The dusky exhalations of the combustion of coal and certain other solid substances are in themselves somewhat uninteresting to the ordinary being, but somehow or other around the effects of smoke popular interest can always be created. Smoke occupied a great deal of consideration at the hands of one of the sections of the Local Legislation Committee during the past week; and the Gaslight and Coke Company and the South Metropolitan Company (acting in concert) supplied, through Mr. Corbet Woodall and Mr. W. Doig Gibb, evidence on the subject that ought to show gas undertakings generally in a good light in regard to smoke, in a double sense. The London County Council are wanting to obtain more stringent powers respecting the smoke nuisance. They have found (among other factories) electricity generating stations fearful sinners in the matter of emitting smoke from their shafts. But as the law stands, the Council claim that they cannot effectually combat the evil from these and other sources (as the Lot's Road generating station case illustrated), because they have to prove that the smoke was "black," whereas smoke of quite another colour may be exceedingly deleterious, and as great a nuisance as that which is black. They therefore desire amended powers. Mr. Balfour Browne, K.C., strongly urged that the change might prove very onerous to the gas companies in meeting their statutory obligations, through temporary and accidental breaches of the proposed modified law—such as when charging and discharging retorts, when a fracture occurs in a retort, and when quenching coke. The learned Counsel and Mr. Woodall and Mr. Gibb averred that gas undertakings generally bear a very clean record in respect of smoke nuisances—in fact, as Mr. Woodall puts it, gas undertakings are very sensitive and jealous over the character of their works in this matter. And their very work does much towards contributing to the abatement of the nuisance from domestic and factory chimneys. Some figures quoted as to the smoke-preventing connections of the Gaslight and Coke Company are of more than ordinary interest. The Company have now about 150,000 gas-fires, 430,000 cooking-stoves, 6000 to 7000 water-circulators, and an enormous quantity of incidental apparatus linked up to their system—all of which means the displacement of so much solid fuel. And they do not take into account the privately owned fires and stoves. It was, too, a good point that Mr. Woodall made, as to the opposition last session of the West Ham Corporation and the inhabitants to the removal of the local gas-works from their midst, and as to the consequent compulsion placed on the Company to keep those works going in substantially the same degree as now for ten years, so both are the people in the area to part with their presence. What it comes to is this, that

if the qualifying term "black" is deleted, London gas-works will be subject to prosecution for effects that are unavoidable in the course of their operations; and Mr. Balfour Browne submitted that there ought to be protection in the way of duration of emission, in order to exclude inadvertent short-period lapses. The County Council representatives object to special protection being given to different interests, as by so doing local authorities, they contend, will be placed in great difficulty. More of this, however, in the next "Notes."

Garnant Gas.

It seems impossible to get away from the echoes of the Amman Valley trouble. The Garnant Gas Bill has been before the Unopposed Bills Committee; and it transpires that it is a promotion of the Directors of the Ammanford Company, who are the successors of the Amman Valley Company, under powers of purchase granted by Parliament, and a price determined by Mr. Charles Carpenter, the Arbitrator named by the Board of Trade. Garnant is a district bordering on that of the Ammanford Company; but there seem to be various obstacles to the latter Company taking up the supply, and hence the proposal for a new and distinct Company. It was rather a significant question that the Chairman of the Committee addressed to Mr. E. Herbert Stevenson: "Do you not think it is very enterprising of these Directors, before they have had their existing powers one year, to form a Company for Garnant?" The reply was: "Well, it is a district that must have gas." But there was evidently some little doubt lurking in the minds of the Committee; for they cut down the proposed capital of £18,000 to £10,000, and made the maximum price 4⁵/₈ d. per 1000 cubic feet.

Water Supplies Protection.

It will be seen from our "Parliamentary Intelligence" that we are reporting liberally the proceedings before the Joint Committee of the Lords and Commons on the Water Supplies Protection Bill. The Committee are giving the representatives of the water authorities of the country every opportunity for stating their case against the Bill, and that they have cause for complaint on all points of the measure must have been ere this made perfectly apparent to the Committee. If it has not been, then there would be ground for despair of ever showing the Committee that right is not by any means altogether on the side of the promoters. But the Committee have not yet finished hearing evidence; and when they have done, we fail to see how any Bill can result that will please the irreconcilable interests. It must be nothing short of a miracle if the Committee succeed in producing such legislation.

Water Loan Periods.

The Fylde Water Board Bill has been before a Committee of the Commons, presided over by Sir Luke White; and the most interesting point was the question of the time-limit for a loan for the construction of the Grizedale Lea reservoir. The Board wanted to extend the time from thirty to sixty years; but the Local Government Board objected on the ground that it would create a precedent. A reservoir, if properly constructed, is a thing that may be regarded as practically a permanent structure; so that the attitude of the Local Government Board is not altogether reasonable, especially as it is proved that the financial burden will fall heavily if the shorter period is insisted on. The Committee would not alter the period; but they expressed their unanimous opinion that this was a case in which the Local Government Board might have reviewed their decision, and suggested that the Water Board should appeal to the central authority for the reconsideration of their case so far as this particular loan is concerned. In regard to other loans, the Committee granted fifty-five years, instead of sixty years, for the repayment of money for the purchase of land, reconstruction of a covered service reservoir, &c.; and forty years, instead of fifty years, for loans for the construction of aqueducts, high-level mains, and the extension of the existing mains.

A Result of Popularity.

The Southend Water Company have considerable difficulties to contend with, and something of their nature was gathered when the Company's Bill for additional powers was before Sir Luke White's Committee. It should be mentioned that the Company want the sanction of Parliament to certain wells already sunk in the area of supply, and to the construction of fresh wells, and power to raise new capital to the extent of £250,000. In 1891, the population of Southend was only about 13,000; to-day, it is, in round figures, 62,000. The summer population is estimated at 100,000; and "trippers," to as many as from 60,000 to 70,000, favour Southend with their attentions in a single day. It can be imagined, with such a variable population, the task of supplying water to the area is not by any means a light one, and it is expensive, more particularly as the Company have to sink all through the London clay (which goes down 250 feet on the western side, and 460 feet on the eastern side). The wells have to be sunk to the depth of 700 to 1000 feet; and their average cost is about £18,000. The Committee found the preamble of the Bill proved.

Water for Motor Cars, &c.

A note may be made on a matter that is of importance to water authorities generally. The Bradford Corporation have in their Bill a clause giving them power to make a special charge for water used for washing carriages and motor cars; and, on the third reading of the Bill in the House, there was an attempt to amend this provision, in order to cause such use of water to be regarded as a domestic purpose. The amendment was negatived.

Another Water Supply. The question of the water supply of the Monmouthshire Valleys has been a much-debated one now for several years, and the County Council two years ago unsuccessfully brought before Parliament a scheme that it was thought would relieve the district from all further trouble. Owing to the scheme being abortive, a Bill has been introduced this session which again deals with the matter. Its intention is to constitute a Water Board, consisting of representatives of the Councils of Abertillery, Abercarn, Risca, and Mynyddislwyn, and to authorize them to construct new water-works, and take over those of the Councils mentioned. Abergavenny opposed, believing that, in some peculiar way, their supply will be affected. The new Water Board propose a reservoir in Brecknockshire; and in carrying their main to the sources of supply, they will pass within $\frac{3}{4}$ mile of Abergavenny, and will have to go under two streams which are tributaries of a brook from which Abergavenny are entitled to take their water. This they allege would injure their supply. Mr. Baldwin Latham denies this; and Mr. Rofe says he has never known a case in which special protection has been asked for in regard to such trifling matters. The Committee allowed the Bill to proceed; but a clause drafted for the protection of Abergavenny was declined by that nervous body.

RETIREMENT OF MR. H. KING HILLER, OF SHANGHAI.

AN interesting function took place on Saturday, the 4th inst., at the offices of the Shanghai Gas Company, Limited, at Shanghai, China; the occasion being a presentation by the staff to the retiring Engineer-in-Chief, Mr. H. King Hiller.

Mr. Hiller has been seventeen years in the service of the Shanghai Gas Company, for fifteen of which he held the position of Engineer-in-Chief. During this time he has seen the annual make of gas increase from 95 to 522 millions, and the capital of the undertaking from 300,000 to 2,528,000 taels. The labour entailed in the design and construction of the necessary manufacturing and distributing works to meet this great increase has naturally been very large—especially as England (the base of supplies) is 10,000 miles distant.

The original buildings and plant have been entirely done away with; the work of rebuilding having been commenced immediately after Mr. Hiller's appointment as Engineer, when a section, consisting of a complete works for the manufacture of a million cubic feet of coal gas per day, was put in hand. This was supplemented later on by an installation of carburetted water-gas plant for about half-a-million feet per day. Within the past five years, a further coal-gas section of a million feet per day, with electrical charging and discharging machinery, has been added, together with a carburetted water gas section of a million-and-a-half feet capacity in substitution for the original water-gas plant. At the present time, therefore, the works have a capacity of over 3 million cubic feet per day. The storage consists of three spiral-guided gasholders—one of half-a-million and two of over a million feet each. The latest of these is an annular steel tank placed above ground, the interior of which is used as a store for tubes, fire-clay goods, &c.

The distribution system is supplied through four district governors. The gas for one of the out-districts being pumped through three-and-a-half miles of 6-inch steel tube at a pressure of 10 lbs. per square inch; while during the peak of the load in the central district, the necessary pressure is maintained by a Sturtevant "Tube-Pressure Raiser," driving the gas through about two miles of 12-inch high-pressure cast-iron main, which is connected at two points to the low-pressure system by underground governors.

Mr. Hiller's relations with the European and Chinese staff have always been of a very cordial nature; and the send-off accorded to him was of a most enthusiastic character, in which all grades took an active part. On the occasion referred to, Mr. F. W. Potter—then Assistant, but now Engineer-in-Chief—in a felicitous speech, presented Mr. Hiller, on behalf of the staff, with a massive rose-bowl of the highest Japanese silversmiths' art, suitably inscribed; and he invited all present to drink to the departing Engineer's health and prosperity. The toast was received with acclamation, and Mr. Hiller replied, thanking them all for the honour done him, and referring to the long period during which he had been so amicably connected with the staff.

Mr. Hiller's departure from the works and jetty to join the mail steamer "Empress of Japan" for Canada, was accompanied with salvoes of bombs and crackers, after the most approved Chinese fashion.

We understand that Mr. Hiller is returning to London, where he purposes entering into consulting practice, as his long experience of the conditions of gas-works construction and management in a sub-tropical country should prove of service to those having works abroad. A successful career for him seems well assured.

The New York Section of the Illuminating Engineering Society held their annual meeting in the Engineering Building on the evening of the 9th inst. Dr. Arthur H. Elliott was elected Chairman for the ensuing year; Mr. A. J. Marshall was re-elected Secretary; and Mr. L. R. Hopton and Mr. Rhoades, Managers. Dr. C. H. Sharp read a paper on photometric units.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.

THE THIRTY-SEVENTH ANNUAL CONGRESS—Paris, June 20 to 23, 1910.

REVIEW OF THE PROCEEDINGS.

[FROM OUR OWN CORRESPONDENT.]

In brilliant sunshine, and with a high temperature, the Thirty-Seventh Annual Congress of the Société Technique de l'Industrie du Gaz en France was opened on Monday last week in the hall of the Society of Civil Engineers of France, Rue Blanche, Paris, by M. Godinet, the General Manager of the important group of gas undertakings in the hands of MM. P. de Lachomette, Villiers, et Cie., of Lyons. M. Godinet had on his left M. Marquisan, the Vice-President, and on his right M. Visinet, a Past-President. There was a good attendance of members; among those from London being Mr. R. S. Gardiner, Mr. W. B. Brady (General Secretary of the European Gas Company), and Mr. E. C. Bode, of L'Union des Gaz Company.

General Meeting.

The first business, which was taken shortly after nine o'clock, was the presentation of the report of last year's proceedings at Lyons, as contained in the volume of "Transactions;" and it was adopted unanimously. Then came the admission of new members, of which there were upwards of fifty in the two classes of members and associates—the majority, of course, being in the former class. Mr. J. W. Helps, the Past-President of the Institution of Gas Engineers, was elected an honorary member of the Society; his name—which was submitted by the President, with an appreciative reference to the hospitality shown by the Institution on the occasion of the visit of the Society to the Franco-British Exhibition—being received with loud applause. He also mentioned that the President of the Society had been elected an honorary member of the Institution. The President then read the report of the Committee, the greater part of which was devoted, as usual, to records of the life-work of the members who had passed away during the year; reference being made to Mr. W. A. Valon, who, as a President of the Gas Institute, was one of the honorary members. At the close of the year, the total membership, including those just admitted, was 798, consisting of 22 honorary, 636 ordinary, and 140 associate members. Reference was also made to the relinquishment of the position of Permanent Secretary by M. Payet, and the appointment of M. Henry Bouron, formerly Manager of the Bucharest Gas Company, as his successor. Next came the report of the Treasurer (M. Frère), which showed that the revenue last year was 68,172 frs. (£2727), and the expenditure 61,150 frs. (£2446). The latter included 8683 frs. (£347) for prizes and 1462 frs. (£58) for investigations and for the library. At the close of the year, the Society's capital amounted to 209,271 frs. (£8371), compared with 203,453 frs. (£8138) at the corresponding period in 1908; being an increase of 5818 frs. (£233). The reports were unanimously adopted.

The President having congratulated Mr. R. S. Gardiner, a Member of the Committee, and M. Séguin, of Le Mans, on being admitted to the order of the Legion of Honour—his remarks being cordially received—an extraordinary meeting was held to consider a report by the Committee on certain proposed alterations of the rules, with the result that it was adopted unanimously. The changes proposed had been necessitated by the growth in the membership of the Society, especially from what may be called outside sources, which it was thought should be represented on the Committee. Under the new arrangement, this is increased to 21 members; and there are three Vice-Presidents.

The meeting then proceeded to ballot for members of the Committee, of whom five were retiring. Several additional names were proposed, and the result was the election of MM. Boutan, Rouland, and Laurain for three years; of MM. Masse and R. Ellissen for two years; MM. Koechlin and Guillet for one year; and the re-election of MM. Monthiers, Villiers, Gaston Gautier, and Kaeuffer. This brought the business of the general meeting to a close.

Opening of the Congress.

At the afternoon sitting, the Congress was formally opened by the President, who announced that the "bureau" for the year 1910-11 would be as follows: President, M. Marquisan; Vice-Presidents, MM. Boutan, Rouland, and Delebecque; Secretaries, MM. Gaston Gautier and Kaeuffer; and Treasurer, M. Frère. The President also announced the attendance of M. Sorné, in the capacity of delegate of the Minister of Commerce and Industry, for the purpose of presenting the medals awarded by the Government to gas-works employees for long and meritorious services. Having discharged this duty, he expressed the great pleasure it gave him to be present. Next came the distribution of the Society's medals and premiums for similar good conduct—the services of one from Strasburg, who had retired and been overlooked, coming in for recognition. Attention was afterwards directed to the prizes awarded by the Society for papers read at last year's Congress. They were as follows: To M. Hovine, for

his communication describing his recuperative furnace having an arrangement for eventually heating by tar, 250 frs.; to M. Teulon, whose paper dealt with the extinction of coke at the Marseilles Gas-Works, 250 frs.; to M. Ramassot, for the description of his water heater, 200 frs.; and to MM. Boissonnas and François, who made contributions to the proceedings at the Lyons Congress—the former on the conveyance of electric energy from the Alps to Lyons, and the latter on the use of tar on roads—a silver plaque each. Reports were then read on the distance lighting of gas-burners and on the appliances presented in competition for the Society's prizes for the present year. An announcement by the President that next year's Congress might possibly be held at Bayonne brought this portion of the programme to an end.

Attention was then given to the technical communications, of which there were no less than twenty; some of them, of course, being quite short. The first taken was one by M. Parsy, on "The Klönne Chamber Settings." It was an important communication, and was accompanied by nine folding plates.* It gave rise to an interesting discussion, in which MM. Mallet, Grebel, Heeley, and Laurain took part. M. Mallet wished to know why the firm of Klönne prefer the horizontal to the inclined chamber settings. M. Parsy replied that, though the results are nearly the same with the two systems, the inclined chamber settings require the use of a special kind of coal in order to prevent clinging of the material to the sides; and, moreover, they cost 30 per cent. more than the horizontal chambers. M. Grebel remarked that for distilling coal in large quantities the modified coke-oven was specially suitable; and he added that the gas and metallurgical coke industries are destined to amalgamate. M. Heeley spoke in favour of the inclined chambers of M. Ries. M. Laurain offered some observations of an historical nature concerning the Pauwels and Dubochet furnaces referred to early in the paper. M. Mallet generally confirmed the remarks of M. Grebel. He recalled the fact that the Pauwels furnaces were heated from below. The charging and discharging of coke-ovens and chamber settings did not, he said, present any difficulty. With regard to the use of a conveyor, this was much easier than with vertical retorts, as the bulk of coke is discharged from the chamber in some two to three minutes. M. Parsy replied to the several speakers; and, after a few remarks from the President, the discussion closed.

M. Camille Roche then read a paper on the regulation of the output of a gas-generator furnace. It bore upon the subject of one presented at the Paris Congress of the Society in 1908. A few remarks were made upon it by the President, M. Marquisan, and M. Grebel, and then M. R. de la Boulaye read a paper describing the double charger-discharger system of M. de Brouwer. By this time there were very few members left in the hall. On the next paper on the programme—one by M. Foillard on the electric dischargers of the Paris Gas Company at Le Landy—being called, the author was not present; and it was passed. The next subject set down was a discussion on the quenching of coke; but as the wish of the members was that it should be deferred till next morning, the sitting was brought to a close shortly after five o'clock.

The business on Tuesday morning was of a somewhat mixed character. It opened with the paper by M. Foillard, on the electric dischargers of the Paris Gas Company; and as no one seemed inclined to offer any remarks upon it, the President invited discussion, not only on this paper, but on that of M. Boulaye of the previous day, as well as on the subject of the extinction of coke. The invitation as to the papers was not accepted; but in regard to the subject mentioned, M. Teulon furnished a little additional information as to his work in this direction at the Marseilles Gas-Works, and stated that new plant will be put down next winter. Then came a paper that gave rise to some controversy. M. Bonnet submitted a communication on the gasholders with curved metal tanks of the Maschinenfabrik Augsburg Nürnberg; supplementing it with diagrams on the blackboard and explanatory observations. He claimed for the new system its adaptability for gasholders of 700,000 cubic feet capacity and upwards, but especially for those of larger dimensions, on the score both of good construction and economy. The President thanked M. Bonnet for his paper, and asked him to send his additional figures to appear in the "Transactions." He invited discussion; and M. Bonnet found an opponent in M. Leclaire, who practically read another paper on gas-holder construction, with blackboard diagrams and formulæ and a blue print. M. Leclaire was talking rather at large when the President reminded him that the matter then in question was the weight of the tank; and M. Mallet remarked that the question under discussion was too mathematical, and could not be followed by those present. M. Leclaire dissented, and said the matter was only common sense. However, he would say no more, but leave the members to judge for themselves.

* An abstract translation of the paper will be found on p. 949.—Ed. J. G. L.

At this point, M. René Masse, the Engineer of the Société d'Éclairage, Chauffage, et Force Motrice, whose new works at Gennevilliers were to be visited in the afternoon, arrived, and, with the aid of a large plan of the works, indicated the course the visitors would take so as to see as much as possible in the minimum of time, and gave some explanatory details in regard to the works. The thanks of the members having been accorded to him, the technical business was resumed.

M. Grebel read a paper on condensation, in which he described his system, which he was tempted to call a "revolution," inasmuch as it would cause the suppression of foul mains, condensers, washers, naphthalene traps, and battery condensers. M. Sainte-Claire Deville spoke at some length on the subject—giving what was practically a lecture upon it. This distinguished scientist does not appear to be a partisan of condensers, with washing of the gas by the tar, for the arrest of the naphthalene. He evidently prefers his own system, which consists in cooling. In his reply, M. Grebel said M. Sainte-Claire Deville thought that naphthalene could not be arrested at average temperatures, in consequence of the high maximum vapour tension. But the tension of dissolution must also be considered; and in the case of methodical washing, this was very much smaller than the maximum tension. M. Cornuault, referring to the Feld process, which had already been mentioned, said if it was not quite perfect yet, it very soon would be. He knew of a case in which it was to be adopted.

This brought the sitting to a close; and the afternoon was spent at the Gennevilliers Gas-Works. Reference to the visit is made elsewhere.

On Wednesday morning, the first paper taken was one by M. Bromham, on the use of a turbine in the production of sulphate of ammonia. Questions as to entrance and exit of the sulphate were put by M. Mallet and the President; and the author agreed to furnish some additional particulars. Next came a paper by M. Camille Roche, on the use of aluminium in gas-works, on which a few observations were made by MM. Mallet and Bouvier. M. F. Chevalet followed with a paper on the treatment of ammoniacal liquors in small gas-works. It appeared that the author had cited figures which it was thought could not be arrived at elsewhere; and the Committee of the Society will judge of the advisability of the paper being withdrawn. M. Dupoy followed with a paper on the alteration of ordinary meters into constant-level meters by means of a compensator furnished with an injector. No remarks were made upon the paper, nor upon a report by the Committee (read by M. Bouvier) as to the precautions to be taken in the employment of mixed gas and electricity appliances. M. Vanderpol submitted a paper (to which he made some additions) on obtaining perfect combustion of gas by means of the previous admixture of gas and air. M. Bouvier, who has given much attention to this subject, offered some remarks on the economy resulting from the pre-mixture of gas and air, which assures high temperature and the best combustion. An interesting paper was submitted by M. Greyson de Schodt, on inclined incandescent burners, which he claimed give much better illuminating results than those in the upright position. [See p. 951.] The only other paper taken was by M. Méker, who described an appliance for heating bakers' ovens by gas. One of them was on view in the vestibule of the meeting-place. M. Bromham offered some remarks on the paper, and called attention to a gas-heated oven on view at the Brussels Exhibition.

M. Laurain, the Chief Engineer of the Société du Gaz de Paris, furnished, by the aid of two large plans, some particulars in regard to the works at Le Landy, which were to be visited in the afternoon. He was warmly thanked for his interesting remarks; and the sitting closed.

On Thursday morning, the technical business was preceded by an acknowledgment by M. Séguin, the Manager of the gas-works at Le Mans, of the appreciative remarks made by the President on the opening day in reference to his receiving the decoration of the Legion of Honour. Then came a paper by M. Cramer on inverted incandescent burners in general, and on the improved "Mars" gas-burner (which was on view in the vestibule of the meeting-place) in particular. There was only one question put in connection with this communication. It was by the President, and had reference to the pressure at which the burner works. M. Grebel was then called upon for the second paper standing in his name, on the subject of his reflectors for economizing light. Before reading it, he began to offer some remarks in reply to M. Sainte-Claire Deville's observations on his previous paper; but the President pointed out that this was scarcely permissible in M. Deville's absence, as no reply could be made by him. Nevertheless, he allowed M. Grebel to add some particulars as to his communication. He then indicated the nature of his second paper, without actually reading every line, and illustrated his remarks by diagrams on the blackboard. He claims a saving of one-third or one-fourth the quantity of light by his reflectors; but he hopes to be able to give next year the results of some practical trials of the system, which has been patented. No remarks were made on the paper.

There was next a discussion on a question submitted by M. Sellier, as to the means to be employed to prevent the fouling of gas on its passage into the holders, and as to the causes of this fouling. Some interesting remarks were made upon it. M. Sellier stated that gas entering the holder at the Melun works clean leaves it dirty; and he said this result could not be attributed to the contamination of the vessel by imperfectly purified gas. It must, no

doubt, be attributed to the water in the holder containing much sulphate, and even sulphide, of calcium. Carbonic oxide could displace the sulphur, and form sulphuric anhydride. M. Chevalet and also his son (M. F. Chevalet) both spoke on the question. They thought the sulphate of lime might be decomposed by organic matter and by some special microbes. M. Mallet bore testimony to the efficient purification of the gas at Melun before it was allowed to pass into the holder; and he thought the hypothesis submitted was quite admissible. M. Séguin remarked that he had seen a similar case to that described. M. Coze mentioned an instance in which contamination was due to gas passing direct through a distributor. M. Sellier replied that at Melun there was no by-pass in the purifier-house; so that the case was not similar. Other members offered some remarks on the question. In thanking the speakers, the President pointed out that the problem still remained unsolved; and therefore it was to be hoped that the managers of any works in which a like trouble arose would carry out some chemical tests.

After this interlude, the reading of papers was resumed. The first taken was by M. Blanpain, on an improved arrangement of automatic gas lighter and extinguisher. M. Ménagé followed with a communication on another clockwork appliance; and M. Aubert dealt with the "Alex" system of lighting and extinguishing gas at a distance. The final paper was one prepared by M. Winckler, in which he compared electric and inverted incandescent gas lighting as used in a sewing-room, to the advantage of the latter. It was summarized for him, in his absence, by M. Bigeard. A paper by M. Largeron, on a new pressure-gauge registering loss of head, was not taken, as the author was not present.

This brought the technical business to an end and the Congress to a close.

Visits to Works.

On Tuesday afternoon, a large party proceeded by special train to Gennevilliers, where they had an opportunity of inspecting the works of the Société d'Éclairage, Chauffage, et Force Motrice. These works have been described in the "JOURNAL" from time to time—in the issues for Jan. 2 and 23, 1906; Jan. 8 and 29 and July 2, 1907; and Jan. 28, 1908, in which number a plan of them was given. As our readers may remember, the works were very seriously affected by the great floods which occurred early this year, as shown by the views, accompanied by descriptive particulars, which appeared in the number for the 1st of March (p. 571); and one could scarcely realize, when walking through them on Tuesday, that only a few months ago they were about 5 feet under water, as shown by a significant mark on one of the buildings. Since the description appeared, the works have been brought quite up to date, as will be found from the particulars which are to be given in an early number. It may be mentioned here, however, that on Jan. 1, 1906, when the Company commenced operations, they had to supply 68 of the suburban districts of Paris, with a population of 851,000 (60 of the districts having previously been served by the old Paris Gas Company); whereas on the 1st of January last they had concessions for 83 districts, with a population of 1,031,400. At the close of the inspection, the party were invited to partake of refreshment by the Chairman of the Company (M. Krantz), who, on behalf of his colleagues on the Board and himself, extended to the members a very cordial welcome, and drank to the success of the Society. The President (M. Godinet), in expressing the thanks of his colleagues for the good wishes enunciated, congratulated the Company on their very fine works. He alluded to the fact that only a short time ago the operations were affected for seventeen days by the dreadful floods with which Paris was visited; and therefore he said that he must congratulate the Company's Chief Engineer (M. René Masse), the Engineer-in-Charge (M. Raoul Frère), and the whole of the staff, on the efforts they had put forth to cope with the great difficulties which presented themselves during that very trying time.

The next afternoon a visit was paid to the works at Le Landy of the Société du Gaz de Paris, where the members had a good opportunity of seeing an interesting admixture of the old and the new in gas-works construction. Side by side with low gasholders working with outlet-pipes having bayonet joints are springing up others on quite modern lines; and in the immediate vicinity are the latest appliances for saving labour in the conveyance and storage of material and sending out gas at high pressure. Some weeks ago, an indication was given in the "JOURNAL" of the proposals formulated for rendering the gas-works of the City of Paris equal to the future demands upon them. Those of our readers who perused the articles referred to will probably remember that the station at Le Landy was several times mentioned. [We reserve till a future issue some technical particulars in regard to this station.] In their inspection of the works, the visitors had the assistance, as they did at Gennevilliers, of members of the staff; and in the pressure-house they listened to an interesting discourse by M. Laurain, the Chief Engineer of the Society, on the work of the plant it contains. Before leaving, M. Rouland, the Managing-Director, expressed the pleasure of the Société du Gaz de Paris to welcome members of the Société Technique. He remarked that they had had in the morning an explanation of the works by M. Laurain, and they now saw the extent of them. In addition to those inspected, new ones were to be constructed close by (the Cortillon works). He then introduced to the members

M. Garcenot, the chief carbonizing foreman at the works, who, he said, had been 35 years in the Company's service. He concluded by drinking prosperity to the gas industry, and expressed the hope that he should meet the members again two years hence. The President having voiced the thanks of the Société Technique to M. Rouland, the visitors returned to Paris.

The Banquet.

The subscription banquet of the Society took place at the Grand Hotel on Tuesday evening. M. Godinet presided; having on his right and left M. Marquisan, the President-Elect; M. Piaton, the President of the Syndicat Professionnel de l'Industrie du Gaz; M. Rouland, the Managing-Director of the Société du Gaz de Paris; M. Ancel, the Chairman of the Lyons Gas Company; M. Krantz, the President of the Société d'Éclairage, Chauffage, et Force Motrice; and M. Tissier, representing the President of the Council. After dinner, the company having honoured the toast of "The President of the Republic," M. Godinet referred to the object of the congress and the work which had so far been done during the present gathering. He alluded to the wide interest taken in the congress, as was shown by the presence of representatives from Belgium and Italy. He concluded by drinking the health of all his colleagues. M. Rouland referred to the work of the Past-Presidents; and MM. Ancel and Krantz drank "Prosperity to the Société Technique du Gaz." M. Godinet and M. Marquisan having exchanged complimentary remarks on the transfer of the presidency, M. Tissier, in a rather long speech, dealt with the relations of the Government to the industries, of gas companies to the consumers, and of employers to employed; and he referred to the system of profit-sharing as a means of ensuring peace instead of war between the latter classes. This speech brought the proceedings to a close.

EXCURSION TO BRUSSELS.

In accordance with the arrangements announced in the programme, the rest of the week was spent in Brussels, on the invitation of the President (M. Prisse) and the members of the Committee of the Belgian Association of Gas Managers. A party of eighty, including the President (M. Godinet), the President-Elect (M. Marquisan), M. Visinet (a Past-President), and the Permanent Secretary (M. Bouron), left Paris shortly after mid-day on Thursday for the Belgian capital, which they reached in the afternoon.

A Cordial Welcome.

In the evening the visitors received a cordial welcome at a gathering which took place in the tea-room of the Taverne Royale, at which were present Mr. Alexander Wilson (President), Mr. James W. Helps (the Past-President), Mr. S. Y. Shoubridge (Hon. Secretary), representing the Council of the Institution of Gas Engineers, who had received a similar invitation, and Mr. Philip Holmes Hunt, the President of the Victorian Gas Association. M. Prisse was accompanied by members of the Committee of the Association, including MM. Busine and Brender à Brandis (Vice-Presidents), M. Van Heede, Engineer of the Molenbeek-Koekelberg works of the Imperial Continental Gas Association (Secretary). He extended a cordial welcome to the members of the French and English Associations; and his remarks were followed by the playing of the "Marseillaise" and the English National Anthem. M. Godinet responded on behalf of his Society. The function was a very pleasant prelude to the subsequent hospitality.

Visits to Works.

Next morning, the entire party assembled early on the Place de Brouckère, where they found carriages waiting to convey them to the Forest works of the Imperial Continental Gas Association. The long procession of private vehicles was the cause of much astonishment to the suburban inhabitants. On arriving at the gas-works, the visitors were received by Mr. H. Salomons, the Engineer of the station, by whom, assisted by M. Delepaulle and other members of his staff, they were shown all that was of interest to be seen. The special features were probably the benches of vertical retorts, some of which were discharged in the presence of the company. This installation, some particulars in regard to which are given elsewhere, from a descriptive pamphlet prepared by Mr. Salomons, was thoroughly inspected; and then the party went through the other portions of the works. [These we hope to describe in an early issue.] Before leaving, the visitors were invited to partake of refreshment; and while doing so they received a cordial welcome by Mr. Salomons, who expressed his pleasure in receiving the members of the Société Technique and also of the Council of the Institution of Gas Engineers. They had, he said, witnessed the results of the conversion of old gas-works into new ones; and the transformation was still going on. Next year, they would erect a holder of 100,000 cubic metres (about $3\frac{1}{2}$ million cubic feet) capacity, which would be the largest in Belgium; and also convert an old coal-store into a vertical-retort house. Referring to the Société Technique, he remarked that it had extended over two generations, as there was present with them M. R. Ellissen, son of one of its founders. He drank to the prosperity of the gas industry. M. Godinet, in reply, thanked Mr. Salomons for his remarks, and he then proposed prosperity to the Association with which he was connected. Mr. Helps, speaking as the Past-President of the Institution of Gas Engineers (though he said this duty should have fallen upon Mr. Wilson, his successor), thanked Mr. Salomons for giving

them an opportunity of looking over his works, in the improvement of which so much skill and energy had been displayed. He never visited the Continent without taking back something, as his works at Croydon showed. He therefore thanked the Belgian Association for their invitation to the English Institution, and assured them that the visit would leave many happy memories. The party then returned to the city.

In the afternoon, the carriages were again in readiness in the vicinity of the Northern Railway Terminus to convey the party to the works at Jette-St.-Pierre of the St. Josse-ten-Noode Gas Company. There they were received by M. Pavoux, the Chief Engineer, and M. Casaubon, the Assistant-Manager, by whom they were shown over the establishment. At the close of the inspection, M. Pavoux made a few remarks on the works (some particulars of which will be found elsewhere), and mentioned that they had been carried out in a short space of time. "Success to the French and Belgian Associations" was proposed and duly acknowledged; and the party left.

They were then driven to the gas-works of the Municipality at Schaerbeek, of which M. Aerts is the General Manager, M. Gennotte the Chief Engineer, and M. Bromham the Engineer. Pending a fuller description which will appear in a subsequent issue, it may be said that much interest was displayed in the spacious coal-store, with its electrically worked coal-trucks. Some of the inclined retorts here are on M. Gennotte's system—i.e., larger at the discharging than at the charging end; and the generators are governed by M. Bromham's primary air regulator.

The Gas Lighting at the Exhibition.

Later in the evening, the visitors assembled at the principal entrance to the Exhibition (several ladies being of the party), where, under the guidance of the officials of the Belgian Association, they had a good opportunity of inspecting the systems of lighting in use. Of course, the chief interest centred in the gas lighting. The Auer Company, who have a tastefully decorated pavilion, exhibit some high-power illuminating gas under pressure on the "Pharos" system; while the Imperial Continental Gas Association light the greater part of the "Plaine des Attractions," where all the side-shows are to be found. The installation, which is one of the most important ever put up on the Continent, outside Germany, consists of about 18 high-power inverted "Colonia" lamps, supplied by the Actien Gesellschaft für Gas und Elektrizität, of Cologne, each supposed to be of 4500 to 5000 candle power; and they showed themselves certainly superior to ordinary arc lamps, and quite equal to "flame" arcs. The Brussels Municipality have in the city what they call "mixed" lighting—that is, gas and electricity; two branch lanterns being fitted with upright incandescent gas-burners, and the top lantern having electricity. The Imperial Continental Gas Association have put up, by way of contrast, a few lamps on the high and low pressure systems—two lanterns with three burners on the latter, and one upper lantern with two burners on the former. Other lamps have three inverted burners in small, and three upright burners in large, lanterns. One of the features of this excellent display is that the motive power for obtaining the high pressure is supplied by an exceedingly good small gas-engine, of 2 H.P., of German make; and it deserves to become more generally known (as it requires very little cooling water) in order to compete with electric motors. The compressing plant was described by M. Delepaulle, who is the Engineer for the outdoor work of the Association; and he also explained the construction of the high-power lamps which can be raised and lowered—the supply of gas being kept up during the ascent by an india-rubber tube, which is detached automatically when the lamp reaches the top. Not far from the compressor house are some lamps fitted with incandescent gas lights on the Greyson de Schodt "angle" system. As it was now getting late, the members of the party made their way back to the city.

A Day at the Exhibition.

On Saturday morning, the party again assembled at the principal entrance to the Exhibition, and proceeded to inspect the objects of more special interest to the gas industry. Passing through the British Section, attention was directed to the cases of chemical products shown by the Gaslight and Coke and South Metropolitan Gas Companies; the exhibit of the latter being a model, in pitch and sulphate of ammonia, of the Matterhorn. The stands of Messrs. Fletcher, Russell, and Co., Limited—one of heating and cooking stoves and the other of laboratory appliances—were visited. Other exhibits in the British Section were noticed in the "JOURNAL" for the 3rd ult. (p. 302). In the Machinery Section, there was seen a complete model of an installation of Bueb vertical retorts, transporter plant in action, a very fine show of both horizontal and vertical gas-engines, retort-charging machinery, and the Humphrey pump. In the Dutch Pavilion, Mr. George Wilson, of the Hague, Brussels, and Coventry, has an excellent show of gas-meters, both wet and dry—one, for 1000 burners, being in a glass case. There are also the "Excelsior" meter, and a new patent prepayment meter for two different pieces of money. Mr. Wilson also has on view a good collection of testing apparatus. In this pavilion there is a model of gas residual plant on the Rincker and Wolter system. Moving on towards the exhibit of the Belgian Gas Association, the party looked again at the compressor plant for the high-pressure lighting which had been explained on the previous evening. Close to this pavilion is that of M. Nestor Martin, containing a large and varied collection of gas-stoves. The house of Martin is well known all over the Continent; and

there is a very fine show of their goods. Next to M. Martin's pavilion comes the tastefully decorated one of the Auer Company, who show, in addition to lighting appliances on this system, including the "Pharos," the Clamond gas heating-stove. The pavilion of the Belgian Gas Association is packed with gas appliances of all kinds which space does not admit of separate notice. It may be mentioned, however, that the exhibit includes a baker's oven heated by gas, and also a large gas-heated pastry oven, with which practical demonstrations are given. The pavilion contains the latest types of heating and lighting appliances, including the incandescent burners set at an angle described by M. Greyson de Schodt at the congress of the Société Technique earlier in the week, and seen in operation in lamps erected in the grounds of the Exhibition. Close to the pavilions just mentioned is that of the Solvay Company, who show models of a coke-oven and coke quenching and loading plant, photographs of the plant at work, and glass jars containing samples of the products. The number of these ovens erected since their introduction in 1882, when only six were in use, is 3573. This part of the Exhibition must not be left without reference to the very fine pavilion of the City of Brussels, which one would never suppose was not a permanent building. It contains examples of the various branches of the communal services; but, of course, the gas supply was the one of special interest to the visitors, in view of their inspection of the gas-works the preceding day. There are on view numerous drawings of the different portions of the works and plant; one being of the telescopic gasholder of 1,306,000 cubic feet capacity. Another drawing shows the various kinds of public lamps in use in the city.

The next item on the programme was an exceedingly pleasant one. It was an invitation by the Belgian Gas Association to their French and English colleagues to luncheon in the restaurant in the Bruxelles-Kermesse. There was a numerous company. M. Prisse presided, having on his right and left respectively M. Godinet and Mr. Alex. Wilson. At the conclusion of the repast, M. Prisse, in the course of a brief speech, thanked the President of the Institution of Gas Engineers for accepting the invitation to visit Brussels, and also alluded to the presence of Mr. Holmes Hunt, the President of the Victorian Gas Association, who had come from Melbourne. He said that the gathering was evidence of the cordial feeling existing between the French, the Belgian, and the English Gas Associations; and he drank to their union. M. Godinet, responding for the Société Technique, said he knew the members would be well received in Brussels. It was very agreeable to him, at the close of his two years of office, to have such a welcome as he and his colleagues had had. He was

much touched at this, and did not know how to thank the Association for all their kindness, and for the excellent conductors who had been provided for the visitors. He drank to the *entente cordiale* of the two Societies. Mr. Wilson asked to be permitted to express his pleasure at accepting the kind invitation offered by the Belgian Association to the Council of the Institution of Gas Engineers to join them and their French colleagues in Brussels. At first he thought he would not be able to do this; but the Fates had been kind to him, and had arranged matters so that he could join the gathering. His national poet, Burns, had sung of the time when—

"Man to man, the world o'er,
Shall brothers be."

So far as gas men were concerned, however, that happy time had apparently now arrived; for there were present gas engineers from Belgium, France, Germany, England, and even Australia, meeting as "brothers"—*confrères* all. On behalf of the Institution of Gas Engineers, he tendered the Belgian Association their best thanks for the invitation they had sent, which had enabled him and his colleagues who had accompanied him to inspect several of their gas-works, see the progress which had been made, and visit their fine exhibition; but, best of all, it had afforded them an opportunity of renewing old friendships, and of forming new ones with their brethren on the Continent. Mr. Holmes Hunt associated himself heartily with Mr. Wilson in his expressions of thanks. With a recognition of the great services rendered by Mr. Salomons and his assistant M. Delepaulle, and a toast by M. De Brouwer, jun., to the union of the gas engineers of all countries, this most pleasant function closed.

The party then proceeded to carry out the last item on the programme by visiting the French and Belgian Sections of the Exhibition. This may be left for subsequent notice; when opportunity may be taken to amplify the notes of the morning's visit.

The programme being completed, farewells were exchanged, and the happy and instructive visit was brought to a close.

Before concluding these necessarily brief notes of a week's important work, acknowledgment must be made by the writer of much assistance received, from printed matter and otherwise, in the preparation of them. To the new Permanent Secretary of the Société Technique (M. Bouron), to the officials of the gas-works visited, both in Paris and Brussels—especially to Mr. H. Salomons, the Engineer of the Brussels station of the Imperial Continental Gas Association—and to many others to whom it is unnecessary to refer personally, his sincere thanks are tendered.

TWO BRUSSELS GAS-WORKS.

As mentioned in the review of the proceedings at the recent congress of the Société Technique du Gaz en France, visits were paid to five gas-works. The following are particulars concerning two of those at Brussels; notices of the others being reserved for subsequent issues.

THE VERTICAL RETORTS AT THE FOREST WORKS OF THE IMPERIAL CONTINENTAL GAS ASSOCIATION.

The installation of vertical retorts at the above-named works was constructed in 1909, on ground previously occupied by the coal-stores connected with the original horizontal retorts. There are twelve furnaces in two groups of six. Each furnace contains ten retorts, 13 feet high, conical in shape, of rectangular section; measuring 23 in. by 9 in. at the top, and 28 in. by 14 in. at the bottom. The charging-stage is accessible from both ends, and also in the middle, by staircases, which at the same time give access to the steam inlet-pipes and the sight-holes placed on the front of the furnaces; also to the hydraulic mains and to the ends of the ascension-pipes. These incline towards the retort; thus allowing the heavy tar, which would rapidly block up the pipes, to flow towards the retort and deposit.

The discharging-floor is on the general level of the works. It is simple, owing to the employment of mechanism without complications situated at the height of a man on the front of the furnaces, and causing a minimum number of manipulations. The gas-producer is at the back of the furnaces. It occupies the whole height from the ground to the charging-stage, and will contain all the gas-producing material necessary for 24 hours. The grate-bars are horizontal. The cleaning-stage is on the general level of the works.

Besides giving access to the different places mentioned, one of the end staircases leads to the top of the coal-elevator, and on to the gangway all along the store; while the other leads to the coke and breeze bunkers, which are capable of containing sufficient for 24 hours, and also to the gangway which connects the two lifts that convey the coke and breeze into the settings.

When the coal is unloaded, it falls into a distributor, which causes it to pass in equal quantities to a breaker. The distributor works like a jigger conveyor, only much more slowly. On coming out of the breaker, the coal falls on to a bucket elevator, which deposits it either on to the automatic weigher situated over the furnaces, or into an intermediate receiver, which distributes it on to the conveyor filling the large reservoir from which the furnaces are supplied. This conveyor is double—that is to say, there are



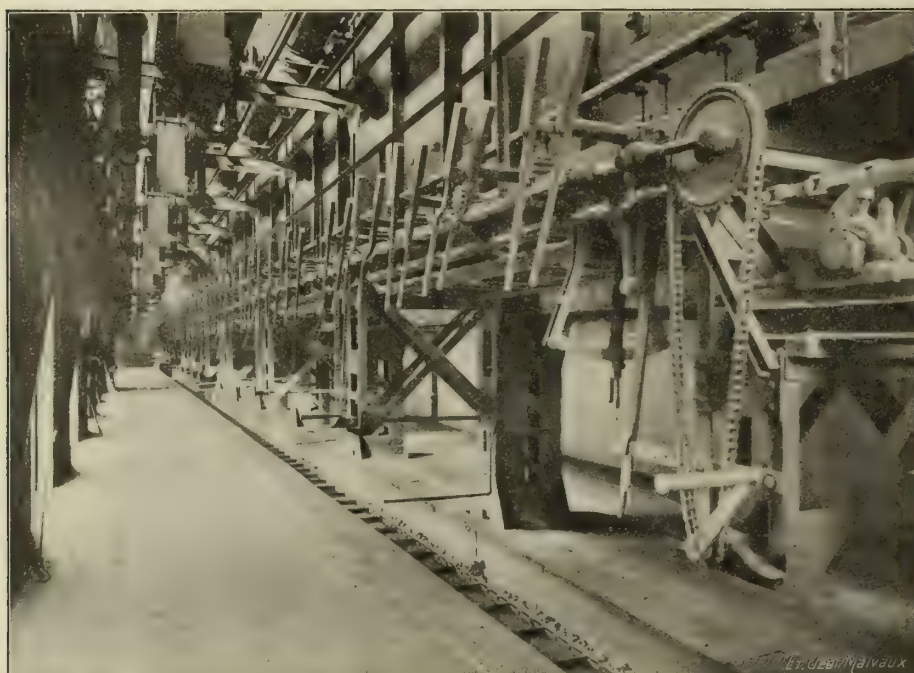
View of the Retort-House from the North-East.

two scoop chains inside each other, with a clutch arrangement to make them independent as regards movement. This enables the conveying of coal to keep going should one of the chains break. The two chains are driven by the same electric motor. The coal breaker and the elevator also have each an electric motor. If an accident should happen to render any part of the installation incapable of conveying the coal, it could be taken up to the top level of the storage hopper by means of a lift, in small ordinary overturning trucks, which can run on a gangway all along the hopper, and discharge their contents direct. Only one man is necessary to ensure even distribution of the coal.

The coke formed in the retorts falls into a conveyor, which is not immediately underneath them, but in front of the furnaces. This arrangement has several advantages, the chief of which is to allow the vapours and smoke caused by the extinction of the coke to rise much more quickly towards the roof, instead of inconveniencing the charger when the retort is open at both ends. Neither are the walls of the furnaces liable to become deteriorated



The Charging Stage of the Vertical Retorts, Showing the Hydraulic Mains.



The Discharging Stage for the Vertical Retorts.

in consequence of the action of these vapours.

A De Brouwer conveyor runs along the fronts of the twelve furnaces; and the return is above. The driving power is electricity. The coke which is not used to feed the generators passes through a drawer at the end of the transporting-box, and is taken up by a cross transporter of the same system, which conveys the coke to a shoot for loading. Here are filled small trucks holding about 8 bushels each, which are afterwards run along an overhead railway, having an incline of 15°, to a storage reservoir annexed to the sorting plant. In regard to the coke used for feeding the generators, it is first cleared of its dust by being passed over perforated plates (forming a grating) which fill the bottom of the box at the end of the conveyor. It eventually reaches a loading shoot, where the small trucks are filled which are raised by a lift to a hopper placed next to the one receiving the breeze. This hopper has also underneath it flaps, which allow the coke to pass into charging bunkers for the generators. These bunkers, which contain about 27 bushels, run on a rail suspended

from one end of the retort-house to the other. The filling of the generators takes place every twelve hours.

The entire installation is worked by six electric motors.

The other portions of the works will be noticed in a future number.

THE JETTE-ST.-PIERRE WORKS OF THE ST. JOSSE-TEN-NOODE GAS COMPANY.

The concessions granted to the St. Josse-ten-Noode Gas Company (a limited liability undertaking) embrace ten communes, the total population of which is 183,000. For the supply of these communes, nearly 850 million cubic feet of gas were sent out last year; the maximum day's output, on Dec. 25, being rather more than 3½ millions. The network of mains (the total length of which is 217 miles) is served from two works; one situated in the immediate vicinity of the Northern Railway Station, the other at the extremity of the communes of Laeken and Jette-St.-Pierre. The former works, which contain a central electricity supply station, date from 1845. The construction of the latter was not commenced till



The Overhead Coke Transporter.

March 1, 1906; and they were brought into use on the 20th of October the same year.

The Jette-St.-Pierre works, which occupy an area of nearly 20 acres, are connected to the Belgian State Railway, by which they receive direct their supplies of English, German, and French coal. The existing buildings, with the exception of the retort-house, were designed for a production of about $5\frac{1}{2}$ million cubic feet of gas per day; but the works as a whole have been laid out for an ultimate output of rather more than 8 $\frac{3}{4}$ millions daily, inclusive of carburetted water gas. The installations actually in use are capable of turning out 1 $\frac{3}{4}$ million cubic feet per day. At present, there is only one bench of nine settings of eight 20-foot retorts at work, equal to the production of 152,000 cubic feet per day. The coal, brought direct by trucks or taken from the stack in Decauville waggons, is discharged by hand into two hoppers provided with oscillating distributors which feed the breakers. Two bucket elevators, each equal to lifting 30 tons per hour, raise the broken coal into the upper part of the building, where it is distributed by a horizontal conveyor into nine sheet-iron stores, each of about 640 cubic feet capacity. The retorts are charged and drawn by De Brouwer machines of the well-known type. On being discharged from the retorts, the coke can be shot into the furnaces or on to a De Brouwer conveyor, by which it is removed to the extremity of the bench, and, after being quenched, loaded into trucks with flap doors on to the heap in the yard.

The purifying plant at present in use consists of two water condensers, each having a cooling surface of rather more than 2000 square feet, one Pelouze and Audouin apparatus, and a "Standard" washer. The building containing this plant has been designed for three sets of appliances of the same power; and in it are two Beale exhausters of 1 $\frac{1}{4}$ million cubic feet capacity, and also the tar and liquor tanks, which have been constructed of armoured concrete. A separate building contains the apparatus for the chemical purification of the gas. On the ground floor are four purifiers with two hurdle grids in a group, each of about 1000 square feet superficial area, worked by a centre-valve, and having lids of sheet iron, four to each purifier, with dry joints. On the first storey is the revivifying floor, provided with 16 trap-doors corresponding to the number of purifier-covers. At about 10 feet above the floor, there are two travelling cranes connected by switches controlling two fixed side lines. When a box has to be emptied and the spent material spread out, a skip, mounted on a waggon worked by electricity, is first of all lowered into the box to be emptied. The skip is filled by hand, raised, drawn by the travelling cranes along the side lines, and emptied at any desired spot on to the floor. It then returns to its starting-point, and is lowered once more into the purifier.

There are on the works two "Duplex" station meters of 1 $\frac{1}{4}$ million cubic feet per day. For the storage of gas, there are three holders—one of 706,000 cubic feet capacity; another, in course of erection, of 530,000 cubic feet; and the third, of 141,000 cubic feet, intended to hold the carburetted water gas before its admixture with the coal gas.

The outlet pipes from the Jette works are connected with the town mains by a 40-inch pipe, which passes in a tunnel of armoured cement under the line of railway running to Ghent. Moreover, a trunk main 14 inches in diameter connects the works in the Rue du Marché with those at Jette, and, by means of two Roots blowers, electrically worked, enables the gas produced at one works to be sent to the other, as required, at the rate of about 106,000 cubic feet per hour.

The Jette works possess carburetted water-gas plant, on the Humphreys and Glasgow system, capable of producing 600,000 cubic feet per 24 hours. The installation is about to be doubled. The air necessary for "blowing" the generator is furnished by two blowers electrically worked. The oil used for carburetting the gas is stored in underground tanks of armoured cement. The gas is stored in a holder capable of containing about 140,000 cubic feet; and before its admixture with the coal gas, the water gas is first passed through a Pelouze and Audouin apparatus and afterwards through a meter.

All the plant on the works is actuated electrically; and for this purpose a small central station has been provided. It consists of a steam-worked generating plant of 50 kilowatts capacity, and rotary transformer plant actuated by three-phase current at 11,000 volts supplied from an outside station, and brought down to 500 volts at the entrance to the works. The latter machine is to be duplicated.

The ammoniacal liquor is treated for the manufacture of sulphate of ammonia by plant, on the Chevalet system, of a capacity of about 7700 gallons per 24 hours. The salt, after being taken from the still, is air-dried; then stored in wooden bins.

The water for the supply of the works is obtained from a boring 12 inches in diameter and 525 feet deep. It is raised by a pump working by compressed air furnished by a special compressor in the machine-room. The water-tower, constructed of armoured cement, has on the ground level a room in which are assembled all the pumps used for the works; on the first floor, the tar and ammoniacal liquor reservoirs; and on the second floor, a water-tank capable of holding 22,000 gallons.

The works include the usual provision for the convenience and comfort of the workmen; and there is a laboratory, comprising an office, an operating-room, and rooms for carrying out photometric and calorimetric tests of the gas.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

FIFTY-FIRST ANNUAL GENERAL MEETING AT KÖNIGSBERG, June 20 to 24.

[BY OUR SPECIAL REPRESENTATIVE.]

A REVIEW OF THE PROCEEDINGS.

THE Fifty-First Annual General Meeting of the Association was held last week at Königsberg, the flourishing capital of East Prussia, and the most easterly town of importance in the German Empire. It has now a population of upwards of a quarter-of-a-million, and carries on an immense shipping trade through its wharves on the River Pregel, which is navigable for large ocean-going steamers, and embouches within a few miles of Königsberg into the Frische Haff, which is one of the large salt-water lakes separated from the Baltic Sea by a narrow "Nehrung," or strip of low-lying sandy soil, at one end of which is a channel communicating with the sea. The adjacent sea-coast, on which several watering places have attained to considerable popularity, and excursions to some of which were made by those attending last week's meeting, is known abroad chiefly as the principal source of the world's supply of amber.

Königsberg presented many advantages as a *venue* for the annual meeting of the German Association. The gas-works of its Corporation has become well known of late years on account of the many novelties in methods of working and in plant which have been introduced there. The first Dellwik water-gas apparatus on a gas-works was erected at Königsberg, and some interesting experiments were made with it, as reports by Professor Vivian B. Lewes and other authorities in earlier volumes of the "JOURNAL" have disclosed. At one time, a proportion of town refuse was converted into gas on the works, and it is not many years since that at a meeting of the German Association, Herr Kobbelt, the Manager of the Königsberg gas undertaking, startled his hearers by expressing the opinion that gas of far lower illuminating power and calorific value than was then ordinarily made, or generally advocated even by advanced gas engineers, would fulfil modern requirements. He stated that he was then adopting the supply of very low-grade gas at Königsberg, and that the results were justifying the move. To-day he enjoys the distinction of having popularized the sale of gas to an extent which few of his German colleagues can claim to equal, by the widespread employment of prepayment meters, in connection with which (as was reported recently in

the "JOURNAL") he has introduced somewhat novel methods of collecting the coins and checking the receipts. Also, he has erected on the gas-works a large installation of carbonizing chambers or ovens, of which a description appeared in the "JOURNAL" a few weeks ago, and of which more will be said anon. To sum up, he is a Gas Manager ever ready to adopt new ideas provided they show good promise of furnishing results in any way better than those hitherto obtained; and, further, he is himself well capable of originating ideas of value in connection with gas supply and of bringing them to fruition.

On the other hand, there were many disadvantages attendant on the choice of Königsberg as the place for the meeting. It lies in an extreme corner of Germany, and to reach it means from most parts a long and costly journey, which many members of the Association could not be expected to undertake. Even from Berlin it is 366 miles distant; and the route to it from nearly all the large towns of Germany lies through Berlin. From the south of the Empire it is a very far cry—for instance, it is about 770 miles by rail from Munich. Hence it is not surprising that the attendance at this year's meeting of the Association fell far short of that which we have come to regard as normal for these annual gatherings. Instead of ten to twelve hundred persons, there were this year only five hundred odd present. In many respects, the smaller attendance was advantageous. There was less inconvenience than sometimes occurs through overcrowding at the technical meetings and social functions; while those who came to the former were bent for the most part on closer attention to the proceedings than is often the case.

Many prominent German gas men were, however, absent. Among those who are well known in England may be mentioned as absentees: Herr W. von Oechelhaeuser, the Managing-Director of the German Continental Gas Company, and Professor H. Bunte, of Carlsruhe, who unfortunately was unable to be present through ill-health. Of prominent water engineers whose presence was missed, Mr. W. H. Lindley, of Frankfort, may be mentioned, since he is one of the most active members, and at the time a Vice-President of the Association. The usual considerable complement

of Swiss gas engineers dwindled to one or two, owing to distance; but the northern countries of Europe were naturally more numerous represented. The President of the Association, Herr Prenger, the Manager of the Gas, Water, and Electricity undertakings of the Corporation of Cologne, presided at the sittings in a highly commendable businesslike manner, with the result that the lengthy programme was carried through with a promptitude and dispatch which are sometimes far to seek at the meetings of the Association. Fine weather prevailed except on the Friday, when the whole-day excursion to the Baltic bathing resorts was marred by rain, and consequently was poorly attended.

The meetings were held in the Thiergarten, which lies outside the city wall, but is easy of access by the Corporation tramway system, on which members were carried throughout the week without charge. The technical proceedings took place in the Concert Hall of the Thiergarten—a more commodious and convenient, if less ornate, room than is generally obtained for the annual meetings. The inaugural reception and the banquet were held in the adjacent Banqueting Hall—an enormous barn-like structure, which, however, served for the purpose excellently. Königsberg is not rich in fine, modern buildings and halls; but from the purely practical or utilitarian standpoint, the members could not have had better accommodation for the meetings. Another feature of the gathering in respect of which it contrasts very favourably with those of several recent years, was the excellent organization of, and promptitude of service at, all the functions, for which, and the absence of any formality, the practical northern character of the members of the local organizing committee may perhaps fairly be said to have been responsible. The technical programme, as will appear later, was also good, though two papers which had been announced for reading were as a fact not presented.

Minor Gas Meetings.

Advantage was taken of the assembly in Königsberg of so many German gas engineers to hold two minor gatherings in which a number of them participated. There was a meeting on Saturday, the 18th inst., under the chairmanship of Dr. Leybold, of Hamburg, of the Committee who control the collection of, and administer, the special workmen's accident compensation fund, to which all German gas undertakings are compelled by law to contribute. The sums disbursed annually through the medium of this fund are very large, especially when there has been during the year an accident involving many fatalities and serious injuries, such as that of the burning out of the large gasholders at the Grasbrook Gas-Works at Hamburg last December. [In regard to these gasholders, we learn that the re-erection of the old or smaller one is already far advanced, and that it will come into operation in the late autumn of this year; but so far the reconstruction of the large new gasholder with its annular elevated tank stands in abeyance.] On Monday, the 20th inst., the Baltic District Association of Gas and Water Engineers took the opportunity to hold its thirty-eighth annual meeting at Königsberg—this being the first time that it has met there since its inception. About eighty members assembled shortly after eleven o'clock in the Artushof, which is the quarters of the local Association of Commerce, under the chairmanship of Herr Gellendien, the Manager of the Gas and Water Works at Elbing. The Mayor of Königsberg was represented by Town-Councillor Bieske, who tendered, on behalf of the Corporation, welcome to the members. He went on to say that the town of Königsberg had been in possession of its gas and water undertakings for over fifty years, and in the course of this time had had many "hard nuts to crack" in regard to them. Such an Association as that of which they were members was valuable in assisting in the solution of difficult technical problems, and in advancing the application of scientific methods to industrial concerns. He hoped that those present would assist to dispel the impression which prevailed in parts of Germany that Königsberg was imbued with the Russian rather than the German spirit and ideals. The Chairman, after thanking Herr Bieske for his words of welcome, presented the report for the year 1909-10, which showed that the membership of the Association had increased to 163. Two of the gas-works which had been affiliated to the Association since its formation—viz., Elbing and Thorn—were now celebrating the jubilee of their existence. The past year had witnessed many technical advances in the gas industry; but a step had been taken in another direction which the Council regarded as of the greatest importance for the further development of gas supply. This was the establishment of a Central Organization for Promulgating the Sale of Gas, which had been started with funds contributed mainly by some of the larger German gas companies and a number of manufacturers of gas plant and apparatus.

After the report had been adopted, the Chairman proposed, and it was unanimously agreed after a lively discussion, that the Baltic District Association should support the new Central Organization by contributing £10 per annum to its fund for the next three years, with an additional donation this year of £15. In the course of the discussion, Herr Lempelius, the Manager of the organization, explained its objects, of which more will be said later in connection with the proceedings at the meeting of the parent Association. A debate then took place on the *brochure* relating to the sale and use of gas, and in particular on the section of it giving rules to be observed by gas-fitters, compiled by the Heating Committee of the German Association of Gas and Water Engineers. This *brochure* will be referred to in connection with the

report of the Committee—it will suffice now to say that the Baltic District Association expressed approval of its contents. Herr Gellendien, of Elbing, was re-elected President of the Association, and it was decided to hold next year's meeting at Hohen-salza. After other private business had been disposed of, a discussion took place on prepayment gas-meters, in the course of which Herr Merken, the Manager of the Instertburg Gas-Works, said that their introduction in the town had been attended with a most satisfactory increase of business. The unsatisfactory behaviour of water-meters was the theme for further debate; and the proceedings closed early in the afternoon with a vote of thanks to the Chairman.

The Inaugural Reception.

About 500 members and guests of the German Association of Gas and Water Engineers assembled in the Banqueting Hall of the Thiergarten on Monday evening, the 20th inst., for the customary inaugural reception and supper. The hall, in which (appropriately enough) electric arc lamps have recently been displaced by the high-power inverted "Degea" gas-lamps of the German Welsbach Company, was decorated for the occasion. The Burgomaster of Königsberg (Herr Kunckel) represented the Corporation, and welcomed the visitors.

Technical Proceedings—First Day.

The technical proceedings commenced shortly after 9 o'clock on Tuesday morning, in the Concert Hall of the Thiergarten, under the chairmanship of the President of the Association, Herr Prenger, the Manager of the Gas, Water, and Electricity Works of Cologne. He was supported by Herr Kordt, the Manager of the Düsseldorf gas undertaking, and Dr. K. Bunte, of Carlsruhe, who has succeeded his father Professor H. Bunte, as General Secretary of the Association. Other members of the Council of the Association were not present. The government of the province was represented by Privy-Councillor Twiehaus, in the absence on holiday of the Governor Count von Keyserlingk. He said that the Government took a keen interest in the proceedings of the Association, having regard to the importance to the nation of proper supplies of gas and water in towns. He was glad to see that the vexed question of the use of the divining-rod was to be discussed. In the absence of the Lord Mayor, Herr Körte, Burgomaster Kunckel expressed the gratification which was felt in Königsberg at the visit of the Association. He referred to the importance of gas and water works to a community, and to their revenue-earning value. It was very necessary that the manager of a municipal gas undertaking should be not only a gas engineer, but also a commercial man. In Königsberg, the population had scarcely doubled the last 21 years; but the quantity of gas sold had increased six-fold, which indicated a remarkable commercial expansion. He hoped that those present would find time to see Königsberg thoroughly, and would form a favourable opinion of it. He wished that their deliberations might be fraught with beneficial results. Professor Strache, of Vienna, next expressed the good wishes of his colleagues in the Austro-Hungarian Association of Gas and Water Engineers, and their hopes that success might attend the meeting. The President, in acknowledging all the good wishes expressed by the previous speakers, pointed out that, while the gas and water engineers would ever be loyal to the State and their respective Municipalities, they would point out that gas was now subject to keen competition from electricity, and that it could not stand repeated attacks on it by way of State taxation and calls for profits for the relief of rates. He desired to acknowledge, however, in particular the indebtedness of the Association to the Corporation of Königsberg for two elaborate *brochures* presented to everyone attending the meeting—one dealing fully with the water supply of the city, and the other with the gas supply. [An account of the gas undertaking, compiled from the latter *brochure*, is commenced on another page—955—of to-day's "JOURNAL."] It had long been the desire of the Association to make the acquaintance of the Baltic cities of Germany, but hitherto they had been unable to carry their wishes into effect. Passing on to the record of the Association for the past year (which will be more fully dealt with in a summary of the annual report of the Council next week), he referred with special regret to the loss which the members had sustained through the death of their colleague Herr Kunath, late Manager of the Gas and Water Works of Dantzig. This reference was recognized in the customary manner by all those present rising from their seats. In regard to the absence of Professor H. Bunte, of Carlsruhe, through illness, a telegram from him wishing success to the meeting was read out by the President, who said that a telegraphic acknowledgment expressing hope of his speedy recovery would be sent. Continuing, he emphasized the benefits accruing to the gas industry through the stimulus of competition, to which he ascribed its indebtedness for many of the recent technical advances. Gas managers could no longer sit down quietly and look for the receipts to pour in. They had to strive strenuously to secure them. It was now necessary that they should have free scope to work their undertakings as commercial enterprises, without the incubus which the demand for heavy and constant contributions to the municipal chest laid upon them. He referred to the new Organization for Promulgating the Sale of Gas, initiated in Berlin on March 14 last, and commended it earnestly to the support of all interested in the future of the gas industry. Relatively peaceful and uneventful was the life of the water engineer. He had quietly to set about pumping more water. He had not to advertise his wares in order to increase his sales.

Retorts and Gas-Meters.

The President then called upon Herr Kobbert, the Manager of the Königsberg gas undertaking, to read a paper on "Retorts and Gas-Meters." Unfortunately, the author failed to make himself heard throughout the room (and the paper was not circulated in print); but the following are the chief points he made: The phases of gas supply might be considered as, firstly, the manual working of retorts and processes; secondly, the development to mechanical operation and improved retort-settings and modes of carbonization; and, thirdly, the chemical utilization of the by-products of gas manufacture. Discussing these points, he came to the conclusions that: (1) The interest and depreciation charges which it was necessary to allow and the cost of repairs might quite easily eat up any advantage which might accrue in other directions from the adoption of costly plant. The final and most important point in determining the choice of retort-settings or other plant was the capital outlay that was involved, and frequently, assuming the same productive capacity, this had nothing to do with the technical advantages of the plant. (2) A proper estimation and comparison of the capital charges for different plants and types of setting only became possible when an actual plain working-scale investigation had been carried out. (3) A comparison of the economical achievements or industrial results attained by different gas-works could only be fairly made on the basis of the net profit realized, taking into consideration the average price at which gas was sold, and allowing a proper mode of reckoning for the cost of public lighting. It was best made by drawing up a balance-sheet, which should be applicable to both municipal and commercial book-keeping. (4) The object of gas-works should be to agree to a plain scheme for calculating prime cost, which should be independent of the particular method adopted on its own account by each undertaking. A common basis would thus be afforded for the exchange of opinion which was of so much importance in regard to the economical results attained by a works.

In regard to gas-meters, the author expressed the view that, notwithstanding the high degree of perfection and the great convenience of dry meters, the measurement of gas by means of wet meters must be considered less open to objection. But in that case a liquid of constant volume, and not liable to corrode metal, must be found and employed.

The next paper, which was discussed together with that by Herr Kobbert, was one written by Herr F. Kordt, the Manager of the Düsseldorf gas undertaking. It dealt with "Depreciation Charges, Capital Redemption, and Renewal and Extension Funds of Corporation Gas-Works." An abstract of this paper is in preparation for the "JOURNAL." But it may here be said that the author has arrived at the conclusions that with small works, with relatively little receipts and outgoings, it is better to reckon depreciation charges on the basis of prime costs, as uniform sums for depreciation which shall not be too high at the commencement must be applied. For large works, on the other hand, where the receipts and outgoings throughout the year are heavy, and there are numerous new buildings and extensions, the author thinks that it is better to take depreciation on the book-value of the plant, as is done in the case of almost all large industrial concerns. The depreciation charges must, in any case, be fixed on a proper accountant's method, and not in deference to the requirements for the time being of the municipal exchequer.

Promotion of the Sales of Gas.

The next item in the proceedings was the giving by Herr Lempelius, of Berlin, of an account of the new "Central Organization for Promulgating the Sale of Gas," to take up the management of which organization he resigned the position of Engineer of the Barmen Gas Works. He said the first question was, What is the present real position of the gas business? Electricians would reply that it was retrogressing; and this opinion was not uncommonly held by many persons of all ranks who had no special knowledge of the matter. Some believed that the use of gas would in the future become restricted to its application as a source of heat for industrial purposes, to household heating, and to cooking. In order to learn the real position at the present time, and the prospects for the future of gas supply, the author had set himself to study whether the apparatus available for the use of gas for different purposes was as technically perfect as possible, as its perfection must be a condition precedent to progress and to extension in the employment of gas.

He had sought to ascertain whether the technical advances in the methods of using gas were such as to cause it to appeal to wider circles of users, and to extend its use in new directions. An article in a recent number of the "Electrotechnische Zeitschrift," was of interest in this connection. It referred to the displacement of electricity by high-pressure gas for street lighting in the City of Westminster, which raised a signal of alarm for electricity in its competition with gas. This use of gas might have reached England, like so much else, from Germany. For years past, high-pressure street lighting had been more and more

used in place of electricity in Berlin, as it was proved by the results to be preferable. It afforded a more brilliant and better illumination; but, unfortunately, the gas-lights were commonly supposed by the general public to be electric, and consequently gas did not get the credit for its achievements. High-pressure gas also was finding many new applications for industrial purposes; and these constituted a great advance and an extension of the use of gas in a new direction, in which many brilliant opportunities for it presented themselves. The use of high-pressure gas for lighting, also, though adopted on an extensive scale in Berlin, had still to extend to other towns, and must be regarded as yet in its infancy. It could not be contended, either, that the maximum economy in the development of light from gas had been attained. Further advance was assured; and, speaking generally, it might be said that there had been no previous period in the history of gas supply characterized by such continuous improvement in gas-lamps as was the present.

The advantages of gas for the supply of heat also were unparalleled; and it only rested with gas engineers to see that advantage was taken fully of the wide field that lay open, in Germany in particular, for development in the use of gas for heating purposes. Connections and mains should be extended, and supply-pipes put in free of charge, and meters and heating and cooking apparatus installed on the prepayment or hire system. By this means, gas would be brought within reach of people of small means, who would not be slow to avail themselves of its advantages for lighting, heating, and cooking.

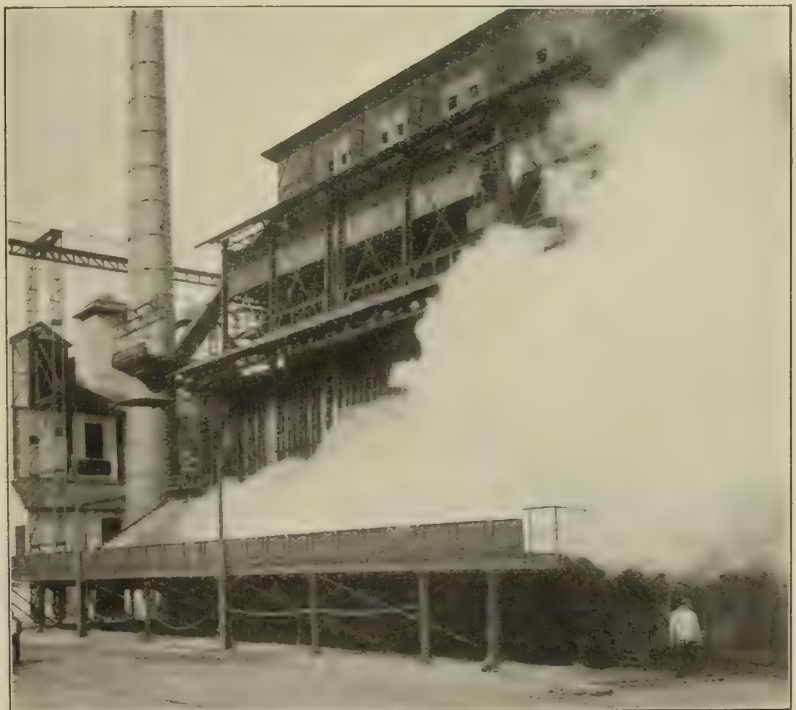
The answer to the general question which he (Herr Lempelius) had propounded at the outset, as to whether we were now in a period of expansion in the gas industry, was an unqualified affirmative. He had endeavoured to review the whole field of the use of gas, and its general prospects, with the object of showing that there was ample scope for development; and it was the purpose of the newly-founded organization (to the managership of which he had been appointed) to further this development by making known to the Press, to the public authorities, and to the general public the great advantages to be gained by the employment of gas to a greater extent than hitherto and in new directions. He asked all those present at the meeting to give the new Central Organization their moral and their financial support. The efforts would result in general benefit to the gas industry.

The Application of Gas for Industrial Purposes.

The next paper, by Dr. E. Schilling, of Munich, on the "Application of Gas for Industrial Purposes," overlapped in some points the ground covered by Herr Lempelius. But it dealt in greater detail with the newer industrial uses of gas, and contained a carefully made and apparently (for the time being at least) exhaustive compilation of the different types of gas apparatus, the uses to which they were being put, and the German firms by whom they were supplied. A summary of the contents of this useful contribution to the proceedings will be given in the "JOURNAL" next week. A short discussion concluded the technical proceedings for the day.

Visit to the Königsberg Gas-Works.

In the afternoon, the new gas-works of the Corporation were thrown open to inspection, and were visited by most of those attending the meeting, though two alternative visits to other works had been arranged for the same afternoon. A description of the



Quenching the Coke after Discharge from One of the Chambers of the Königsberg Installation. From a Photograph by A. Kuhlewindt, of Königsberg.



The Installation of Inclined Carbonizing Chambers at the Königsberg Gas-Works on the occasion of the Visit of the Members of the German Association on Tuesday last.

(Photograph by A. Kühlewindt, of Königsberg.)

gas-works is commenced in other columns of to-day's "JOURNAL;" and it will suffice to say here that the interest of those who visited the works centred chiefly in the installation of six beds, each containing four large inclined carbonizing chambers or ovens. The discharge and quenching of the coke from these chambers was witnessed by the party; but in one case at least the discharge proved to be anything but automatic, and some ten minutes were expended in getting the greater part of the block of coke out of the oven. When the discharge of the coke takes place automatically in the proper manner, nothing more perfect, from the technical standpoint, could well be desired. But, apparently, the coke is very apt to hang-up in most of the existing types of large inclined chamber settings; and it is then very difficult to handle, owing to its immense mass and the great amount of heat radiated from the open oven. The quenching of the coke in the open trough at the foot of the inclined plane in front of the discharging side of the settings presents many advantages; and the enormous cloud of steam raised by the operation passes away quickly without appreciably incommoding the men employed in the quenching, which is done by hose manipulated from the top of the inclined plane. The annexed illustrations are reproduced from two photographs of the discharge and quenching of the coke in the presence of the members of the German Association on their visit to the works on Tuesday last.

Another group of members visited on the same afternoon the Corporation water-works at Hardershof. A very exhaustive account of the water undertaking of Königsberg had been prepared by Herr E. Kuck, the Manager of the water-works, in collaboration with Herr B. Denk, the Corporation Building Surveyor. It was printed in the form of a *brochure*, replete with many plates and maps—a copy of the *brochure* being presented to every one who attended the meeting. Yet another group of the members visited the large gas-meter works of the firm of Liessmann and Ebeling.

In the evening, there was a garden festival in the pretty adjacent gardens of various lodges and clubs on the bank of the lake known as the Schlossteich, which is one of the most charming and characteristic features of Königsberg. Outdoor glee singing and illumination of the grounds conducted to the general entertainment of the members.

Technical Proceedings—Second Day.

The second day—Wednesday—was, as usual, devoted almost entirely to matters connected with water supply. The first paper, by Herr Bieske, of Königsberg, discussed the *pros* and *cons* of the utility of "The Divining-Rod," in which, to judge by the discussion which followed, there are still a number of believers in Germany, even among technical men. The author said that when the water-diviner failed to find water on a particular day, he ascribed the fault to the rod he happened to be using at the

time. Apparently the virtue of the rod was somewhat intermittent in its manifestation. Recently, diviners had sprung up who professed to find petroleum by means of a bronze wire "rod," and others who used a copper rod to detect the presence underground of coal seams. It was an unfortunate fact, the author said, that the State authorities in Germany certainly appeared to recognize the claim of the water-diviner to professional status, and acted accordingly, though they had been led into many mistakes as a consequence. A letter written by Herr Dernburg, the late Chief Secretary of the Colonial Office of Germany, to an engineer with reference to available water supplies in the African colonies, showed that while he was not prepared to express any definite opinion as to the merits of water divination, he was disposed on the ground of its lower cost to prefer it to a scientific investigation for water. The author protested strongly against the putting of water divining on terms of equality with scientific work. In conclusion, he expressed the opinion that the Government should appoint a competent authority—such as the Geological Survey Department—to collect statistics as to all known cases of water-divining; recording both successes and failures, and in the former distinguishing between the instances where there were previous indications of water and those in which there were none at all. As already stated, several speakers in the lively debate which ensued on this paper took a more favourable view of the pretensions of the water-diviner than did the author. The President, in conclusion, said that scientific inquiry would undoubtedly put light on the whole question of water-divination.

The next paper was one by Herr Denk, of Königsberg, describing experiments which had been made on "The Clarification of the Königsberg Drinking Water with Sulphate of Alumina." Certain of the available sources of water supply to the town lacked clearness, owing to the settling-out of peaty matter containing iron, and were not clarified by slow sand filtration. Experiments had been made, on a small scale, of the use of sulphate of alumina for clarifying this water; and the results had been so far successful that a large plant for the purpose was about to be installed. The objections to the use of the unclarified water were rather a question of its taste and its appearance than of hygiene; but it was hoped that the use of sulphate of alumina would remove in a satisfactory manner all the objections to the use of the water from the peaty sources.

A paper was next read by Dr. Tornquist, of the Professorial Staff of Königsberg University, and Director of its Geological Institute, on the "Subsoil of East Prussia, and its Bearing on the Water Supply of the Province." This paper, naturally, was primarily of local interest, and need not here be mentioned any further.

The report of the Committee appointed by the Association on the question of the Working of Water-Works was next presented

by the Chairman Herr Reese, of Dortmund. A brief abstract of this report will be given in the "JOURNAL," along with abstracts of the reports of the other Technical Committees of the Association. That of the Committee on Electrolysis or Vagrant Electric Current, signed by Mr. W. H. Lindley, of Frankfurt, as Chairman, was next taken, and was followed by the report of the Educational or Instructional Committee, of which Herr W. von Oechelhaeuser, the Managing-Director of the German Continental Gas Company, of Dessau, is the Chairman. The day's technical proceedings concluded with the presentation of the report of the Committee on Gas-Meters, by Herr Kohn, of Frankfurt-on-the-Main, its Chairman.

Excursion to a Baltic Bathing-Resort.

In the afternoon, the members left Königsberg by special train for Cranz, a popular bathing-resort about 40 minutes distant by rail on the Baltic coast. The weather was good, and the promenade was found very pleasant. After supper in the restaurant of the Grand Kurhalle, a dance occupied the time until the return special train to Königsberg had to be joined.

Technical Proceedings—Third Day.

The third sitting opened on Thursday with private business; and then Dr. Hurdelbrink, of Königsberg, read a paper describing a "Process for the Joint Extraction by Washing of Ammonia and Sulphuretted Hydrogen from Coal Gas." An abstract translation of this paper is given on another page of to-day's issue. In the discussion which followed, an opinion was expressed that the difficulties attendant on the working of the process would be such as to preclude its practical adoption. The next paper was by Dr. Wolfram, of Hamburg, on "Development in Gas Purification." An abstract translation of this paper also appears in another column of this number. Then followed an interesting paper by Dr. Max Mayer, of Berlin, on "Valuing the Quality of Illuminating Gas according to its Calorific Power." Particulars of the contents of this paper will be found on another page.

Dr. K. Bunte next presented the report of the Committee on the Instructional and Experimental Works of the Association at Carlsruhe. In view of the large amount of work of general interest recorded in this report, a special abstract of it is given to-day, together with a synopsis of the results of tests on English gas coals referred to in the report. Supplementary to the report of this Committee, was a paper by Dr. K. Bunte, giving "Information about Gas Coals," as gathered from the experimental work on gas coals carried out at the Carlsruhe Institution. A nearly full translation of this paper follows our abstract of the report of the Committee. The report of the Committee of the Association on Photometry was not ready for printing with the reports of the other Technical Committees; but Dr. Leybold, of Hamburg, the Chairman, stated that the Committee had been mainly engaged in testing the efficiency of safety lamps for use on gas-works. Eighteen types had been tested; but though many of these were perfectly satisfactory for the mixtures of air and fire-damp which occur in coal-mines, they were not reliable for mixtures of air and coal gas such as might occur on gas-works. Details of the investigations and the conclusions therefrom would be given in the report which was about to be printed. The report of the Committee on "Heating" was presented by its Chairman, Dr. E. Schilling, of Munich. It dealt mainly with the establishment of a general code of regulations for the sale of gas, and for the carrying out of house installations by gas-fitters. These regulations had been under the consideration of the various District Gas Associations for a twelvemonth, and a number of modifications had been made in them, on the suggestion of one or other of the District Associations. The regulations are set out at great length and with much fulness of detail. Any further reference to them must be postponed until next week; but it may be said that they are framed, after the German fashion, with a view to providing for all probable (and many improbable) contingencies, and that they would be antagonistic to the procedure followed in connection with gas supplies in this country. They were approved by the meeting.

On the recommendation of this Committee, it was decided that, if adequate accommodation could be secured, the Association should participate in the Exhibition on Hygiene which is to be held in Dresden next year. A Special Committee was appointed to make the necessary arrangements.

It was also decided to appoint a new Technical Committee to investigate and report on "The Working of Gas-Works." The members selected by the meeting were: Herr Kordt, the Manager of the Düsseldorf Gas-Works, Herr Kobbert, the Manager of the Königsberg Gas-Works, Herr Lempelius, the Manager of the new organization for promoting the sale of gas, Dr. E. Schilling, of Munich, and the President, Herr Prenger, of Cologne.

The report and accounts of the Association for the past year were next taken and passed. A brief abstract of the report will be given next week. The members of the Technical Committees for the ensuing year as well as the officers were next elected. Herr Prenger, of Cologne, was re-elected President of the Association. It was decided to hold next year's meeting at Dresden. With a few speeches of compliments and thanks, the sitting was brought to a close.

Concluding Functions.

For the afternoon of this day (Thursday last), alternative visits to three works had been arranged—viz.: (1), The Corporation water-works at Hardershof; (2), the Corporation sewage-works;

and (3), a waggon-works, and the grain silos which are a characteristic feature of Königsberg. In the evening, the customary banquet took place in the Banqueting Hall of the Thiergarten, when the usual complimentary speeches were made. It was followed by a display of fireworks, and an adjournment then took place to the Concert Hall for dancing, which continued up to a late hour.

The concluding function of the meeting was a whole-day excursion on Friday to Warnicken and Rauschen, and the intervening stretch of coast on the Baltic Sea. Unfortunately, its success was somewhat marred by rain falling heavily at intervals. Thus concluded a meeting which, if not conspicuous in the annals of the Association for a large attendance or exceptionally brilliant festivities, carried through a good technical programme in a satisfactory and businesslike manner.

EXTRACTING CARBOLIC ACID FROM TAR-OILS.

By WM. MASON.

As it is just now the quiet time in tar distilleries, it may be advantageous to some to consider the methods of extracting carbolic acid.

Years ago, it was the practice to treat the oils with caustic soda solution; separate this from the denuded oil; and throw up the carbolic acid with sulphuric acid. This results in the loss of all the soda and the whole of the sulphuric acid. But, since at the present time carbolic acid is only worth about 1s. per gallon, such a method is out of the question, as by it the materials to recover a gallon of carbolic acid would cost about 7d. The same, too, may be said of the method by which carbolic acid is obtained by means of sulphate of soda and lime.

The cheapest and best method is to treat the light oil with caustic soda solution of about 22° Twaddell, whereby a carbolate of soda is produced which may be separated from the light oil from which it has been extracted, by subsidence in the usual way. This carbolate of soda is then treated with a current of carbonic acid gas, which forms carbonate of soda, and sets the carbolic acid free. The separated carbolic acid floats on the surface of the strong carbonate of soda solution, which is drawn off from below the carbolic acid, and (being causticized with lime) is employed over again continually.

The point, however, to be considered by this method is the production and purification of the carbonic acid gas. This gas may be produced in a coke-furnace; but much care would have to be exercised in its construction and working, since to obtain gases containing much carbonic acid would result in a higher temperature being obtained than the materials of the furnace would withstand. With escaping gases containing only 6 per cent. of carbonic acid, the initial temperature would be about 900° C. These gases, too, would have to be purified and cooled.

Now, since tar and ammoniacal liquor are generally distilled in the same works, carbonic acid gas may be obtained from the waste gases issuing from the sulphate of ammonia saturators. The gas from this source has been used for this purpose very successfully in the works of Messrs. Hardman and Holden, of Manchester. The method of working was as follows: The gases as they issued from the saturators were first passed through a surface cooling-coil; then through two larger scrubbers (old boiler shells, about 30 ft. by 7 ft.); and, lastly, through an oxide of iron purifier. The gas issuing from the purifier was almost entirely carbonic acid—often containing 96 per cent. With such a strong gas, it will readily be understood that a rather simpler plant may be used than when the gas is made in a coke-furnace, as before mentioned. For instance, a much smaller air-compressor and a coke-tower of simple construction may be used for carbonating the carbolate of soda.

There is, however, one great drawback to this method; and that is the condensed water from the cooler and scrubbers contains hydrogen sulphide in solution, which has to be dealt with before it leaves the works. In Messrs. Hardman's works it was allowed to run away into a sandy soil, and was thus got rid of. But a much better method would be to dehydrate the gases as they come from the ammonia still, as is done in the ammonia-soda process, by placing a surface cooling-coil between the still and the saturator at such an altitude that the condensed liquor could be syphoned back into the still. Or the coil may be placed on the ground; and the condensed liquor, collected in a closed vessel, may be pumped back into the still. In this way, the gases issuing from the saturators would consist only of carbonic acid and hydrogen sulphide, and would therefore not require the large scrubbers and condensers before mentioned. Besides, nearly the whole of the sulphur might be recovered in the purifier. Further, in works where carbonic acid is already being used, only inexpensive additions would be required; but the operations might be much quickened by using nearly pure carbonic acid.

Presentation to Mr. Harley A. Stephenson.—In view of the approaching marriage (July 9) of Mr. Harley Andrew Stephenson, the London officials of the British Gaslight Company, Limited, have presented him with a handsome rosewood-cased clock, with a suitable inscription on an attached brass plate.

A GAS WATER-HEATER.

Davis's "Gilled" Circulator.

DISPLAYED prominently in the window of No. 59, Queen Victoria Street, E.C.—that is to say, the London Show-Rooms of the Davis Gas-Stove Company—there is a section of a new gas water-heater; and should a prospective purchaser of such an appliance step inside, as is likely, in order to make further inquiries as to the merits of this particular form of apparatus, he will see not only other sections, but also heaters in actual working. This idea of showing an article in section is an advantage from the point of view of both buyer and seller. While the former is able to see straightaway the method of operation, the latter does not have to offer the large amount of explanation which would otherwise be necessary; and when the examination of the section can be immediately followed by an inspection of the apparatus at work, then, indeed, is the function of the show-room being fulfilled to the uttermost.

The heater the good points of which are being thus convincingly demonstrated by the Davis Gas-Stove Company is the "Gilled" circulator, which is a compact appliance for connecting to an ordinary circulating system. That the claim to compactness is fully justified will be gathered from a glance at fig. 1 (which is a view of the apparatus in its complete form), and a study of the following dimensions. The circulator is made in two sizes, each tested to stand a working pressure of 60 lbs. to the square inch.

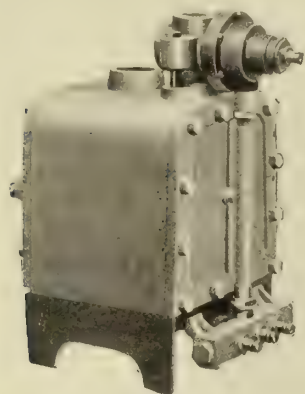


Fig. 1.—The Circulator—Back View.

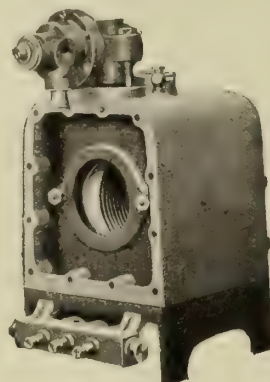


Fig. 3.—Showing Inspection Plate Removed.

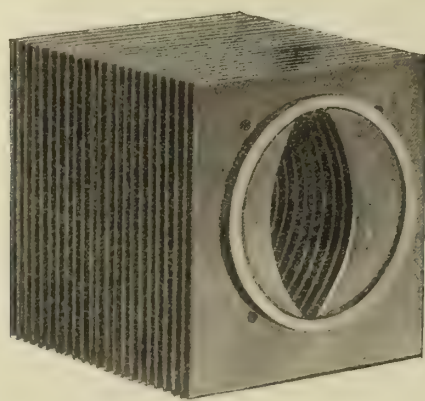


Fig. 2.—The "Gilled" Tube.

The smaller, which is suitable for connecting to a circulating tank of from 20 to 25 gallons capacity, has a height over all of 16 inches,

a width over all of 13½ inches, and a depth of 9 inches.

The larger, which is for connecting to a tank of from 30 to 35 gallons capacity, is 16 inches high over all, 16½ inches wide over all, and 9 inches deep.

A more important consideration, of course, is efficiency; and this it is claimed has been secured in a very high degree by the special construction of the heating chamber, which is practically a tube made up of mild steel gills and rings alternately, welded together by a special process. The gills, or plates, which have given the name of "gilled" to the circulator, extend, as will be seen from fig. 2, both inside and out-

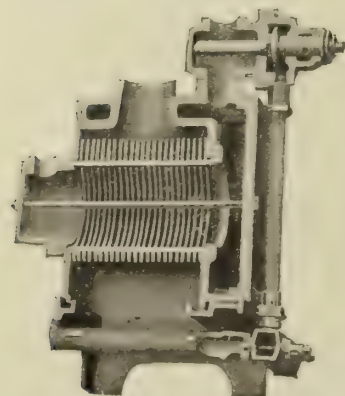


Fig. 4.—A Section of the Apparatus.

side the tube. The external gills come in contact with the hot gases of combustion (but not the flame); and the internal ones, with the water to be heated. The result of this form of construction is a very large heating surface in a very small space; the heat taken

up by the outside portion of the plates being rapidly conveyed to the water by means of the portion which projects inside the tube. The tube is placed inside a cast-iron water-jacket of the saddle type, which forms a heat insulator, and thus prevents loss by radiation. The water enters at one end of the apparatus, goes through the tube, then flows into the water-space of the jacket, and then passes along the hot pipe by way of a thermostatic valve—when this, from an economical point of view, desirable adjunct is fitted. The object of the valve being to reduce the gas supply when the water has reached a certain temperature, its beneficial effect on the consumption is easily understood. The general action of the circulator will be gathered from the section shown (fig. 4).

Now let us for a moment consider some of the other advantages possessed by this water-heater. In the first place, it may be pointed out that great strength of construction, combined with simplicity of design, ensures a long life for the apparatus. The cast-iron water jacket and the heating chamber should in fact last for an indefinite number of years—particularly when one takes into account the fact that the flame does not at any time come into actual contact with the gills. Further, there are no copper parts whatever in the circulator—a matter on which emphasis is laid by the manufacturers. Then as to accessibility. The removal of a few screws is all that is necessary—without disconnecting either gas or water pipes—to enable one to examine the inside parts. One end portion constitutes an inspection plate, and when, as illustrated in fig. 3, this is taken off—the work of a few seconds—the inspection, and if necessary cleaning, of the interior surfaces of the circulator can at once be proceeded with. What more simple than this could ever be desired? In a similar manner, the gilled portions can be taken out, if required, by unscrewing half-a-dozen nuts at the other end.

A powerful triple cast-iron burner is the heating agent employed; and by merely loosening one screw, this can be easily removed for examination or for cleaning purposes, without in any way disturbing the gas connection. It is pointed out, however, that such removal is very seldom necessary, as special provision is made for dealing with the water resulting from condensation. A feature of the apparatus is the automatic igniter, which is fitted with a pilot-light giving a luminous flame (thus providing against the danger of the atmospheric burners being blown out). The automatic igniter is drawn out to light the pilot; and this action shuts off the main gas supply. The pushing back of the pilot to its original position inside the casing, however, turns on the gas supply again.

In conclusion two more facts only need be mentioned. The circulator, in addition to the pattern which has been the subject of this notice, can be had in a self-contained form. That is to say, a circulator and a 30-gallon water-tank in one—the storage cylinder in this case enclosing the heater. Where existing conditions do not govern the type of apparatus to be connected to a circulating system, the adoption of this pattern might be expected to result in some slight gain over the arrangement by which the heater might be situated in one part of a building and the hot-water storage tank in another. What has been said here may induce those who can conveniently do so to call at the Queen Victoria Street Show-Rooms to see the "Gilled" circulator; but for the benefit of others who are unable to do so, it may be mentioned that the Davis Gas-Stove Company have in course of preparation an artistic illustrated booklet the particulars and diagrams contained in which set forth more fully than it is possible to do in the space at disposal here the advantages that are claimed for this particular method of overcoming the "gas-cooker and hot-water supply" problem.

Personal.

Mr. HUGH E. ROBERTS, who was Assistant-Manager at the Carnarvon Gas-Works, has been appointed Manager of the Pwllheli Gas-Works, North Wales. Mr. Roberts, who was formerly employed as Assistant-Chemist at the Manchester Gas-Works, last year won the Bronze Medal in the Examinations in Gas Manufacture.

Obituary.

The death is announced of Alderman G. F. TRAVIS, who for a long time occupied the position of Chairman of the Gas Committee of the Southport Corporation. Deceased, who was only 52 years of age, was elected a member of the Town Council in 1891, and always took an active share in municipal work. In fact, it is said that at one time and another he had been Chairman of every Committee of the Council, which he had also represented on the West Lancashire Water Board. He had been in poor health for some time; and death was due to heart failure.

In a communication to the Paris Academy of Sciences, MM. Berthelot and Gaudechon dealt with the chemical effects of the ultra-violet rays on gaseous bodies. On exposure to these rays, a mixture of cyanogen and oxygen was nearly quantitatively converted into carbon dioxide and nitrogen. Ammonia mixed with oxygen gave as a final product water, nitrogen, and hydrogen. Hydrogen does not combine with oxygen under these conditions. Formic acid was identified among the products of the reaction with a mixture of acetylene and oxygen.

KLÖNNE'S SYSTEM OF GAS-CHAMBERS.

By M. PAUL PARSY.

[Paper read at the Meeting of the Société Technique du Gaz.]

The first paper read at last week's meeting of the French Gas Society—a report of the proceedings at which appears in another part of our present issue—was by M. Parsy. In it, he described several installations of gas-chambers constructed by the firm of Aug. Klönne, of Dortmund, commencing with the inclined chambers put up at Schalke Gas-Works in 1892, the last example of which is the plant at the municipal works of Königsberg, started in 1909. The horizontal chambers described are those built at Rotterdam (1908), Padua (Nov., 1909), Rixdorf (Dec., 1909), and Frankental, near Mayence. The following is a full translation of the paper, with the exception of a few tabulated figures, which have been summarized.

Towards the beginning of the gas industry (about 1850), the carbonization of large masses of coal was tried by Pauwels and Dubochet, and achieved by the Compagnie Parisienne du Gaz in their works at Ivry and La Villette. The ovens were analogous to those then used in the coke industry; for the object was to make metallurgical coke, the market for which appeared to be more advantageous than that for gas coke. It was, however, not lost sight of that gas was the principal product, the make per ton of which should not be reduced, so that the heating of the ovens was done by coke. One realizes the difficulties which these inventors had to encounter (with only fire-bar furnaces at their disposal) to heat chambers containing 6 tons of coal, and the dimensions of which were 2 metres (6 ft. 6½ in.) wide by 7 metres (23 feet) long. The duration of the charge was 72 hours. The results were not economical; and the system was abandoned without the exact value of the gas made being ascertained, as it was mixed with the rest of the gas made in the works. This was not the object of the experiment, though it would have been interesting, from the technical point of view, to know what it was. What is curious to remember about these trials, however, is that in these original ovens, "the floor was inclined and facilitated the discharge, while in a second system the floor was horizontal, and the discharging was effected by means of a very powerful pusher worked by windlasses, which pushed the coke into masonry quenching boxes" ["Encyclopédie Roret," Vol. I., p. 265]. The economic rock on which the system split was the heating; but, it may be asked, whether success, instead of failure, would not have crowned the efforts of the two inventors, if they had had at their disposal, as modern engineers have, coke producers and regenerative furnaces, which the gas industry only adopted about 1880. At this time, the idea was taken up again; and at the annual meeting in Marseilles in 1883, M. Rodberg read a paper on "An Oven for Illuminating Gas and Metallurgical Coke," which was the outcome of investigations by M. Lencauchez, to whom we owe nearly all the first applications in France of industrial heating by means of poor gas.

This was, however, merely a demonstration, which did not leave the domain of theory. The new method of heating was at its commencement, and was still being discussed even in regard to its application to ordinary retort-furnaces. It is only in recent years that the question has been resuscitated, and has been able to be studied in the full light which gas engineers and contractors now possess on the subject of the carbonization of coal.

A large German firm of contractors, Aug. Klönne, of Dortmund, who for thirty years past have made a specialty of the construction of gas-works, and whose retort-settings are favourably known everywhere, have for some time devoted attention to this problem, and have at the present moment a perfect solution to it. In 1892, they built, at the Schalke Gas-Works, a first setting of inclined chambers, each to contain 5 (metric) tons of coal, able to be carbonized in 24 hours. The results were not what were hoped for; the trial was premature and abandoned. It must be said that then there was little information on the process of carbonizing in bulk, which was not examined and explained as it was some years later by M. Hilgenstock of the Société Otto et Cie., of Dalhousie-on-the-Ruhr, who read a paper* at the forty-second meeting of the German Gas and Water Association, in 1902, at Dusseldorf. This threw new light on the question, and enabled specialists the better to concentrate their efforts into directions likely to lead to success. In this paper, the author investigated the carbonization of coal with the aid of a number of interesting experiments; and he came to the conclusion to adopt a narrow chamber, high and elongated, in which the coal prism would be heated only by the side walls. This chamber, which he advocated for coke-ovens, he also advised for the carbonization of coal for the production of illuminating gas, as he was convinced it would give, with economy, a larger yield and a better quality of gas with gas coals.

About the same time, attention was being directed to the utilization of the bye-products of coke-ovens, and especially of the gas in excess of that required for heating the ovens. Alongside the use of it for motive power, either under boilers or directly in gas-engines, it began to be used for the lighting of towns. In America, where natural gas had long been conveyed under pres-

sure, it was first adopted; and to-day there are several installations of the kind. In Europe, where this means for the utilization of coke-oven gas is less favourably looked upon, it could be adopted in several cases. Certain mining districts would be able, by following what has been done elsewhere, to find economic solutions to provide for interests which have up to now been neglected or badly understood. In Westphalia, there already exist some instances of the distribution of coke-oven gas for public lighting; and a large combination is now seriously talked of, which, if it succeeded, would cause the greater number of the gas-works of the district to disappear. The proposal, in fact, is to lead the gas from coke-ovens to a distance of 50 to 60 kilometres (31 to 37 miles) through wrought-iron pipes or Mannesmann steel tubes, which are rendered necessary on account of depressions in the land of colliery districts. Among existing installations, that of Gelsenkirchen (Westphalia), originally designed for 60,000 cubic metres (say, 2,119,000 cubic feet), reached an output in January last of 50,000 cubic metres (or 1,765,800 cubic feet). The gas is guaranteed to be of 5200 calories, measured at 15° C. and at 760 mm. pressure. It must be stated, however, that this is a standard that is not easily attained with most coal for coking; and it necessitates taking only a certain portion of the gas made during the distillation. The gas is usually delivered at a pressure of 2 metres of water.

The firm of Klönne, who assisted in putting up this special plant, profited by their experience there to examine the new methods of distillation in bulk which they have always had in view; and it has enabled them to arrive at the solution shown in the construction of their ovens which will now be described. So as to arrive at exact figures in comparing the two systems, it was decided to put up at the same time ovens with inclined chambers and with horizontal chambers, the construction of which was begun in 1908—relying in both cases on the data of M. Hilgenstock for the form of the chambers and their heating, which, of course, was to be with coke in regenerative furnaces.

OVENS WITH INCLINED CHAMBERS.

The installation of ovens with inclined chambers was made at the municipal gas-works of Königsberg, where at first two ovens of four chambers, 9.50 metres (about 31 ft. 2 in.) long, each containing 6½ to 7 (metric) tons of coal, were erected. This bench, which was put to work on Jan. 1 last year, has since been completed, as the results surpassed those anticipated. It now comprises six ovens. [The author here gives photographic views of the setting like those reproduced in the "JOURNAL" last year—June 22, p. 837—in connection with Dr. Lessing's Gas Institution paper.] During official tests, from Feb. 12 to March 15, 1909, under the direction of the Manager of the works, M. Kobbert, the following results were obtained:—

- (1.) An average carbonization of 52 tons of coal for the two ovens or eight chambers per 24 hours—i.e., 6½ tons per chamber.
- (2.) A make of 17,000 cubic metres (say, 600,000 cubic feet).
- (3.) Average coke fuel used, 15 per cent.
- (4.) The labour required for the eight chambers, charging, clinking producers, coal handling, and all supplementary work, was 22.65 workmen-hours.

All these results exceeded those guaranteed. Diagrams [given in the paper] show the regularity of the hourly production of gas and of its calorific power. Though the working of these inclined chambers continues to give every satisfaction, it is recognized that the large capital outlay necessitated by their construction is not justified by any appreciable advantage, as compared with horizontal chambers, which are much simpler to erect, stronger, and (above all) less costly.

OVENS WITH HORIZONTAL CHAMBERS.

It was at the municipal gas-works of Rotterdam that the first trial oven with horizontal chambers was erected. It was put into use on Aug. 9, 1908, and has worked without interruption ever since. It has enabled the working of this oven to be followed in a special manner; and as it is isolated, and has its own sequence of apparatus for condensation, purification, washing, and storing of the gas, it really forms a small experimental plant at the works of Oostzeedyk where it is erected—see "JOURNAL" for Dec. 29, 1908, pp. 902-3.

The space available was very limited, and it was necessary to somewhat restrict the dimensions of the oven. It consists of four chambers, 4.50 metres (14 ft. 9 in.) long by 2 metres (6 ft. 6 in.) high, and with an average width of about 40 centimetres (15½ in.). The duration of the charge is 24 hours. The chambers are charged through two openings (fitted with self-sealing lids) placed on the top. The discharging is effected by a horizontal pushing machine, similar to those used for coke-ovens. The coke falls on to an inclined surface, where it is quenched by a spray. The chambers are closed at each end by self-sealing lids, which are moved by lifting apparatus. The broken coal is lifted by an elevator and stored in a tank, from which it is taken to each chamber by means of a shoot hung on rails. In order to equalize the cones of coal formed by the charging at the top of each chamber, a rake worked by the machine is used. This levels the coal along the whole length of the chamber. The discharging machine runs on rails, and is worked by an electric motor. The heating of the oven is done by a coke-producer, and a regenerative furnace, on the Klönne system. The circulation of the gases

* See "JOURNAL," Vol. LXXX., p. 1145.

of combustion takes place between the vertical walls as adopted in coke-ovens. In short, it is clearly to be seen that, following the principles stated by M. Hilgenstock, this oven is nothing else than an adaptation of a metallurgical coke-oven to the manufacture of gas.

The gas escapes by an ascension-pipe that is fixed to one of the charging openings, and terminates in a main, where there is a hydraulic seal. The production of gas begins directly after the charge, and increases successively until its maximum is reached about the fifteenth hour. It then diminishes regularly until the end of the charge. The coke at the moment of discharge is in the form of a prism; an empty space of at least 5 centimetres (nearly 2 inches) running along the walls of the chamber, which enables it to be discharged with very little effort. This prism of coke is divided into two longitudinally, which causes it to open out and fall away on the quenching surface. The coke is harder and denser than ordinary coke; but this hardness varies with the kind of coal, its size, and moisture. The ascension-pipes are never stopped up, and it is never necessary to scurf the chambers—thanks to the good distribution of the heat.

TEST RESULTS.

Tests were made by the technical staff of the works, from Oct. 7 to 10, 1908, under the control of M. Sissing, the Manager of the Rotterdam Gas-Works. The summarized results are as follows:

The coal carbonized was from the "Hugo" colliery of the Ruhr. An average sample showed (per cent.): Water, 2'45; volatile matter, 28'32; carbon, 59'83; ash, 9'40.

The quantity of coal carbonized during the three days in the four chambers was 33,004 kilos., which produced (reduced to standard) 11,327'9 cubic metres of gas. The average make of gas was, therefore, 343'23 cubic metres per ton of coal carbonized (the equivalent of 12,316 cubic feet per ton).

The analysis of this gas gave, on the second day, the following percentage averages: CO₂, 2; C₂H₄, 3'9; O, 0'4; CO, 7'5; CH₄, 27'7; H, 54'5; N, 4.

The calorific power was taken every hour; and the average of the results was 5541 calories gross, and 4971 calories net. The make of gas per (metric) ton in cubic metres multiplied by the gross calorific power gives a result of 1,901,837.

The coke used for fuel was 5810 kilos. during the tests, without deducting cinders or clinker. The analysis of the coke gave: Water, 3'57 per cent.; carbon, 82'63 per cent.; ash, 13'80 per cent. Deducting for moisture and ash, the consumption was 14'5 kilos. per 100 kilos. of coal carbonized.

The production of tar was 1910'25 litres, or 57'88 litres per ton of coal carbonized. Its density was 1'09. Its analysis gave: Free carbon, 2'54; distillates below 170° C., 2'4; 230° C., 15'4; 270° C., 14'01; 350° C., 21'7; naphthalene, 1'1.

The production of ammonia was 110'235 kilos., or 3'34 kilos. per ton of coal carbonized.

The quantity of coke produced was estimated at 767 kilos. per ton of coal. This coke contained 5'32 per cent. of water, which reduces the make to 726 kilos. of dry coke per ton.

The temperature of the oven, taken on the side walls of the chambers, was 950° C., and in the combustion passages 1210° C. It was, it will be observed, lower than that of ordinary retort-settings, which puts these ovens in the best conditions in regard to upkeep.

So as to make a comparison between the distillation in an oven with chambers and one with retorts (horizontal retorts charged with Fiddes-Aldridge machines or inclined retorts, both with regenerative furnaces), a series of experiments with different coals was carried out. The figures in the third and fourth columns represent the product of the number of cubic metres obtained per ton, multiplied by the gross calorific power:—

| Date. | Kind of Coal Carbonized. | Working of Oven with Chambers. | Working of Ovens with Retorts. |
|----------------------------|--------------------------|--------------------------------------|--------------------------------------|
| | | Calories per Ton of Coal. | Calories per Ton of Coal. |
| Aug. 28, 1908 | Hugo | 1,801,476 | 1,626,118 |
| Sept. 24 | " | 1,847,356 | 1,655,290 |
| Oct. 3 | " | 1,907,334 | 1,691,530 |
| " 7-9 | " | 1,901,837 | 1,738,205 |
| Nov. 3-6 | New Pelton | 1,660,870 | 1,738,205 |
| " 16-20 | Rhein Elbe | 1,867,630 | 1,462,860 |
| Dec. 1-5 | Hugo | 1,715,200 | 1,479,550 |
| " 7-9 | " | 1,823,318 | 1,554,142 |
| " 24-25 | Ministre Achenbach | 1,816,998 | 1,554,142 |
| " 26-28 | Hugo | 1,782,612 | 1,644,463 |
| Jan. 26-27, 1909 | Burnhope | 1,756,800 | 1,644,463 |
| Jan. 29-Feb. 1 | Shaw Cross | 1,835,820 | 1,504,800 |
| Feb. 4-11 | Consett | 1,704,768 | 1,519,850 |
| " 16-18 | Single gas nuts | 1,698,918 | 1,519,850 |

It will be noticed that the results of the summer months are higher than those of the winter. M. Sissing attributes this to the fact that, generally, the collieries send an inferior quality of coal in winter to what they do in summer.

Diagrams are given in the paper showing the influence of the charges on the hourly make, the calorific power, the specific gravity, and the lighting power. From an examination of these diagrams, it is seen that the demands of the works could be met

without the necessity of working at night time. With a larger number of chambers, the make could be regulated by avoiding the sharp variations observed at the moment of charging. It will be noticed, also, that the maximum of lighting and calorific power is reached between 3 and 8 o'clock in the evening, which might favourably affect the output when so required. By a mixture in the holders, if desired, an absolutely constant quality of gas could be supplied.

All the figures given were furnished by M. Sissing, to whom the author expresses his thanks. They were taken with the greatest care, with a view to the adoption of oven chambers in the new works proposed at Rotterdam.

INSTALLATION AT PADUA.

The results which have just been given led to the construction at Padua of a bench of four ovens each of four chambers, 6 metres (19 ft. 8 in.) long, of a capacity of 4 tons—i.e., 16 tons per oven, or 64 tons for the whole bench, corresponding to a production of gas of about 20,000 cubic metres (706,330 cubic feet). The two end ovens are divided into two half-ovens of two chambers each, with independent producers and regenerators, so as to form units of 8 tons each. This installation, which was put into action in November last, supplied by itself the gas service of the town during the winter. From the point of view of labour, the reduction has been considerable, because at Padua, the working is done by three squads of eight hours. With the old horizontal retorts with mechanical charging and drawing, to make 20,000 cubic metres of gas per day, 66 stokers were required in the retort-house. With the horizontal chambers, to make 21,000 cubic metres (741,650 cubic feet), it requires one mechanic, only three stokers, and seven labourers. The tar is quite liquid, and does not necessitate any looking after in the hydraulic mains. The ascension pipes have never been stopped.

The results of tests made from Jan. 26 to Feb. 2 last are given, and may be summarized as follows:—

- Duration of test, 7 days; in work, 14 chambers.
- Coal carbonized (net) 377,189 kilos.
- Coke used as fuel (net) 56,335 "
- Gas made (at standard temperature and pressure) 130,584 cubic metres.
- Make of gas per 100 kilos. of dry coal: 34'61 cubic metres (or equivalent to 12,419 cubic feet per ton).
- Make of gas per chamber in 24 hours: 1332 cubic metres (or 47,041 cubic feet).
- Coke used for fuel—wet: 15'84 per cent.
- " " " " dry: 14'48 " "
- " " " " net: 13'99 " "
- Make of coke (4000 kilos. of coal produced 3025 kilos. of coke): 75'89 per cent.

INSTALLATION AT RIXDORF.

A plant of three ovens of four chambers has been erected at the municipal works at Rixdorf (Berlin), and has been at work since December last. Its make, which is 15,000 cubic metres (nearly 530,000 cubic feet), is going to be increased to 25,000 cubic metres (883,000 cubic feet) by the construction of two new ovens.

INSTALLATION AT FRANKENTAL.

We mention, also, the plant at Frankental, near Mayence, the results of which are of special interest to gas-works of average size. It consists of a bench of two ovens, one of which has four chambers and the other three; their length being 5'25 metres (17 ft. 3 in.). The make was intended for 7500 cubic metres (nearly 265,000 cubic feet); but shortly after being put into operation on March 4 last, the output fell to between 5000 and 6000 cubic metres. In order to reduce the make in the same proportion, the oven with three chambers was regulated to carbonize in 36 hours, while that with four chambers continued to work off in 24 hours. The results remained excellent; the calorific value of the gas, ascertained by a Junkers calorimeter, has not fallen below 5000 calories—the average being 5800 calories and the maximum 6800 calories. The make of gas remained at from 34 to 35 cubic metres per 100 kilos. (the equivalent of 12,200 to 12,559 cubic feet per ton) with Saar coal; the expenditure of fuel being 12 to 14 kilos. of coke per 100 kilos. of coal carbonized, with clinkering every 48 hours. At Frankental, the working of the ovens is altogether suspended on Sundays; the last charge being made on Saturday night, and work not being resumed till Monday morning. Not only can night working be got rid of with gas-chambers, but the question of a weekly rest is solved.

We have shown by the results cited that ovens with chambers to-day enter into the domain of the normal carrying on of gas-works, as shown by the lighting of the towns of Padua and Frankental depending exclusively on this method. The principal advantages of this system of carbonization may be summarized as follows: Abolition of night work, which enables a day of eight hours to be adopted without inconvenience; abolition, if desired, of Sunday work, which facilitates the solution of a weekly rest; reduction of labour; higher quality of gas to that from retorts of the same yield; abolition of scurfing, ascension pipe obstructions, and naphthalene; liquid tar and of better quality; yield in ammonia increased by about 30 per cent.; coke harder and in large pieces; less costly upkeep of ovens.

In conclusion, Klönne chambers are in course of construction at the Versailles Gas-Works, at the municipal works of Saint Gilles, Brussels, and at Tilburg Gas-Works (Holland),

ILLUMINATION BY USING INCLINED MANTLES.

By M. GREYSON DE SCHODT.

[A Paper read before the Société Technique du Gaz.]

If the curve of the illumination produced by an incandescent mantle burning in the upright position be traced, it is found—assuming the mantle to be a point—that the illumination is not evenly distributed around this point. Considering the hemisphere below the lamp, it is found in any given plane that 40 per cent. of the total light emitted is projected in a cone (the apex of which is the point of the light source) bounded on one side by the horizontal line passing through this point, and on the other by a line inclined at an angle of 20° below the horizontal; 30 per cent. of the light occurs in a zone defined by two generating lines, one at 20° and the other at 45° below the horizontal; while 30 per cent. is in the space included between this last generating line and the perpendicular passing through the point. This means that in the most common cases—where the light is placed at a height about equal to the radius of the space which is to be illuminated—only 30 per cent. of the total light is obtained on the horizontal plane.

In attempting to obtain a better distribution of illumination, the author has been led to use mantles in an inclined position. The angle will depend on circumstances. It will be greater when illuminating a confined space than in street lighting; but in all cases it can be adjusted to give the maximum light at the spot where the light is actually required. We have to realize the importance not, as hitherto, of the power of the light only, but of its efficient utilization. In an office, for example, it matters not what is the gross candle power of the light; the important thing is to obtain, on the work-table or desk, the maximum illumination of which the light-source is capable.

Though 30 per cent. has been named as the proportion of light of which direct use is made, it is true that some light is obtained from the reflector and from the walls of the room. The reflector on the burner is necessarily of small size, and so reflects the rays of lowest intensity—those nearest the vertical. The proportion of light reflected from walls has been put at 13 to 40 per cent. of that reaching them, according to their colour. The figure for illumination on the floor, when using an ordinary source of light provided with a reflector, may thus be put at 33 per cent.

The author will attempt to show that this illumination may be doubled, and still further increased by the use of inclined burners, without incurring increased gas consumption. The invention is but the application to gas lighting of methods which have long been employed by electricians, who are in the habit of inclining a light-source provided with reflectors so as to produce the maximum illumination at a given spot. In the case of gas lighting, however, this application has involved the production of a bunsen flame which could be used at an angle, as well as of a mantle capable of retaining its shape at an angle without support below. Also means have had to be provided of utilizing the reflected as well as the direct rays of the mantle. The problem of the flame has been solved by providing a current of air able to keep the flame in alignment with the mantle. The mantle is specially prepared and externally supported; and a reflector re-directs the rays of light (which, but for it, would be scattered) upon the mantle. Where sufficient pressure is available, or where the gas (or air) can be used at extra artificial pressure, a chimney for the mantle can be dispensed with.

In giving, now, the photometric measurements showing the economy effected by the inclined burners, it should be stated that they have been obtained in the laboratory of the Société Nouvelle d'Incandescence de Namur, by M. Lamberti, and have been checked by M. Richard, formerly experimental chemist to the Brussels municipal gas service.

SINGLE BURNER WITH INCLINED MANTLE.

Describing first the single burner, and postponing for the moment the multiple or grouped burners, fig. 1 shows the type of construction. A Greyson burner is provided (between the bunsen and the mantle) with a movable connecting piece, jointed elbow, or circular chamber, which carries a fitting holding the carrier or gallery of the mantle and chimney. The burner is provided below with a needle regulator. In addition to these features, the burner is provided with a slender rod mounted in a holder, and covered with a protecting sheath of magnesia, held in a tubulure forming part of the gallery, so that it is in place even when the mantle is inclined. The reflector is formed from part of the surface of a paraboloid.

The action of the burner is as follows: The gaseous mixture passes into the connecting chamber and ignites on emerging from the metal gauze at A. In consequence of the greater height of the chimney, the draught is sufficient to keep the flame axial and the mantle incandescent throughout its whole length, and this however it may be inclined.

The inclined burner can be used for many special purposes, such as the lighting of shop windows, for which it can be installed at the side, on vertical staging, or on one placed horizontally either above or below the level of the contents of the window. The piece connecting the bunsen and the upper part of the burner being hinged to the bunsen, the mantle can be given the inclination needed for the maximum illumination of a given spot.

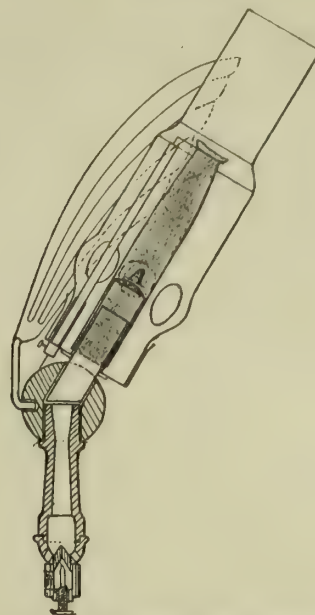


Fig. 1.—The Greyson Burner with Inclined Mantle.

Fig. 2 gives the results of photometric comparisons of two ordinary No. "o" Greyson gas-burners consuming 110 litres—one used upright, the other at an angle of 30° to the horizontal. Both burners were fitted with a reflector of the same kind. The figures given in the diagram are the mean of several observations made at 30 mm. pressure. Similar tests were also carried out with burners consuming 60, 90, 140, and 220 litres of gas. In the case of the upright burner, the maximum intensity of 106.7 candles occurs along the horizontal at the height of the mantle. The variations are traced by the "dot-and-dash" line. The mean spherical intensity of illumination below the burner is here 82.84 candles—equivalent to a consumption of 1.26 litres of gas per candle-hour of mean spherical intensity. The full line gives the illumination with the burner inclined at 30° to the horizontal. Here the maximum intensity of 136 candles is reached at 40° below the horizontal, owing to the better action of the reflector, while the mean spherical intensity is 128.13 candles, equal to a gas consumption of 0.86 litre per candle-hour. The dotted line is that of an inverted Graetzin burner fitted with a reflector

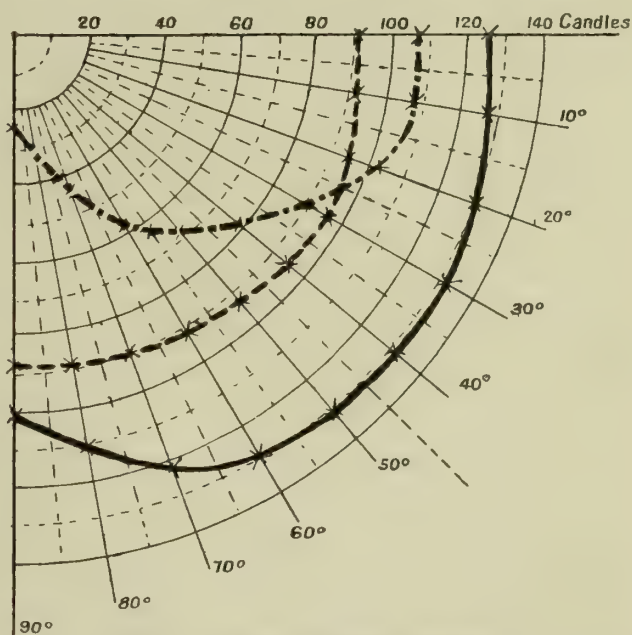


Fig. 2.—Spherical Luminous Intensities.

The Greyson upright burner with reflector is shown by the dot-and-dash line; the Graetzin burner with reflector, by the dotted line; and the Greyson inclined burner with reflector, by the full line. The consumption by the Greyson burners was 105 litres, and by the Graetzin burner, 90 litres. Pressure, 30 mm.

Anticipating the objection that the above may be a particular case, the author has made measurements of the intensity in a plane which is that of the mantle, and also in those inclined thereto at angles of 60° , 75° , 90° , 135° , and 180° . These results are shown in fig. 3 from which it is seen that the solid curves, I, II., and III., corresponding to a sector of 180° , are superior to that of the upright mantle, shown dotted. The curves of illumination corresponding with these different planes (fig. 4) better show the superior illumination; and this demonstration may be pushed still further by working out—as is done in fig. 5—the curve of equal illumination. From this latter, it is seen that, in the case of the upright mantle, the angular measurement of the surface evenly illuminated

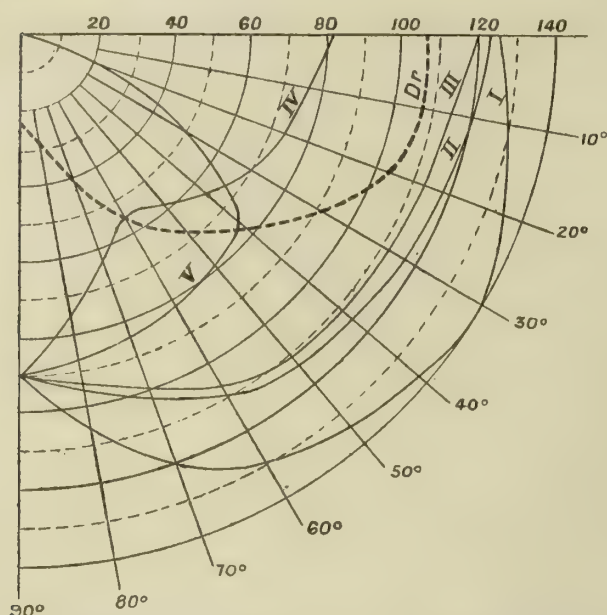


Fig. 3.—Lighting Curve for Greyson Burner with Mantle inclined at 30°. Consumption, 105 litres. Pressure, 30 mm.

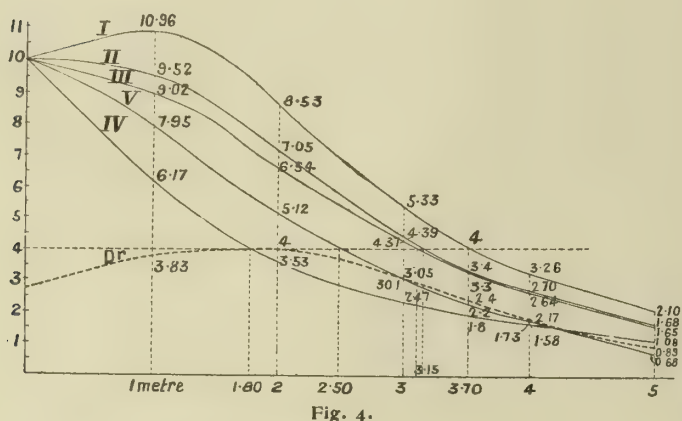


Fig. 4.

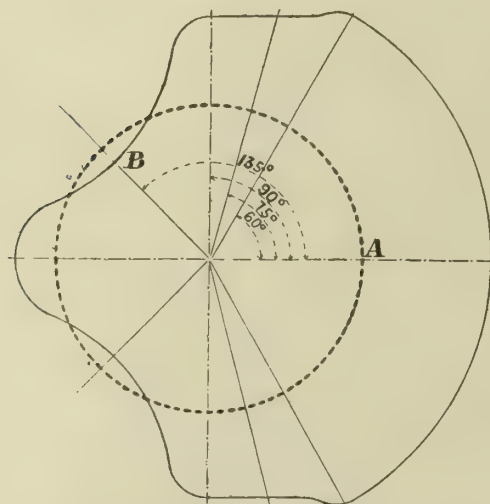


Fig. 5.—Lighting Curve.

Upright mantle, dotted line. Inclined mantle, full line.

is 100, while in that of the inclined mantle it is 240. This is in respect of an illumination of 4 candle-metres. In the case of illumination of a particular point A, the illumination with the upright mantle will be 4 candle-metres, while with the inclined mantle it is 8.53 candle-metres. B, on the other hand, receives 4 candle-metres with the inclined burner, and only 3.53 candle-metres with the upright one.

A specific example will give a better idea of the gain in illumination. Let us take the case of a shop window, 3 metres wide and 1.50 metres deep. In order not to favour the inclined burner, we will place the upright mantle in the most advantageous position—that is, at the centre and at a height of 1.2 metres (H thus equals 0.7 A, where A is the radius of the space to be illuminated). The inclined burner, on the other hand, is assumed to be placed at a height of 1.5 metres, and in the centre of the back partition of the window. In spite, however, of its more favourable position, the upright burner is shown to give a maximum illumination of 25 candle-metres; and the inclined, 43 candle-metres. In the case of the more distant portions of the field, the illumination with the upright burner is 17.29; with the inclined, 20.47. The mean re-

spective illuminations are 21 and 35 candle-metres, or an increase of 66 per cent. The efficiency would have been greater had the inclined burner been placed the same height as the upright.

In the case of street lighting, the adjustability of the inclined burner to any angle (as required by width of roadway) and its provision with a suitable reflector allow of the total light being directed on the ground, instead of being largely scattered in a sideways direction. A street lighted with inclined burners would have an illumination of 285, as against 100 with upright mantles.

MULTIPLE BURNERS WITH INCLINED MANTLES.

As already shown in fig. 3, the illumination given by a single inclined burner is not uniform throughout the whole hemisphere below it; and the author, therefore, sought to group several such burners together in order to increase the illumination at the less intense parts and to provide a uniform spherical illumination in all the vertical planes. The principle on which these lamps are constructed is the grouping upon a single support A (fig. 6) of two

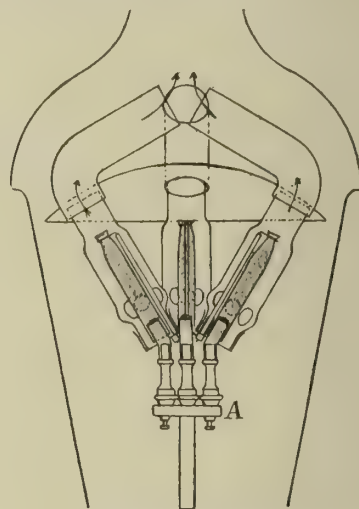


Fig. 6.—Greyson Burners with Inclined Mantles Grouped in Street Lamp.

or more burners each fitted with its movable connecting piece, and thus allowing of the mantle placed above being given any desired position or inclination. The supporting plate of the burners is fitted with adjusting screws, while the gallery of each burner carries either a long glass chimney or a short one; several of these latter meeting (*e.g.*, in a lamp for street lighting) in the chimney surmounting the reflector. The reflector itself is placed at right angle to the axis of the mantles, so as to collect all the rays which are cast upwards. The adjustments permit of one or more burners being extinguished as required.

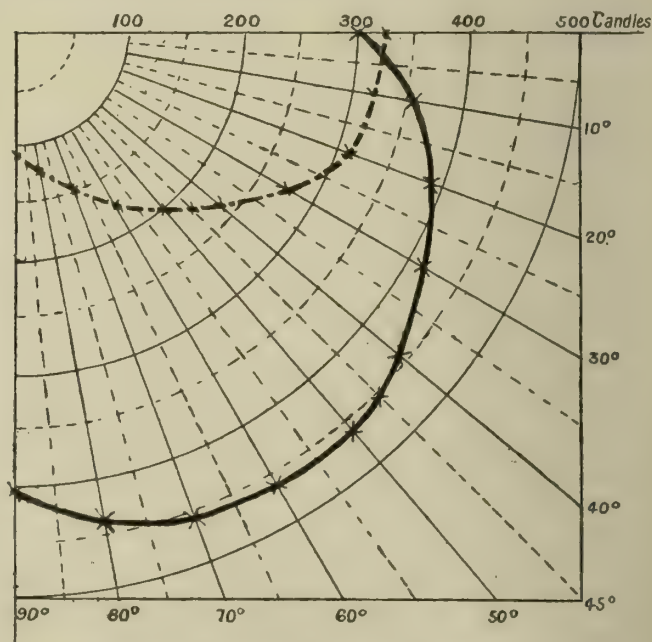


Fig. 7.—Spherical Luminous Intensities.

Three Greyson burners with upright mantles and reflector shown by the dot-and-dash line; the same burners with mantles inclined at an angle of 30° with opaque parabolic reflector, by the full line. Consumption, 315 litres. Pressure, 25 mm.

These grouped burners allow of the inclined system being applied to the lighting of the interiors of workshops, or to public (outdoor) lighting; a bunch of three or four burners, the mantles of which splay outwards from the upright burner-tubes, being a convenient arrangement. As already stated, the degree of angling of the mantles will depend upon the specific conditions.

Fig. 7 shows the results obtained by measurements of two

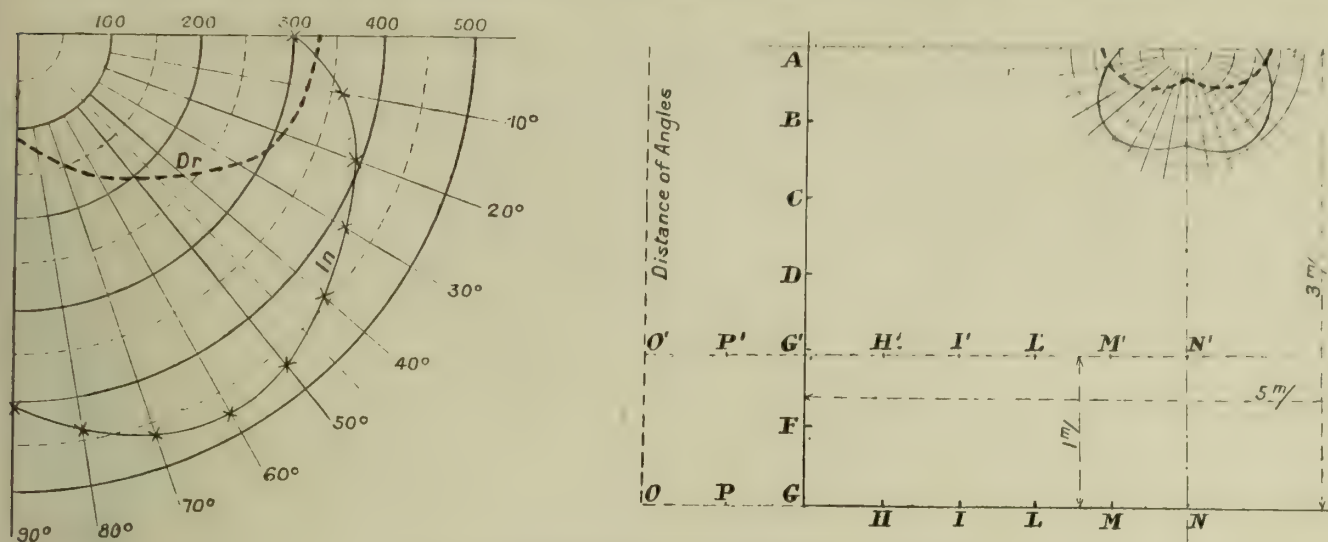


Fig. 8.—Comparative Study of the Lighting of a Room.

groups of three No. "o" Greyson burners of 110 litres consumption. One set was used with upright mantles, and the second with inclined mantles; a similar reflector being used in each case. With the upright mantles, the maximum intensity of 324 candles was obtained along the horizontal; but with the inclined burners, the maximum intensity was 471 candles, and was obtained at an angle of 60° below the horizontal. The mean spherical intensities were 300 and 403 respectively, corresponding with gas consumptions of 1.06 and 0.78 litres per candle-hour of mean spherical intensity. The curves of illumination showed that the light is uniformly distributed around the vertical axis of the apparatus.

To take a concrete example of the differences in the two methods of lighting, the author will assume a room 5 metres square to be lighted by a bunch of three mantles, placed at a height of 3 metres, provided with reflector of the same kind in the cases of both the upright and inclined mantles. Fig. 8 gives the two curves of intensity. From these latter, the illumination of the walls of the room in the two cases may be worked out by the formula

$$E_a = \frac{I_a \sin \alpha \cos^2 \alpha}{H^2}$$

while, as before, in the case of the single burners, the curve of illumination on the floor and on a plane one metre above the floor may be calculated. Expressing these results in the figures which best convey their practical significance, it is seen that the illumination on the walls averages 24 candle-metres with the upright burners and 33 with the inclined burners. On a plane one metre above the floor level, the figures are 24.4 and 68.1 respectively. On the floor itself, they are 11.7 and 36 candle-metres—that is to say, with an illumination of the floor of 100 by the upright mantles, the illumination with the inclined mantles will be 308. These figures do not take into account the light reflected from the walls; but the illumination of the walls being about 37 per cent. better in the case of inclined mantles than with upright, the comparison, with this factor allowed for, would be still further in favour of the inclined mantles.

A shop window lighted by two burners, one set inverted and the other set inclined, may be taken as a second example. The two Graetzin burners are assumed to be placed at a height of 1.5 metres; the pair being placed centrally with a separation of 1 metre. The two Greyson burners with inclined mantles are assumed to be placed on the back wall at a height of 1 metre, and 1 metre apart. The respective mean intensities are 43 and 149 candle-metres, equal to an illumination of 324 by the inclined mantles compared with 100 with the inverted. The consumptions of gas are in the ratios of from 90 to 105 or 100 to 116. The inverted burners are given a position 1.5 metres in height in order to ensure the proper illumination of the upper part of the window.

As a third example, the case of a street 12 metres in width is chosen; the lamps being placed 25 metres apart and the mantles 6 metres from the ground. Let us assume the use in the lamps, first of three upright burners and secondly of the same number of inclined mantles. From the calculated curves, it is seen that the mean illumination of the ground with the upright mantles is 2.35 candle-metres; and with the inclined burners 5.89 candle-metres, or a ratio of 100:290 with the same gas consumption.

It will be readily understood that the inclined mantles are susceptible of various arrangements. The burners, or rather the parts above the burners proper, can be placed obliquely, spreading from each other, under one reflector, or several mantles can be mounted on a single large burner. Or, again, the mantles may be placed obliquely round a sphere, or longitudinally in a vertical or horizontal cylinder. The inclined mantle also permits of the system of lighting by reflection being adopted; the burners being mounted in a hemispherical chamber and the light escaping from the upper open side of the chamber being reflected from the ceiling or other screen back into the workshop. Similarly, the horizontal position of the burner can be utilized by placing the

mantles immediately under reflectors. The system is thus adaptable to all the conditions encountered in practice; and it affords the maximum illumination at the desired spot—being three times as efficient as other systems in this respect. It may, therefore, claim to be a step forward in lighting by gas.

REFORM IN CONDENSATION.

By M. GREBEL.

[A Paper read before the Société Technique du Gaz.]

The author, in dealing with the modern method of treating with tar the gas from the hydraulic main for the removal of naphthalene and the retention of benzol, refers to the forecast of such a method in Bowditch's well-known book, "The Analysis, Technical Evaluation, Purification, and Uses of Coal Gas," published in 1867, in which it was suggested that an efficient method of purification would be to interpose between the hydraulic main and the purifiers proper special apparatus kept at a given temperature, at which the gas and light hydrocarbons would separate from the heavier bodies. The author points out that few of the so-called analyzing condensers designed about 1875 on this principle have survived. Differences of opinion existed as to the temperature at which gas should be treated at this preliminary operation; but the view was almost unanimously taken that the gas should not remain long in contact with the tar. It is bad practice to keep the gas in contact with tar in the cold; but of late it has been found practicable to remove almost the whole of the tar and of the naphthalene at a fairly high temperature, yet retaining still more benzol in the gas. It is an astonishing fact, proceeds M. Grebel, that gas engineers have been so slow in appreciating this good method of condensation, the modern appliances for which have emanated from Germany.

The modern process may be described as consisting of condensation at a fairly high and constant temperature; this condensation being an analyzing or separating process, in which the gas and vapours are treated with the products which condense from them. In other words, by washing the gas with an ample supply of tar at a proper temperature, almost all the vapours, tarry products, and the whole of the naphthalene are absorbed without retaining as much benzol as is taken out of the gas when the treatment is less systematic.

The method raises the question of the removal of vapours from a gas by solvents, in regard to which the author quotes from a private conversation he had with M. Desvignes, following a paper (read in 1908) in which M. Chevalet had recommended the use of a liquid of great solvent action with respect to naphthalene for the extraction of the latter. In order to remove naphthalene, it is not sufficient to discover a liquid in which the naphthalene is highly soluble; it is necessary also to use this liquid in a systematic way. The problem resolves itself not upon solubility but upon vapour tension. When we bring together a gas containing a vapour and a liquid capable of dissolving the vapour, a state of equilibrium is produced between the tension of the vapour in the gas and in the liquid. For example, in the case of the extraction of benzol from the gas of coke-ovens by means of heavy coal-tar naphtha, the benzol is soluble in the naphtha in any proportion—that is, to an indefinite extent. But though the naphtha is an excellent solvent, it is not possible to saturate it with benzol beyond a certain point for any given proportion of benzol in the gas. This point corresponds with the equilibrium of the tension of the benzol in the gas and in the liquid. If this point could be exceeded, the gas would remove benzol from the naphtha, and restore the equilibrium. In practice, the naphtha employed for the recovery of the benzol takes up only from 1 to 2 per cent., and much the same thing occurs in the case of naphthalene.

As Mr. Young and his students have preached, one of the best solvents of the tarry matters and the naphthalene in the gas is

the tar itself. But the process must be carried out scientifically. Of the different methods of treating the gas with tar, one consists in allowing the tar to fall in a finely-divided state down a tall tower (the Klönne process); another, in reducing it mechanically to a fine state in contact with the gas (the Otto method).

In the Klönne condenser, perforated diaphragms, &c., break up the tar into tiny drops, forming a fine rain or mist in the apparatus, in which the gas mixes without appreciable loss of pressure. The crude gas enters the lower part of the condensing tower while it is still warm. The diameter of the tower is about 3 metres and the height about 30 metres. In the case of one erected at the Lünen works, of a capacity of 6000 cubic metres a day, the base forms a reservoir from which the tanks are directly charged. Another large installation is that at The Hague. It consists of four condensers with a total capacity of 150,000 cubic metres per day.

The outside air supplies the cooling action, which, owing to the large size of the towers, is slow and gradual. As the gas in its passage meets the tar coming in the opposite direction, this latter and the hydrocarbons with it undergo a species of fractional distillation to the advantage of the lighting power of the gas. These more volatile hydrocarbons which tend to condense in the upper part of the tower are re-absorbed by the ascending stream of gas. Benzol cannot remain in solution in the tar which collects at the base of the condenser, since the temperature here is practically that of the incoming gas, or about 60° C. Moreover, a steam-coil may be used to keep the tar at a constant temperature.

On the other hand, the intimate contact with the constituents of the tar capable of dissolving naphthalene retains this latter completely. At the temperature of the outlet of the condenser, which is about that of the outside air, the naphthalene cannot escape solution, nor can it be taken up by the gas. According to Schäffer (as translated by M.M. H. Marquisan and Ph. Delahaye) "the chemical analysis of the tar separated in different works by the Klönne coolers shows that this tar is richer in naphthalene than that produced in works where cooling is done more rapidly." The following two analyses were made at Dortmund and Bochum respectively:—

| | Per Cent. | Per Cent. |
|--------------------------------|-----------|-----------|
| Ammoniacal liquor | 5'6 | 7 |
| Light oils | 2'4 | 8 |
| Naphthalene, dry | 12'6 | 14 |
| Medium oils | 10'4 | 27 |
| Heavy oils | | |
| Anthracene | — | 3 |
| Pitch | 68'0 | 41 |
| Loss by distillation | 1'0 | — |

Now the tars from gas-works and coke-ovens in Germany contain, as a rule, only 4 to 7 per cent. of naphthalene. Owing to the higher proportion of light and medium oils in it, compared with that from the hydraulic main and the usual condensers, the Klönne tar is fairly fluid.

There is no antagonism in the two operations which go on in the condenser—viz., the absorption of the naphthalene and the retention of the benzol by the gas. The boiling points of benzene and toluene, 80° and 110° respectively, are widely removed from those of naphthalene (210°) and anthracene (350°); and thus the difference in the vapour-tensions of the two classes of body permits of a very complete separation of them within moderate limits of temperature. The temperature of the tar which collects at the base is about 60°, or 20° above that of the outlet. In order to regulate the latter, there is fixed a bye-pass, which takes off part of the gas mid-way up the condenser. Since, in cold weather and in the case of a small make, this bye-pass can be used full open, and half of the cylinder is thus put, practically speaking, out of action, it will be understood that the constructors have been led to build their apparatus of very considerable height. In some cases a series of bye-passes have been fitted at points at various heights.

The way in which the gas circulates in the condensers is of great importance. The speed should be slow enough not to reverse the current of the fine stream of tarry particles—that is, not to take these latter with it from the outlet. The Klönne firm have not given many details of the arrangements at the outlet, nor of the means which they adopt to induce the state of mist in the tar. The best testimonial to the working of the installations which have been erected is that a species of chart or table is now issued by which the gas-maker can work under various conditions. The spraying arrangement also permits of the trellis diaphragm being cleaned from time to time.

The author must express a preference for this principle of condensation over that of the naphthalene trap. When this latter is used, there is still plenty for the Pelouze and Audouin condenser to do; while, on the other hand, it has been stated by the Director of the La Haye works that after the gas has passed the Klönne apparatus, all the other condensers can be dispensed with. In many works the condensers previously in use absorb ammoniacal liquor, which is scarcely coloured with light oils on the gas being first passed through the Klönne condenser. It should be added that the proper place for the Klönne is as near as possible to the hydraulic main, so as to secure the maximum of condensible products. As an experienced gas-maker remarked to the author, "It is not difficult to see the reason for this; we cook the gas in its own juice."

The Otto system (information in regard to which the author owes to M. Sauvet, who has had the opportunity of seeing the apparatus at work at Julia and Vondern) is applied to coke-furnaces

where as a rule there is a dry hydraulic main. The gas emerges from the main at a temperature of from 160° to 170°. This is brought down to 80° in coolers before the gas enters the Otto apparatus. This consists of a long horizontal main, about two-thirds full of tar. On the top of the main are symmetrically placed three tuyers for the inlet, and three for the outlet, joined by separate collectors. In the inlet tuyers finely-divided tar is injected in the direction of the flow of the gas. The tar is not intermingling with a vapour such as steam under pressure; it is injected "neat," by the turbine pumps, under a pressure of 0·60 kilo. The tar which is thus absorbed in the apparatus, and circulates in a closed circuit, meets the surface of the tar in the main at the same time as all the naphtha oils which it has itself absorbed. The three injectors can be placed in action together or one or two at a time.

Immediately following the injectors in the Otto process is a saturator containing sulphuric acid, in which the so-called process of "direct sulphuration" is conducted. In this, the fixed (combined) as well as the free ammonia is converted into sulphate without, of course, any distilling with lime. Contrary to expectation, the saturator does not heat. In the distillation process for making sulphate, it is not the dry steam which causes the bath to heat, but the large quantities of water mechanically brought into the saturator—the quantity of steam being quite minute. The gas itself in the old process contains only saturated steam; and the temperature at the outlet of the saturator is the same as that at the inlet. No tar is carried forward to the saturator or to the subsequent apparatus in which the gas is cooled to 25° before being treated with the heavy naphtha for the extraction of the benzol. The only product is water, slightly coloured.

Washing with tar at the high temperature of about 100° is an essential feature of the process if the whole of the ammonia, both free and combined, is to be obtained in the saturator. At temperatures which fall appreciably lower than 70° to 80°, the fixed ammonia compounds are to a large extent condensed along with the water, which also retains a little of the free ammonia (as in the Koppers direct saturation method).

It will be understood that the manufacture of the sulphate in this direct manner possesses several advantages; a commercial product being obtained without the expense of washing or distillation. The sulphate is very slightly grey, but is not to be compared with the crystals, floating in a dark liquor, such as the author has seen produced in the Mond apparatus. The objection that has been raised against the process is that the sulphuric acid itself and the hydrochloric and hydrocyanic acids which are liberated by it, give rise to attacks. This can be remedied by once washing the gas and passing it once through a purifier before treating it with the naphtha. As a whole, the Otto system appears to have been brought to a pitch of perfection.

The Klönne and Otto processes having demonstrated the beneficial effects of treatment with finely-divided warm tar, the author has considered whether such action might not be secured in a less elaborate apparatus. It is certain that the ordinary perforated washer would be altogether inefficient, as would also coke-towers, &c., unless employed for the very fluid tars obtained from vertical retorts.* But a finely-divided and even stream (or mist) of tar could be obtained in tall empty scrubbers by means of pumps for the tar and suitable distributors. Existing scrubbers would be usable for this purpose so long as their diameter was large enough for the gas to circulate slowly, and to avoid taking up the tar mechanically. The outlet temperature would be controllable by that of the tar admitted, and to a certain extent by the quantity of tar. Such an arrangement would have the advantage of being adaptable to the more recent methods of making sulphate, such as the Koppers and the Feld† processes. In the former, the wet hydraulic main lowers the temperature of the gas to the necessary 60°, while the latter makes use of the sulphur in the gas in forming the ammonia compound—the sulphur being first converted into sulphurous acid and ferrous sulphate.

* M. Allner pointed out in the "Journal für Gasbeleuchtung" for June 5, 1909, that the tar of vertical retorts can be used in place of anthracene oils in the naphthalene washers. The tar was capable of taking up 13·6 per cent. of naphthalene and removing 0·371 gm. per cubic metre from the crude gas, causing less loss in lighting power than heavy oil.

† Strictly speaking, the description "direct sulphuration" applies more appropriately to the Feld process than to the Otto or Koppers processes.

The Junior Institution of Engineers.—Arrangements are being made for the summer meeting of the Institution to take place at Dublin and Belfast from the 16th to the 23rd prox. The programme opens with a reception at Trinity College, Dublin, by the Provost and Professors of Engineering, and an inspection of the Engineering School, &c. In the evening, the Institution of Civil Engineers of Ireland will entertain the members and ladies accompanying them. Among the visits will be one to the Corporation's new reservoir under course of construction at Roundwood; Mr. John G. O'Sullivan, the City Engineer, acting as guide. In the evening, the party are to be the guests of the Engineering and Scientific Association of Ireland. At Belfast, on the 21st, the Lord Mayor (the Right Hon. Robert J. M'Mordie, M.A.) will receive the members at the City Hall, and entertain them at luncheon. On Friday, the 22nd, there will be the Institution's summer dinner. It is hoped the President (Engineer Vice-Admiral Oram, C.B., Engineer-in-Chief of the Fleet) will be in the chair.

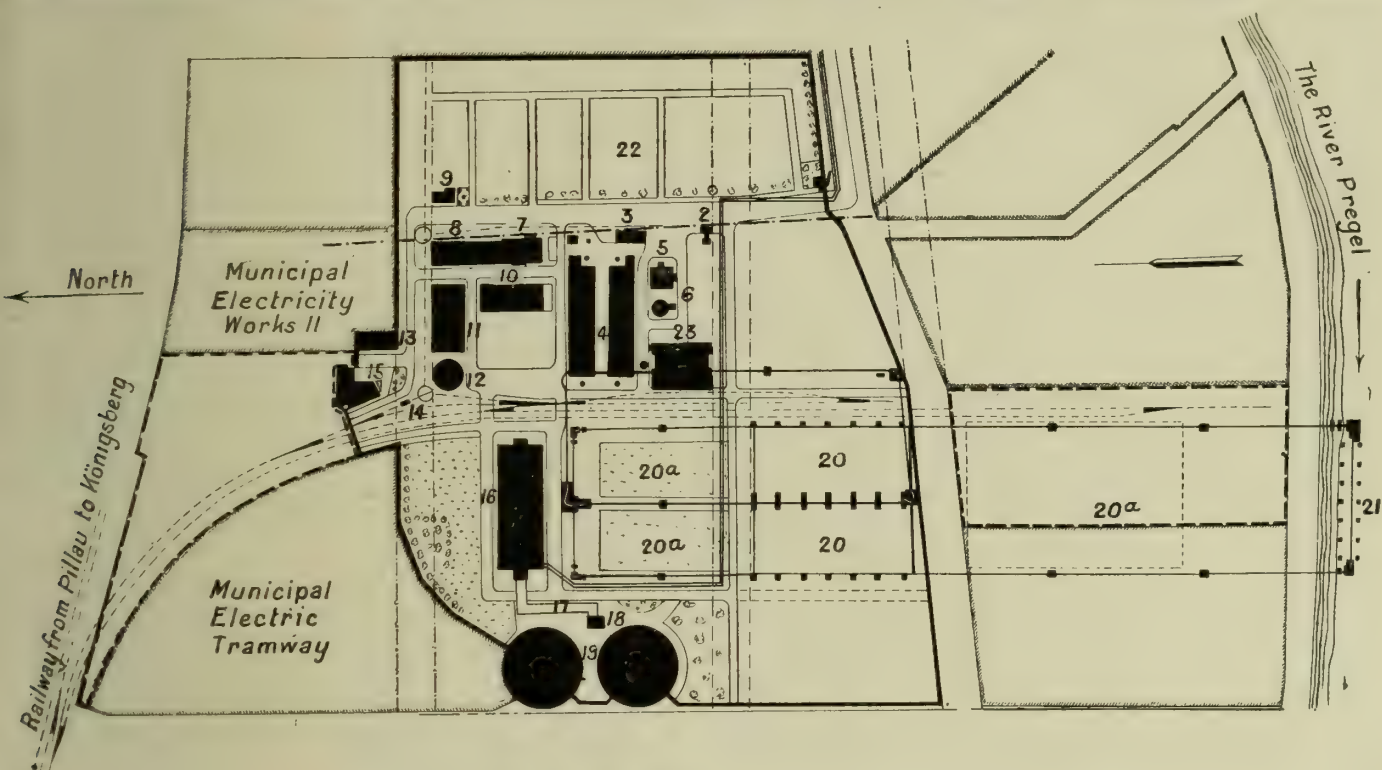
THE KÖNIGSBERG GAS-WORKS.

A HISTORICAL account of the development of the municipal gas undertaking of Königsberg, in Prussia, and a description of the gas-works there at the present time were given by Herr Kobbert, the Manager of the gas undertaking, in a special pamphlet which had been prepared by him for distribution to the members of the German Association of Gas and Water Engineers on the occasion of the annual meeting of the Association at Königsberg on the 20th to 24th inst. Having regard to the great development which has taken place in the sale of gas in Königsberg under Herr Kobbert's management of the undertaking, and to the many more or less novel methods of working which he has introduced on the works, we have prepared from his pamphlet a short account of the more interesting features of the works.

HISTORICAL.

So long ago as 1825, an English company made an offer to introduce gas supply in Königsberg; but the Corporation considered the proposition premature. In 1845, proposals were renewed by private companies for the erection of a gas-works, but it was then thought that the works, if erected, should be in the hands of the Municipality. In 1848, Herr G. M. S. Blochmann, who had erected the Stettin Gas-Works, laid a project for

a gas-works at Königsberg before the authorities; and in 1850, a detailed scheme was worked out by Herr Kühnell, of Berlin. The latter scheme was approved by the Municipal Council in September, 1851; and on Nov. 13, 1852, gas from the new works, erected according to the scheme, was first used for public lighting. The progress of the gas supply in the town was thenceforward continuous and rapid. Considerable extensions of the works were required in 1857-8; and in 1863 a new retort-house, condenser house, coal-store, and boiler and engine house were erected. In 1870, new tar-wells and coal-store were completed, and in 1871 a fourth gasholder. By 1873, six new purifiers and a station meter had become necessary; and in 1877 an engine-house and twelve new beds of seven retorts were erected. A fifth gasholder and offices were required in 1881; and in 1893 a new plant for working up liquor was introduced. The sales of gas in 1858 amounted to about 53,394,000 cubic feet, and had risen by 1885 to 176,631,000 cubic feet, and by 1900 to 315,680,000 cubic feet. Thenceforth the increase in the sale of gas was extremely rapid. In 1905, the quantity sold amounted to 501,158,000 cubic feet; in 1908, to 643,224,000 cubic feet; and in 1909, to 677,021,000 cubic feet. In 1895, it became evident that a new gas-works would be necessary, and it was finally decided in 1897 to erect the same. As, however, the productive capacity of the old works had proved insufficient in the winter 1897-8, a water-gas plant was installed in 1898, which served to meet the demand for gas for a few years longer. The gasholder capacity was, however, inadequate; and consequently a gasholder was the first item erected on the new works. This was brought into action in



PLAN OF THE KÖNIGSBERG GAS-WORKS.

- | | | |
|-------------------------------------|--|--|
| 1. Gatekeeper's house. | 9. Tinsmiths' shop. | 17. Mains to valve-house. |
| 2. Conveyor weighing-machine. | 10. Condenser and washer house. | 18. Valve-house. |
| 3. Coke-breaking and sorting plant. | 11. Boiler-house and sulphate plant. | 19. Gasholders. |
| 4. Retort-houses. | 12. Reservoir tower. | 20 and 20A. Coal-storage sheds and sites |
| 5. Water-gas plant. | 13. Baths. | for extensions of same. |
| 6. Relief gasholder. | 14. Waggon weighing-machine. | 21. Coal-unloading berth. |
| 7. Offices. | 15. Workmen's canteen. | 22. Coke-yard. |
| 8. Stores and shops. | 16. Purifier, meter, and governor house. | 23. Carbonizing chamber settings. |

the autumn of 1901. The rest of the new works was then so far advanced that the first of the retorts were charged in July, 1902, and gas was supplied from the works on the 2nd of August.

DESIGN AND PLAN OF THE NEW GAS-WORKS.

When the question of the extension of the old works or the construction of new works was considered in 1896, it was found that all the land available for extension would have been sufficient to raise the productive capacity of the gas-works to a daily make of only about 2,650,000 cubic feet. There would have been the further disadvantage about this extension, that the new portion of the works would have been separated from the old by a public thoroughfare. Moreover, the foundations of the existing buildings of the gas-works were inadequate to carry the heavy load of modern plant, and would have suffered from the erection of any modern buildings adjacent to them. Finally, it was impossible to get railway communication to the works, and the site of the old works also had a very high value for building purposes in the course of the development of the town. For these reasons it was decided to erect new works in a more favourable position. It was necessary that the works should be on the River Pregel, and it was desirable also that it should have railway communication.

Close to the town boundary the only site available which fulfilled these conditions was one in the immediate neighbourhood of the fortifications; and a condition in regard to building there was that the buildings should be of a light and temporary character, so that they could be readily razed. Having regard, however, to the importance of the gas supply to the city, and to the desirability of the works being close to the walls and so protected by the fortifications, a relaxation of this condition was made in respect of the gas undertaking by the military authorities, to whom the Municipality gave written guarantees and a sum by way of compensation for any interference with the existing fortifications. In September, 1896, the required land was bought on favourable terms. Seeing that the position of the site on the River Pregel and adjoining the railway line to Pillau was so satisfactory, it seemed desirable ultimately to transfer the whole of the gas-works plant to this site, where there was ample room for all probable requirements in the way of extensions. The matter was debated, and doubts were expressed in the Town Council as to whether any such development of gas supply as would justify the undertaking of such a scheme of transfer and extension was probable. These questions were discussed in a report which Herr Kobbert presented to the Council in May, 1897, in which he dealt with the

question of the bearing of acetylene and of water gas manufacture on the future of gas supply. Ultimately the Town Council on Sept. 7, 1897, decided to erect a new gas-works on the site referred to, to ratify the proposed agreement with the military authorities, and to proceed with the preparations for the erection of the works by way of inviting competition for designs. A sum of £1500 was set aside for promoting the competition, of which total £1200 was later assigned for prizes for the three best schemes submitted. As a result of this prize competition, the prizes were awarded on Aug. 26, 1898, as follows: First prize, to the Berlin Anhalt Engineering Company, of Berlin, in conjunction with the Stettin Firebrick Works, of Stettin; second prize, to Herr Pohmer, Engineer at the Hanover Works of the Imperial Continental Gas Association; and third prize, to Herr Robert Schilde, Works Superintendent of the No. 2 Gas-Works of the Leipzig Corporation. The judges, however, in awarding the prizes stated that none of the schemes submitted could be recommended forthwith as a basis for the projected works.

The Lighting Committee of the Municipality, having regard to this view of the judges, decided a month later to have an independent general scheme for the new works drawn up by the management of the gas-works. This was done, and the scheme was ratified by the Municipal Council on March 16, 1900. It had special regard to the conditions laid down by the military authorities. The boundary of the site to the east of the fortifications formed the western limit of the coke yard and the other storage ground. The available frontage to the River Pregel amounted to only about 500 feet, and the coal-stores were arranged directly behind this. Railway communication was obtained by a connection having the smallest permissible radius with the line from Pillau to Königsberg. The holders, designed to take the entire make of the gas-works, were relegated to the western portion of the site, which is that farthest away from the fortifications, and consequently the retort-houses and other works buildings were necessarily placed between the coke yard and the coal-stores. The new works were constructed immediately for a daily productive capacity of 50,000 cubic metres (1,750,000 cubic feet); but the site was sufficient for extensions to a daily make of 200,000 cubic metres (about 7,000,000 cubic feet).

A plan of the new works is given on p. 955. It will be seen that the site is cut by three roadways, between the first two of which is the largest available space, and on this the chief works buildings were erected. It was decided that, with a view to subsequent extensions, provision must be made for the stream of gas to have two ways by which it could travel from any point on the works. This entailed the establishment of two systems of works' mains, either of which it was decided must be adequate for the maximum requirements of the purifying or other works' plant. The buildings were to be constructed of such an area that they would contain apparatus for a make of at least $3\frac{1}{2}$ million cubic feet per diem, with the possibility of ready extension for a make of double this quantity. The nature of the site—which for the most part lay in an old bight of the bed of the Pregel—entailed that a framework of piles should be used for any appreciable load, the length of piles requisite being from 40 to 56 feet. The position is only about five miles from the mouth of the Pregel, and the water-level therefore varies with the direction of the wind, rising to as much as 5 feet above the normal level. It was decided, therefore, that the roadways on the works should be 6 to $6\frac{1}{2}$ feet above standard water-level, and that there should be no underground cellars with, of course, the exception of the water-tight tanks. Rain water and clear effluents are discharged direct into the Pregel; but other drainage passes through a sludge pit, and is thence pumped into the town sewers.

RETORT-SETTINGS AND COKE CONVEYING AND SORTING PLANT.

The carbonizing plant was installed according to the ideas which prevailed in the gas industry in the summer of 1900, when inclined retort-settings were in favour, and it was not settled that long retorts were superior. Consequently, the carbonizing plant erected, consisted of 24 settings, each containing nine inclined retorts, $3\frac{1}{2}$ metres (11 ft. 6 in.) long. These were disposed six settings in one bench with a chimney, and each retort-house contained two benches. The settings had producers set in them on the discharging side. The main flue of the producers was placed on the ground level on the charging side of the settings. The whole of the producers and the bottom of the main flue were above ground, because of the high level of underground water, so that the discharging stage was raised 10 feet above the ground level. The retorts are of large cross section, and take charges of about 5 cwt. The average weight of a charge of English coal to be worked off in six hours is about $4\frac{1}{2}$ cwt. Each bed has a separate hydraulic main, with separate tar and gas outlets. In addition to the regular tar overflow, there is a cock at the bottom of each hydraulic main for drawing off the tar at intervals. By this arrangement, it has been found possible to work English coal without special cleansing of the hydraulic mains. The ascension pipes are 7 inches in diameter. The gas connections from six settings terminate in a foul main 18 inches in diameter, and the four foul mains run into two mains 34 inches in diameter, either of which can be used alone if desired. This alternative provision has proved to be very useful as a precaution in case of stoppages from thick tar.

Above the settings is a coal bunker, with partitions so that each setting has its separate store of coal. The scraper conveyor runs above the bunker with a slide over each section for discharging

the coal. Alongside the bunkers is a narrow-gauge railway with waggons of 18 cubic feet capacity, which can be emptied into any bunker through an opening in its side wall. These openings are closed by flaps when this reserve conveying plant is not in use. Work was started in 1902 with the reserve plant for conveying the coal. The apparatus for discharging the coal-ships on the Pregel, and the coal-sheds and coal-conveying plant were not then installed. The coal was discharged from lighters into tipping-trucks of about 1 cubic yard capacity as on the old gas-works, and these trucks were drawn by horses to the works. The coal was similarly taken from the store to one of the ends of the retort-house. At each end of the retort-house was a lift for the trucks, which were thereby raised up to the narrow-gauge railway that runs alongside the coal bunkers. Since the installation of the mechanical coal conveying plant, however, the coal comes by a rope line to the western ends of the two retort-houses. The waggons of the rope line are discharged into small intermediate receivers, from which the scraper conveyor (already referred to) takes the coal into each retort-house and discharges it into the coal bunkers. The coal passes from the bunkers into the fixed measuring chambers, of which there are three over each setting. By the moving of a lever, the measuring vessel is caused to discharge its contents into a travelling shoot which is brought under it, and which enters the mouthpiece of the retort. There is a travelling shoot for each row of retorts in each bench. The coke is discharged red-hot from the retorts into the producers by the aid of a two-wheeled waggon. The producers are recharged at intervals of two to four hours, and clinkered once a day. The rest of the coke is shot into a trough, containing water, placed beneath the discharging stage. This trough is covered, and is provided at the end with a steam escape pipe. The trough is provided with a draw chain conveyor, and the water circulation is maintained by means of a centrifugal pump. At the end of the trough the coke passes under a sprinkler, to ensure that it has been completely quenched, and then falls into a receiver, from which it is raised by an elevator to the coke breaking and sorting plant. This plant contains Krupp's hardened steel drums by which the coke is broken. The coke is sorted into four sizes, of which the dust or breeze is used mainly as boiler fuel on the works, though a small quantity of it is sold for household use. There are ten receivers for the sorted coke, one of which is for breeze, three for the largest, four for the medium-sized, and two for the small coke. Carts can be loaded directly from these receivers, and there is a small band conveyor which takes the coke from openings in the sides of the receivers to railway waggons on an adjacent line. The conveying plant, pumps, and auxiliary apparatus are driven by electric motors, the current for which is supplied, at 500 volts, from adjacent electric works.

The carbonizing staff works in three shifts; the labour being apportioned as follows: Three men for each bench of six settings to charge and discharge the retorts, charge and clinker the producers, and clean the retort mouthpieces and the stages; one man for each retort-house (containing two benches) to clear ascension pipes and generally look after the retort-house equipment; one man to work the elevators and coke breaking and sorting plant. One bricklayer will generally be engaged on the settings for two out of the three shifts, and one smith or mechanic, with a labourer, may be required on the fittings for one shift a day. The retort-houses are on brick foundations raised on a framework of piles 40 ft. to 52 ft. 6 in. long. This framework extends under the whole area of the retort-house. The settings themselves are built on a concrete platform 2 feet thick, between which and the plank bottom over the pile foundation is ballast. The retort-house consists of a lattice framing filled in with rammed concrete from 3 to 4 inches thick, with wire insertion. All the principal columns of the iron framework are stiffened at the height of the stage by a horizontal lattice girder. In order to reduce the width of the roof, a low lean-to lattice glass roof has been erected over the discharging stages, so that only the span roof resting on the principal column is as high as is required for the coal conveying plant. The iron span roofs are covered with grooved tiles. There are in the roofs three dust exits over each bench of settings, consisting of truncated pyramids of iron framing with rammed concrete walls. A passage 40 inches wide leads in each retort-house to an iron framed and cement and lattice tiled structure, which contains a dining and rest room (242 square feet in area) for the stokers, a 307 square feet dressing-room, and five rooms each containing two shower baths.

THE CONDENSER AND WASHER HOUSE.

The two 34-inch mains from the two retort-houses diminish at the north side of the No. 1 retort-house to 24-inch mains, and then run above ground to the condenser and washer house. At the south end of this house an annular condenser, having a cooling surface of 1560 square feet, stands in the open. The apparatus contained in the house is divided into two sections by a gas-tight seal, and each section can be worked independently of the other. The washer-house is divided into three rooms by two partitions. In the first room, there are two water condensers, having 3700 square feet of water-cooling surface and 570 square feet of air-cooling surface. There is room for a second installation of the same size. The second room contains the exhausters, of which two—of the three-blade type, having a capacity of 80,500 cubic feet per hour when running at 80 revolutions per minute, and driven by horizontal steam engines—have so far been installed. There is room for a third exhauster of the same size. In the

upper part of the exhaustor room is a travelling crane to remove any parts of the exhaustors when required. In the third room, there are placed a Pelouze and Audouin tar extractor for 1,750,000 cubic feet per diem and the Pelouze extractor which was erected in the old works in 1896, of 1,225,000 cubic feet per diem capacity. There is room for a third extractor of the same size as the first. There is a washer for cyanogen extraction according to Dr. Bueb's process, driven by a vertical steam-engine, of a capacity of 1,750,000 cubic feet per diem; and space has been allowed for a second washer of the same size. There are two ammonia extraction washers of the "Standard" type, driven direct by vertical steam-engines, of a capacity of 1,750,000 cubic feet per diem. Space is allowed for a third similar washer. A water-tube condenser, with 1765 square feet of water-cooling surface and 270 square feet of air-cooling surface is placed between the cyanogen and ammonia washers.

The general arrangement of the apparatus in the house is such that the gas can pass to it from either of the large works' foul mains, and that space should be available for the installation ultimately of apparatus for a daily make of 3,500,000 cubic feet with 50 per cent. reserve in tar extractors and washers. Great care has been taken that all the connections should be readily accessible. In order to utilize ground area and diminish the high cost of foundations, the space between the pile framework and the floor has been utilized for tar and liquor tanks. Above the floor level is a chamber for the gas and tar and liquor mains. This chamber has a perforated floor, so that there is ample ventilation when work is being carried out on the mains. Two steam-pipes, each of sufficient size to supply the whole of the engines, come into the house from the boilers. Communication between the three rooms of the house is established by means of an open concrete gangway on the eastern side, to which access by staircases at both ends is provided. The tanks for tar and liquor have double lids. The tar and liquor from the apparatus pass through an 8-inch main into a separating tank, from the bottom of which the tar passes into the first tar-tank, and the liquor runs through an overflow into the first liquor tank. The liquor is then pumped through lead pipes by two pulsometers up to an overhead tank of 1400 gallons capacity, from which it passes to the distilling plant. There are also two cylindrical vessels, hermetically closed, to receive cyanogen sludge from the cyanogen washers.

PURIFIER AND GOVERNOR HOUSE.

The gas passes from the washer-house through two underground cast-iron mains, 20 inches diameter, to the purifier-house. The purifiers are arranged in two sets, both of which can be fed from either main. At first only four purifiers, each having an area of 690 square feet, were put in. The purifiers are of the usual cast-iron pattern, with wrought-iron lids with water-seal. The vessels stand 7 ft. 6 in. above ground level, on an iron structure of piles; and 40 inches above the lower edge of the vessels and $2\frac{1}{2}$ inches beneath the upper edge of the cups, is a perforated wood working floor. There is, 18 ft. 6 in. above this working floor, a concrete roof to form the revivifying floor, which is asphalted. The floor is perforated at four points by iron ventilating shafts, 43 square feet in cross section. These shafts pass through the revivifying floor and the roof of the house to the open, having a wind protector at the top. Beneath the roof ties is a wooden floor on which new or entirely spent oxide can be stored. The roof has a lantern with fixed louvres, so that the revivifying floor is freely ventilated. Over each set of purifiers there is a travelling crane with four hooks to raise the lids of the vessels. Above each vessel there are two openings in the revivifying floor through which the material for charging the vessels is passed down two shoots into the vessels. The shoots are carried by the travelling crane. The vessels are discharged through four openings in the bottom on to four shoots leading to a Bradley conveyor, which removes the fouled oxide to any part of the revivifying floor.

(To be continued.)

Woodall-Duckham Verticals for Lausanne.—It is not very often that one sees gas-works contracts noticed in the Engineering Supplement to "The Times;" but last Wednesday the success of Messrs. Woodall and Duckham in connection with the Lausanne Gas-Works was referred to in the following terms: A correspondent informs us that a new gas-works at Lausanne is being built and equipped by Messrs. Woodall and Duckham, Limited, of London, who obtained the contract, amounting to about £30,000, in the face of keen German competition. The firm's patent system of vertical retorts is being installed. The retort-house, which is to be ready by September next, is a brick-lined steel structure, 140 feet long, 50 feet high, and 36 feet wide, standing between the coal and coke stores. From the coal-store, which has a capacity of 8000 tons, and is supplied by means of a private railway siding, the coal is taken by conveyors to hoppers in the retort-house, whence it is fed automatically into the retorts. The carbonization will proceed continuously; the coke, by means of revolving prongs arranged spirally, being mechanically extracted from the bottom of the retorts and sliding down shoots to conveyors that take it to the coke-store, which has a capacity of about 5000 tons. The retorts, numbering 48, are arranged in sets of four, and are designed to deal with 120 tons of coal a day, producing $1\frac{1}{2}$ million cubic feet of gas. The fire-clay retorts, the castings, and much of the material, have been imported from this country. The contract also includes the erection of a brick shaft 130 feet high and 16 feet square.

INFORMATION ABOUT GAS COALS.

A CONTRIBUTION BY DR. KARL BUNTE TO THE REPORT OF THE COMMITTEE FOR THE INSTRUCTIONAL AND EXPERIMENTAL GAS-WORKS OF THE GERMAN ASSOCIATION.

It will be seen from the report of the Committee that the Instructional and Experimental Gas-Works at Carlsruhe have made experimental determinations of the yield of gas with German gas coals from 52 different pits, which comprise the greater number of those from which coals are used in considerable quantity for gas making. The material collected through these determinations affords a fairly comprehensive view of the procedure of gasification in general, as well as of the behaviour of individual coals. But in Germany about 25 per cent. of the coal carbonized is of English origin; and the systematic investigation has, therefore, been extended to a number of English gas coals. A provisional report of the results so far obtained with the latter has been prepared for presentation to the meeting of the Association. This shows the gratifying result that, generally speaking, from the pits in question characteristic English coals are obtained in Germany; and it is hoped that the results reported will be considered to warrant a continuation of the investigation. As soon as the study of the English coals has been completed, it is intended that a comprehensive report should be prepared on the whole of the results obtained to date at the experimental works. At the present time, the author wishes merely to indicate, in a few words, the fundamental ideas to which the investigations of gas coals have led, and the manner in which it is hoped to secure a basis for the valuation of gas coals.

The first question that arises is, naturally, What are gas coals, and in what respect do they differ from other coals? They come between the coke-making coals which are poor in gas, and the coals which are rich in gas but cake poorly. The proportion of carbon in the coal substance (*i.e.*, dry and ash-free coal) lies between 81 and 87 per cent., and the calorific power between 13,950 B.Th.U. and 14,760 B.Th.U. per pound. Two of the most important factors for the valuation of a gas coal are that it must fall between these boundary lines—between flaming and coking coals, or coals which are rich in gas and coals rich in coke. Gasification is a process for enhancing the value of a fuel, since its action essentially implies that the whole weight of the raw material and its whole content of energy—*i.e.*, its calorific value—should be retained and recovered in the products of the process. If it is desired to consider whether a coal is properly a gas coal, the first step will be to ascertain what proportion of its value is recovered in that form which is most valuable. Now 10,000 B.Th.U. are contained in about 18 cubic feet of gas, and in that form fetch about $\frac{3}{4}$ d.; whereas 10,000 B.Th.U. are contained in about $\frac{1}{4}$ lb. of coke; and in that form fetch only about $\frac{1}{4}$ d. Therefore, *ceteris paribus*, a coal would be the more valuable as a gas coal, the greater the proportion of its calorific value that can be recovered in the form of gas. According to the investigations made in the experimental gas-works of the German Association, this proportion varies in the gas coals examined between 90 and 30 per cent. The coke contains 50 to 65 per cent. of the calorific power of the coal; and the tar, from 5 to 8 per cent.

Generally speaking, coals yield more of their calorific power in the gas the more recent in origin they are—*i.e.*, the more nearly they approach flaming coals. But the quantity of coke diminishes at the same time. While the quantity and calorific power of the gas have to be primarily considered, the quantity and quality of other products play an important part. This applies in particular to the coke, since nearly two-thirds of the calorific power of the coal is retained in it. Hence a judgment of the coal according to the proportion of its calorific power which is found in the volatile products, must be modified by the results of tests of the quality of the coke. It is not so much the calorific power of the latter that matters as its mechanical qualities—such as its tendency to crumble, which affects its saleability for use as a fuel for household and industrial purposes and its fitness for being stored. Hence the range of gas coals is restricted on this side by the saleability of the coke.

There is no absolute measure of the strength of gas coke available. Many attempts have been made to obtain comparable figures by crushing tests in ordinary testing-machines; but they have failed owing to the want of uniformity of the material. At the experimental works of the Association a very simple method has been employed, which has answered well. The coke when cold is dropped from the charging-stage on to the concrete floor of the furnace basement, $11\frac{1}{2}$ feet below; and it is then riddled and hand-screened to separate it into four sizes. The results were found by repeated tests of the same coke to be fairly uniform and reproducible. Generally speaking, the yield of large coke—*i.e.*, coke which does not pass through a screen with holes $2\frac{1}{4}$ inches in diameter—suffices to settle the value of the coke. For the coals examined at the experimental gas-works this yield varied between 70 and 30 per cent. Since the introduction of this method of testing, however, only Saar coals have been examined in large numbers; and the isolated examples of other classes of coals tested do not enable any general conclusion to be drawn in regard to the coke from these classes. The quality of the coke, and especially its hardness, is, however, undoubtedly a characteristic property of the particular coal; but all the conditions of

gasification have considerable effect on it. It is well known that rapid carbonization at a high heat improves the coke.

The influence of carbonization in completely filled vessels—as in vertical retorts and carbonizing chambers—is even more important. These conditions will be studied further at the experimental gas-works very shortly; and an experimental setting has been put at the disposal of the works for the purpose by the Dessau Vertical Retort Company, of Berlin. It may be anticipated that the range of gas coals will thus become extended so as to include flaming coals. Another matter of considerable influence on the strength of the coke produced is the size of the coal with which the retort is charged. Several trials demonstrated that the coke was stronger the smaller the coal. If the coal is in lumps the size of the fist or of an egg, the resultant coke is far less strong than if the coal is of the same description but quite small. Hence, in order to produce the strongest coke from a particular coal, the coal must be used in a very finely broken state.

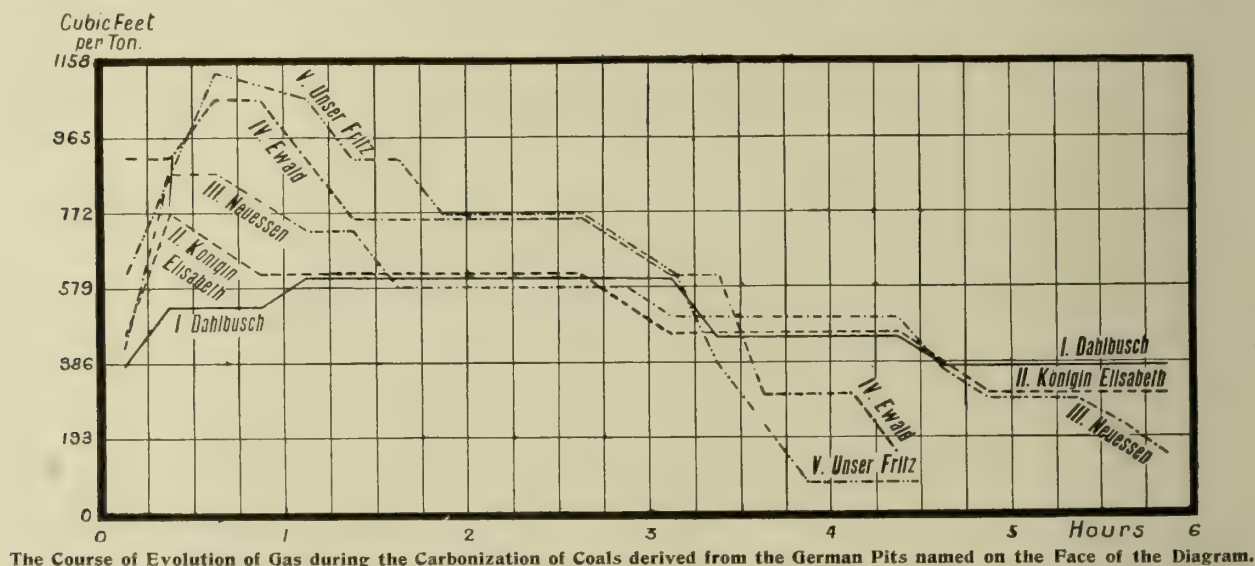
A third essential property of the coal which affects its value, is the length of time required for its carbonization. The more slowly a coal carbonizes, the greater is the expense entailed in respect of carbonizing space and fuel. The annexed diagram shows the carbonization curves of a number of Ruhr coals which are in other respects of about the same value. The difference is very notable. While one coal is worked off in about $4\frac{1}{2}$ hours, another requires $5\frac{1}{2}$ to 6 hours. Broadly speaking, the older coals gasify most slowly, and the more recent coals most rapidly. The time required for carbonization is, however, also dependent to a considerable extent on the size of the coal. Lump or large coal is carbonized much more rapidly than small coal. As a consequence, the gas, being quickly liberated, is decomposed to a less extent, and is better. The yield of gas from very finely broken coal, even when thoroughly carbonized, generally falls short of that from large coal.

Turning again to the idea that carbonization is a process for enhancing the value of the coal, it is evident that the tar forms a

considerable portion of the product of distillation, whether on the basis of quantity or of calorific power. It constitutes about 4 to 5 per cent. by weight of the coal, and contains 8 to 10 per cent. of the calorific power of the latter. Tar is an important product, on which, indeed, flourishing industries depend. The price of tar, however, to-day, as often in the past history of the gas industry, leaves much to be desired, and raises the question of whether it can be otherwise utilized. The tar has a calorific power about 10 per cent. above that of the ash-free coal substance or pure coal from which it was produced. When the price of tar has been low, there have always been attempts to utilize its calorific power by using it as a fuel in retort-settings or boilers, and thus economize coke. Recently tar-firing has in several places been successfully adopted, especially for boilers; and thus from the economical standpoint the tar has been converted into coke.

The repeated attempts to utilize tar for gas making have proved far less promising. Tar consists only to a small extent of constituents of the coal which are susceptible of decomposition, and for the most part of pyrogenous products, which have themselves been formed by heat. The first portion could still yield some gas, but the second could only be decomposed at a higher temperature than that at which it was formed. Practical trial confirms the conclusion thus drawn, that tar can only to a small extent be converted into gas.

In trials made at the experimental gas-works, the dehydrated tar was absorbed in completely carbonized coke breeze, and the mixture (1 part of tar to 2 parts of breeze) was carbonized for several days at a comparatively low temperature (about 1050° C.). The result was that one ton of tar, value about 18s., yielded 11,580 cubic feet of gas, or approximately the same quantity as a ton of coal of about the same value. The tar, however, yields no useful bye-products, and consequently the gas can be made more cheaply from coal. The calorific power of the gas from the tar was only about 470 B.Th.U. per cubic foot. Only about 15 per cent. of the calorific value of the tar is obtained in the gas,



The Course of Evolution of Gas during the Carbonization of Coals derived from the German Pits named on the Face of the Diagram.

which corresponds to scarcely 1 per cent. of the calorific value of the coal from which the tar was produced. The weight of coke was 62.7 per cent. of the weight of tar, corresponding to about 57 per cent. of the calorific power of the tar. The coke breeze was only quite loosely bound together; and the tar in no way rendered it more saleable or more useful than the original breeze. Particularly worthy of note is the fact that about 24 per cent. of the tar passed into the hydraulic main and works connections, and blocked them with a substance having the appearance of axle grease. It is evident, therefore, that no technically useful and economical conversion of tar into gas can be accomplished in this way.

Perhaps a better result could be obtained by utilizing the tar in a water-gas generator or super-heating it with steam at the temperature of the water-gas process. The quality, and consequently the value, of the tar produced depends above all on the method of carbonization, and only to a small extent on the description of coal carbonized. Hence in the valuation of coal, only the quantity of tar formed need in the first instance be taken into account. The difficulties the tar may cause in the working of the plant need not be considered in detail at this stage.

Finally, ammonia is a valuable bye-product of the distillation of coal. It results from the nitrogen of the coal; and it may be assumed that it is split off in distillation from the nitrogenous compounds contained in the coal as remains of the albumen of plants. The proportion of nitrogen in the pure coal substance varies in the coals examined at the Experimental Works between 1.2 and 1.9 per cent. Exceptionally, less than 1 per cent., or over 2 per cent., may be found. How this nitrogen becomes distributed among the several products of distillation—viz., coke, gas, ammonia, cyanogen, and tar—has, so far as the author is aware, only been investigated in small laboratory trials. Investigation on the large scale seems worth making, because the nitrogen is

valuable only when it can be recovered as ammonia; and it would be useful to test whether any considerable part of the nitrogen occurs in a form which is susceptible of ready conversion into ammonia.

The destination of the nitrogen contained in the coal was investigated in the case of 17 coals; and the average of all the results showed that about 60 per cent. of the nitrogen remained in the coke, 20 per cent. was found as gaseous nitrogen in the gas, about 15 per cent. was converted into ammonia, and about 3 and 2 per cent. occurred as cyanogen and in the tar respectively. The difficulties attendant on this investigation were considerable, especially since the nitrogen in the gas amounts to only about 0.75 per cent. of its volume. That is a surprising fact, as in ordinary analyses of coal gas there is generally 3 to 5 per cent. of nitrogen reported. The investigations have demonstrated that no relation can be established between the yield of ammonia and the proportion of nitrogen in the coal, or the age of the latter. No type of coal has been found to afford an amount of ammonia which may be regarded as characteristic of it; and with each type the distribution of the nitrogen has varied greatly in different cases. There is always a large proportion left in the coke, which portion, however, can, it is well known, be partially converted into ammonia by means, for instance, of the passage of steam over the coke.

In conclusion the author would summarize the essential points by which the value of a gas coal should be assessed in the following statement: A coal is the more valuable, *ceteris paribus*, for gas making, the greater is the proportion of its calorific value which can be obtained in the gas produced from it. While the yield of calorific value in the gas generally increases as the coal is of more recent origin, the strength, and consequently the value, of the coke diminish at the same time. The quality of the coke and its strength are of considerable influence, as well as the calorific

valuation figure. A large proportion of ash in the coal not only reduces the yield of gas and the value of the coke, but is detrimental also in respect of the fuel consumption for heating the setting. The proportion of ash is, however, mainly dependent, not on the description of coal, but on the manner in which the coal is treated at the colliery, and hence the ash should be determined for each delivery. In assessing the economical value of a gas coal, regard must be paid not only to its special properties, but the working conditions of the particular gas-works, the state of the market, and other local circumstances must be weighed at the same time. The comparative figures obtained for the different gas coals at the experimental works of the Association afford, however, the necessary data from which the economical value of any one of these gas coals can be calculated for the case of any particular gas-works.

DEVELOPMENT IN GAS PURIFICATION.

By Dr. H. WOLFFRAM, of Hamburg.

[A Paper read before the Meeting of the German Association.]

The great advances which have occurred during the last decade in the manufacture of gas, owing to the construction of vertical retort-settings and carbonizing chambers, and in the utilization of gas through the introduction of the inverted burner, high-pressure lamps, long distance supplies, small gas-engines, &c., make it of interest to inquire to what extent the purification of gas also has undergone continuous development from the earliest times up to recent years.

The original primitive wet treatment of gas with milk of lime very soon gave way to dry purification with slaked lime or with natural and artificial oxide of iron, oxides of other metals, or mixtures of lime and oxide, which, though they have undergone improvements and modifications, have survived all attacks up to the present. But almost as old as the dry process itself is the endeavour to displace it by a wet process, which should have more vigorous action in a smaller purifying space, and produce more valuable bye-products. For a short time there was, however, a reaction in the opposite sense, when ammonia recovery was effected in Munich by means of superphosphate; but the process never attained wide adoption.

An astonishingly large number of new processes for washing gas have appeared the last two decades; but only a few of them have so far secured a firm footing. Knublauch's wet process of cyanogen recovery, though unfortunately it did not become established, was followed by Bueb's process, which, on account of its simplicity, rapidly became extensively used, and had no fault except that, owing to the depression in the price of cyanide and the lower value of the ammonia which was recovered simultaneously, it failed to yield any direct profit. Feld revived Knublauch's idea of using lime and sulphate of iron, with considerable modifications, and carried out exhaustive investigations thereupon at the third gas-works at Hamburg, then just being brought into use. At first, however, satisfactory results were not obtained. Dr. Leybold and Dr. Schmidt perfected the process subsequently, and Herr Heynold, the Manager of the gas-works, improved it considerably from the technical standpoint. In particular, the lime and sulphate of iron are no longer run separately into the washer, but, contrary to Feld's view, are carefully mixed with one another first. The stoppages, which were very common at one time, have thereby been entirely avoided. At present, the process works in a perfectly trustworthy manner, and has already been in use satisfactorily also at the second gas-works at Hamburg for nearly a year. The naphthalene washing process of Dr. Bueb also, in which tar oil of high boiling point is used, has been extensively applied, and certainly ought to have a permanent value.

The process of Pippig and Trachmann for the extraction of carbon bisulphide could not, on account of its very high cost, secure any vogue; but the method of Dr. Mayer for the same purpose, by which the washing liquid is recoverable, appears to have better prospects of success. It is at the present time being tested in a small experimental washer at the No. 2 Gas-Works at Charlottenburg. Feld's numerous washing processes for the extraction of tar, ammonia, cyanogen, and sulphuretted hydrogen would effect a complete revolution in the mode of purification of gas. He has introduced for employment with them a special fast-running system of washer. The trials carried out in Hamburg two-and-a-half years ago with a small experimental apparatus, led to no positive result, however. On the other hand, trials of a most exhaustive character have been going on at Königsberg for over six years; and it may be hoped that, having regard to the great trouble and work involved in them, apart from the expense, they will ultimately have a successful conclusion.

The "direct" process for the recovery of sulphate of ammonia by treating gases with sulphuric acid, is only available for use in coke-oven works. Finally, however, there is Burkheiser's method of purification, with which trials have been in progress at the Grasbrook Gas-Works at Hamburg for nearly a year past. Dr. Krause, the Manager of these works, has already made a preliminary communication in regard to them to the last meeting of the District Gas Association of Lower Saxony. These trials—

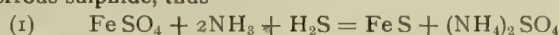
which will soon be completed, and will be repeated on a larger scale by the Berlin Corporation gas undertaking, have had quite satisfactory results. The most suitable apparatus for working the process has now to be devised and thoroughly tested. With gas containing from 920 to 1180 grains of sulphuretted hydrogen per 100 cubic feet, one cubic foot of bog iron ore prepared according to Burkheiser's patent process suffices to purify 20,000 cubic feet of gas. Normally the rate of flow of the gas is 6 inches to 8 inches, but experimentally it has been increased to 24 inches. The sulphuretted hydrogen was completely removed in a single apparatus; but by running two plants in series, 95 per cent. of the cyanogen contained in the gas was extracted from it. The salt obtained from the ammonia and sulphuretted hydrogen by the oxidation of the latter contains 25.5 per cent. of ammonia, and consists as a rule of about two-thirds of sulphate and one-third of sulphite of ammonia. If required, the latter third can also be oxidized to sulphate; but some fertilizing trials which have been made (and are being repeated on a larger scale at present) have demonstrated that the sulphite acts as a manure at least as well as the sulphate.

WASHING OF AMMONIA AND SULPHURETTED HYDROGEN FROM COAL GAS.

By Dr. HURDELBRINK, of Königsberg.

[Abstract Translation of a Paper read at the Meeting of the German Association.]

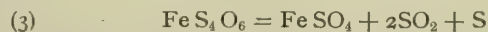
Coal gas is washed with a solution of ferrous sulphate until the liquid is about to cease to be ammoniacal, when it is removed. There are produced from the ferrous sulphate and the ammonia and sulphuretted hydrogen of the gas sulphate of ammonia and ferrous sulphide, thus—



Sulphurous acid produced by the combustion of sulphur which is recovered in the course of the process is then passed in, and the ferrous sulphide and sulphurous acid combine to form ferrous tetrathionate, thus—



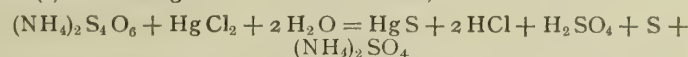
The solution is heated, whereby the ferrous tetrathionate is decomposed into ferrous sulphate, sulphur, and sulphurous acid, thus—



The sulphur and sulphurous acid may be utilized again for the reaction that is shown in equation (2). The sulphur is recovered by filter-pressing from the product of equation (3), while similarly from equation (1) a filtrate is obtained which is a pure solution of sulphate of ammonia, free from iron, ferrous sulphide, and sulphur.

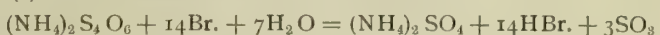
The author then proceeds to refer to the reactions of ammonium tetrathionate—viz.,

(1) On boiling with mercuric chloride, the reaction is—



Thus, one molecule of tetrathionate, containing two equivalents of ammonia yields two molecules of hydrochloric acid and one molecule of sulphuric acid. That is to say, there are two equivalents of acid per equivalent of ammonia.

(2) The tetrathionate reacts with bromine thus—

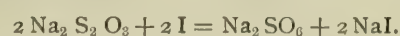


That is to say, one molecule of tetrathionate consumes 14 atoms of bromine, forming 14 molecules of hydrobromic acid and 3 molecules of sulphuric acid, or a total of 20 equivalents of acid. There are therefore 10 equivalents of acid per equivalent of ammonia.

(3) Iodine does not react with tetrathionate.

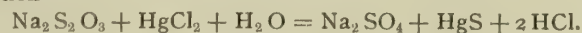
The author next refers to the reactions of thiosulphate, thus, taking the sodium salt—

(1) The action of iodine on it is as follows:—



Therefore, one molecule of the thiosulphate combines with one molecule of iodine.

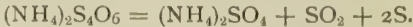
(2) Boiling it with mercuric chloride, will give the following reaction—



Thus, one molecule of thiosulphate yields two molecules of hydrochloric acid, or one equivalent of acid per equivalent of alkali.

Actually the formation of ferrous tetrathionate as an intermediate product of the reaction between ferrous sulphide and sulphur dioxide could not be proved, owing to the ease with which it breaks up. But the production of ammonium tetrathionate from sulphur dioxide and ammonium sulphide, and its decomposition into sulphur dioxide and ammonium sulphate, could be traced with certainty. The product of the reaction between sulphur dioxide and ammonium sulphide in aqueous solution in the cold was isolated by crystallization *in vacuo* over sulphuric acid, and the equivalents of reagents required by it corresponded, closely, according to the reactions already stated,

to the theoretical figures for the tetrathionate, and were at variance with the calculated figures for thiosulphate. The analytical figures are given in detail by the author. On boiling the pure concentrated aqueous solution of ammonium tetrathionate for a whole day, the amount of sulphur dioxide liberated corresponded closely to that required by the reaction—



The theoretical quantities of separated sulphur and the sulphate of ammonia produced could not, however, be quite secured.

Washing trials were made in two washers of Feld's construction, working in series, with a regenerated lye (from equation (3)), containing about 2·8 lbs. of crystallized ferrous sulphate per gallon. The gas contained the following quantities of ammonia and sulphuretted hydrogen in grains per 100 cubic feet:—

| | Ammonia. | | | Sulphuretted Hydrogen. | | |
|----------------------|---------------------|--------------------|-------------|------------------------|--------------------|-------------|
| | Before the Washers. | After the Washers. | Ex-tracted. | Before the Washers. | After the Washers. | Ex-tracted. |
| After 1 hour working | 173·2 | 1·8 | 171·4 | 493·0 | 263·5 | 229·5 |
| " 2 " " | 254·3 | 2·9 | 251·4 | 520·4 | 254·3 | 266·1 |
| " 3 " " | 203·7 | 3·0 | 200·7 | 458·0 | 203·7 | 254·3 |
| " 4 " " | 79·4 | 1·5 | 77·9 | 416·6 | 246·9 | 169·7 |

The liquid was at the end of this time becoming feebly alkaline. The quantity of gas passed through and washed per hour was about 46,000 cubic feet. The solution had been regenerated by treatment with air containing 6 per cent. by volume of sulphur dioxide.

The remainder of the paper is devoted to observations on methods of analysis suitable for the examination of the regenerated lye.

VALUATION OF COAL GAS ACCORDING TO ITS CALORIFIC POWER.

By Dr. MAX MAYER, of Berlin.

[Abstract of a Paper Read at the Meeting of the German Association.]

The author has undertaken a long series of investigations with low-pressure incandescent gas-burners, of the ordinary Welsbach upturned type, with a view to testing the validity of M. St. Claire Deville's contention that the illuminating power of a mantle is proportional to the calorific power of the gas used. This contention, it will be recalled, had been put forward by M. St. Claire Deville in papers which he has presented at the last two sessions of the International Photometric Congress at Zürich. These papers, which contained details of an immense mass of experimental data on which their author based his view, were given in the form of lengthy abstract translations in the "JOURNAL" (Vol. LXXXIII., pp. 499, 567, and 617, and Vol. XCIX., pp. 574, 625, 684, and 830). The conclusion arrived at in these papers was that the same expenditure of heat in the same incandescent burner produced the same illuminating power, even though the gas used was not the same. The author of the present communication has prepared gases of widely varying composition and calorific power, and has investigated with them in three different burners the validity of this conclusion.

The composition of a number of the gases used was determined by analysis, with results as recorded in Table I. The burners used were the ordinary Welsbach burner, and two burners having a smaller consumption, distinguished in the tabular statements of results as "A" and "B." The illuminating power obtained with a particular mantle was ascertained for a number of different gases, the rate of consumption of which was regulated so that the same amount of heat was applied in all cases in each set of experiments. The specific gravity of the gases was determined; and photographs were taken of the flames, and were shown at the meeting. The proportion of air required for the combustion of each gas, and the amount of primary air drawn in by the burner, were ascertained by analysis in each case.

It will be seen from Table I. that, when the net calorific power of the gas falls within the limits 480 to 585 B.Th.U. per cubic foot at 60° Fahr., 30 inches bar., and saturated, M. St. Claire Deville's proposition is supported by the results of these experiments with the low-pressure incandescent burner. On the other hand, it will be seen that the gases of lower calorific power, used in experiments Nos. IV., V., and VIII., display a higher efficiency in use. It might have been supposed, and indeed it has hitherto been assumed, that the higher efficiency was to be ascribed to the smaller proportion of air required for the combustion of the poorer gases, as at the same gas pressure a greater percentage of primary air would then be drawn into the burner. The results recorded in Table I. show, however, that this assumption is not well founded. The superior efficiency obtained with gases of low calorific power is due, as a comparison of the figures given in Tables I. and II. show, to their chemical composition. They contain a considerably higher percentage of hydrogen than the richer gases. The rich gases, containing more heavy hydrocarbons, as used in Experiments VI. and VII., show a lower duty, probably because of the smaller intensity of the combustion of these hydrocarbons.

Analogous conclusions may be drawn from the results of the experiments made with the burners having a smaller gas consumption, as recorded in Tables III. and IV.

TABLE I.—Composition of the Gases Used (Volumes per Cent).

| | Coal Gas. | Oil Gas. | Experiment No. VI. | Experiment No. VII. | Experiment No. VIII. |
|--------------------------|-----------|----------|---|--|---|
| | | | Oil Gas and Coal Gas. Proportions 1 to 8. | Oil Gas and Coal Gas. Proportions 1 to 17. | Oil Gas and Hydrogen. Proportions 1 to 9. |
| Carbonic acid . . . | 2·4 | 0·1 | 2·1 | 2·3 | — |
| Heavy hydrocarbons . . . | 2·5 | 21·5 | 4·6 | 3·6 | 2·1 |
| Oxygen . . . | 0·5 | 0·8 | 0·5 | 0·5 | 0·1 |
| Carbonic oxide . . . | 12·6 | 0·9 | 11·3 | 12·0 | 0·1 |
| Hydrogen . . . | 52·2 | 24·0 | 49·0 | 51·0 | 92·4 |
| Methane . . . | 26·8 | 46·0 | 29·0 | 28·0 | 4·6 |
| Ethane . . . | — | 3·2 | 0·4 | 0·2 | 0·3 |
| Nitrogen . . . | 3·0 | 3·5 | 3·1 | 2·4 | 0·4 |
| | 100·0 | 100·0 | 100·0 | 100·0 | 100·0 |

TABLE II.—Welsbach Upturned Burner.

| Experiment No. | Gas Used. | Net Calorific Power B.Th.U. per C. Ft. at 60° F. 30 ins. Saturated. | Heat Expended per Hour B.Th.U. | Gas Consumption C. Ft. (60° F. 30 ins. Saturated) per Hour. | Candles. | Volumes of Air Required for Combustion of One Volume of Gas. | Percentage of Air Drawn In. | Specific Gravity of Gas. | Percentage of Hydrogen in the Gas. |
|----------------|--|---|--------------------------------|---|----------|--|-----------------------------|--------------------------|------------------------------------|
| I. | Coal gas | 480 | 2182 | 4·54 | 77 | 4·8 | 54 | 0·413 | 52 |
| II. | Coal gas carburetted with benzol | 584 | " | 3·74 | 72 | 5·6 | 58 | 0·490 | |
| III. | do. | 540 | " | 4·03 | 76 | 5·3 | 62 | 0·473 | |
| IV. | Coal gas diluted with hydrogen 2 : 3 | 367 | " | 5·93 | 79 | 3·4 | 50 | 0·237 | 80 |
| V. | do. 1 : 4 | 326 | " | 6·69 | 82 | 3·0 | 41 | 0·185 | 90 |
| Newer Mantles. | | | | | | | | | |
| VI. | Oil gas with coal gas 1 : 8 | 562 | 2262 | 4·03 | 68 | 5·6 | 50 | 0·446 | 49 |
| VII. | do. 1 : 17 | 516 | " | 4·37 | 70 | 5·2 | 44 | 0·442 | 51 |
| VIII. | Oil gas with hydrogen 1 : 9 | 343 | " | 6·61 | 88 | 3·8 | 37 | 0·198 | 92 |
| VIII a. | Coal gas | 479 | " | 4·71 | 76½ | | | | 52 |

TABLE III.—Small Upturned Welsbach Burner A.

| Experiment No. | Gas Used. | Net Calorific Power B.Th.U. per C. Ft. at 60° F. 30 ins. Saturated. | Heat Expended per Hour B.Th.U. | Gas Consumption C. Ft. (60° F. 30 ins. Saturated) per Hour. | Candles. | Volumes of Air Required for Combustion of One Volume of Gas. | Percentage of Air Drawn In. | Specific Gravity of Gas. | Percentage of Hydrogen in the Gas. |
|----------------|---|---|--------------------------------|---|----------|--|-----------------------------|--------------------------|------------------------------------|
| IX. | Coal gas | 480 | 1468 | 3·04 | 67 | 4·8 | 56 | 0·407 | 52 |
| X. | Coal gas carburetted with benzol | 562 | " | 2·62 | 63 | 5·4 | 60 | 0·454 | |
| XI. | Coal gas carburetted with benzol and hydrogen 3 : 7 | 411 | " | 3·57 | 67½ | 3·7 | 56 | 0·253 | circa 80 |
| XII. | Oil gas and coal gas 1 : 8 | 549 | " | 2·70 | 59 | 5·8 | 54 | 0·447 | 49 |

TABLE IV.—Small Burner B.

| Experiment No. | Gas Used. | Net Calorific Power B.Th.U. per C. Ft. at 60° F. 30 ins. Saturated. | Heat Expended per Hour B.Th.U. | Gas Consumption C. Ft. (60° F. 30 ins. Saturated) per Hour. | Candles. | Volumes of Air Required for Combustion of One Volume of Gas. | Percentage of Air Drawn In. | Specific Gravity of Gas. | Percentage of Hydrogen in the Gas. |
|----------------|---|---|--------------------------------|---|----------|--|-----------------------------|--------------------------|------------------------------------|
| XIII. | Coal gas | 490 | 1507 | 3·08 | 65 | 4·8 | 56 | 0·412 | 52 |
| XIV. | Coal gas carburetted with benzol | 569 | " | 2·66 | 62 | 4·9 | 67 | 0·476 | |
| XV. | Coal gas carburetted with benzol and hydrogen 3 : 7 | 390 | " | 3·88 | 67 | 2·9 | 62 | 0·246 | circa 80 |
| XVI. | Oil gas and coal gas 1 : 8 | 558 | " | 2·70 | 59 | 5·4 | 59 | 0·452 | |

INSTRUCTIONAL AND EXPERIMENTAL GAS-WORKS OF THE GERMAN ASSOCIATION.

REPORT OF THE COMMITTEE.

The systematic work on German gas coals which was referred to in the report of the Committee last year [see "JOURNAL," Vol. CVII., p. 41] was continued in the same manner as before; so that now exhaustive investigations have been made on 28 descriptions of coal, in addition to the 52 varieties from the more important German coalfields which had previously been dealt with, and a tolerably complete picture of the character of the more important descriptions of coal available for gas manufacture in Germany has thus been obtained. The larger proportion of the coals examined were from the Rhenish Westphalian coalfields. Last year a fairly comprehensive report on these German gas coals, and the chief results of their examination, was presented to the meeting at Frankfort-on-Maine; and this report has been since distributed to all contributors to the funds of the works and to a large number of works and persons interested in the matter. As a result of the interest raised by this report, numerous questions have been directed to the staff of the experimental works, and have been dealt with by them. The works have also been requested to undertake the investigation of coals before purchase by gas-works; and in many instances have carried out such investigations, for which there will evidently be an increasing demand in the future, having regard to the fact that the range of coals now applicable for gas manufacture has been greatly enlarged through the conditions which now prevail in the industry. The less onerous requirements in the quality of the gas and the employment of new types of setting have considerably extended the choice of coals for gas making. The methods of investigation have been further perfected with a view to obtaining more exact results for comparative purposes. The examination of the coals now extends to testing the strength of the coke produced, the yield of ammonia, or the distribution of the nitrogen in the coal among the products, and the influence of the size of the lumps of coal carbonized on its behaviour during distillation.

In addition to German coals, a large number of descriptions of English coal are used in German gas-works, especially on the northern coasts of the country, though in the neighbourhood of the waterways their use extends far into the south. A circular was addressed to a large number of gas-works to ascertain the descriptions of coal used, and small samples were readily sent by the managements of the works. These samples were subjected to chemical and calorimetric examination, such as had been applied in the first instance to the German gas coals with a view to examining the particular and more important properties of the English coals in use as a preliminary to a testing on the larger scale in the experimental plant. Later, a number of gas-works supplied larger quantities of the more important English coals which come on the German market; and investigations on these have already been commenced. The results obtained in the chemical investigation so far have been collected in a pamphlet which was issued to the meeting at Königsberg. A summary of these results, with a few introductory remarks, is given at the conclusion of this report.

Studies were made, in the course of the systematic testing of gas coals, of the distribution of the ammonia produced in the different parts of the experimental plant, on the evolution of sulphur compounds during the distillation, on the proportion of free to combined ammonia in the gas and gas liquor, and on the variation in the strength of the coke with varying conditions. Having regard to the fairly long period during which the experimental works have been making their investigations, it may be said that the methods of examination, after undergoing numerous improvements, are now established on a fairly settled plan of procedure. It is therefore contemplated compiling a comprehensive report on all the investigations so far made at the works, and, further, to issue from time to time reports on the later work in so far as it is of general interest or of value to members of the Association. In addition to the systematic investigation of gas coals, tests and analyses were made of a large number of raw materials, products, and substances in use on gas-works, including coke, tar, liquor, sulphate of ammonia, cyanogen sludge, oxide of iron, and other purifying materials, and paints for gasholders. A number of gas-lamps of various constructions both for low-pressure and high-pressure gas, and of the upturned and inverted forms, were investigated as well. Also apparatus for the measurement and governing of gas supplies, automatic gas analysis apparatus for furnaces, and other analytical apparatus were tested in the course of the year.

The wide interest taken in the works is shown by the large extent to which it is now being used for such testings and investigations, as well as by gifts for the improvement of its equipment. Dr. E. Blum, the Managing Director of the Berlin-Anhalt Engineering Company, on the occasion of the Redtenbacher celebration at the Technical College at Carlsruhe, presented a sum of £150 to the works for the provision of apparatus for exact photometrical work. The firm of S. Elster, of Berlin, have also presented an experimental gasholder of about 50 cubic feet capacity, which will prove of the greatest service in the investigations. Dr. Strache, of Vienna, has presented the works with one of his new gas calorimeters. Gifts of apparatus have also been received from the German Welsbach Incandescent Company and from

other firms. The Syndicate of Pipe Makers also presented the works with all the requisite pipes and bends for the connections required in the extension of the works' plant. Gas-heating apparatus for the smaller rooms of the buildings were presented by three different firms.

During the year, the staff of the works have carried out a large number of efficiency trials and tests to control working of plant in outside gas-works; and many such further investigations are under consideration. For instance, the works examined the setting of 18 vertical retorts at the Mariendorf works, in Berlin, of the Imperial Continental Gas Association; and the results have already been reported in the "JOURNAL" (see Vol. CIX., p. 27). A large efficiency trial has also been carried out of a setting of inclined retorts at the gas-works of St. Gall, erected according to designs drawn up on that works. In several gas-works smaller investigations were made by the staff of the experimental works, many of which have proved most instructive. In the area covered by the Central Rhine District Gas Association, 14 gas-works were visited, and more or less exhaustive investigations made of works' plant. While such investigations in many cases presented considerable difficulties, and the results were not forthwith so great as was sometimes hoped for, it must not be forgotten that the personal contact of members of the staff of the experimental works with the officials of gas-works and with working on the practical scale cannot but result in benefit to both parties.

In regard to instruction, ten gas engineers have taken part in the operations of the experimental works, after having been qualified by a two-terms' training at the Technical College at Carlsruhe in the scientific principles of gas manufacture and in laboratory work. A fourteen-day course of instruction in the spring was attended by 38 students, who had the opportunity of becoming acquainted with the plant of the experimental works, and the methods of testing used on gas-works and in photometrical investigations. The two retorts on the works, after two-and-a-half years' uninterrupted working, developed cracks; and the interior of the setting had to be renewed. The retorts would have served for a longer period for the ordinary operations of a gas-works; but in order that the results obtained might be free from any doubt, the retorts were changed last autumn. A rotary gas-washer was installed; and new connections were put in on the works to admit of the order of working of the condensing and washing plant being varied as desired. The capacity of the hydraulic main was reduced by filling up its lower part with cement, in order that the tar should flow off more quickly, so that in changing from the testing of one coal to another there would be less mixing of the two tars.

The total number of samples or matters dealt with in the year was 1122; but having regard to the long time required for carrying out many of the investigations, the mere statement of numbers affords no indication of the amount of work performed. The statement of receipts and expenditure for the works covers a period of a year-and-a-quarter. The report states that the past year has been a most satisfactory one so far as the working and affairs of the experimental works are concerned. Tribute is paid to the active co-operation of the members of the staff and of outside helpers. It is pointed out with satisfaction that somewhat similar provision to that of the Association's experimental works has been made in England at the University of Leeds, through the establishment of the Livesey Professorship, and in Austria by the experimental works for gas and fuel established at the Technical College at Vienna. For some years past, also, the Swiss Association of Gas and Water Engineers have been carrying out good work in the same direction at their experimental works at Zürich.

The report is signed by Herr F. Reichard and Professor H. Bunte, who control the works, which are under the superintendence of Dr. K. Bunte. A paper by the latter gentleman, on "Information about Gas Coals," was presented to the meeting as a sequel to the report, and a translation of it is given on p. 957.

CHEMICAL COMPOSITION AND CALORIFIC POWER OF ENGLISH GAS COALS.

A paper supplementary to the foregoing report, and referred to in it, deals with the chemical composition and calorific power of English gas coals as used on German gas-works. The introduction states that, as large quantities of English gas coals are carbonized on many German gas-works, it seemed desirable to extend the investigations already made of the chief varieties of German gas coals to those English coals which come on to the German market for use on gas-works.

Small samples were first supplied by a number of gas-works using such coals; and a chemical examination was made of them, with a view to determining their individual characteristic properties. The analytical results obtained are recorded according to the names under which the coals were sold; but further investigation will be necessary to show whether the coals examined were really representative of their trade descriptions. The investigations so far make no pretence to completeness. In fact, many more samples have recently been received, and are under examination just now. The preliminary testing in the chemical

laboratory will be followed as in the case of the investigations of German gas coals by carbonization trials on a large scale. A number of gas-works have already supplied 10-ton samples to the works; and the trials are in hand.

The analytical results so far obtained are summarized in the appended tables.

TABLE I.—Composition of the Coals as Received.

| Description of Coal, and Gas-Works from which the Sample was Received. | Moisture (by drying at 110° C.). | Ash. | Com- bustible Portion or Coal Substance. |
|--|--|----------|--|
| | Per Cent. | Per Cent | Per Cent. |
| Londonderry (Graudenz) | 1'88 | 9'42 | 88'70 |
| " (Bromberg) | 1'61 | 8'21 | 90'18 |
| Lambton (Stettin) | 1'43 | 8'81 | 89'76 |
| " (Stuttgart) | 1'80 | 6'11 | 92'09 |
| Deans Primrose (Harburg) | 1'52 | 9'58 | 88'90 |
| " (Bremen II.) | 1'15 | 12'45 | 86'40 |
| Wearmouth (Wismar i. M.) | 1'31 | 5'90 | 92'79 |
| " (Wiesbaden) | 1'60 | 8'12 | 90'28 |
| " (Harburg) | 1'86 | 10'85 | 87'29 |
| New Leversons (Memel) | 1'51 | 10'13 | 88'36 |
| " (Stralsund) | 1'20 | 9'78 | 89'02 |
| " (Königsberg i. Pr.) | 1'51 | 8'37 | 90'12 |
| Leversons Wallsend (Kiel) | 1'05 | 12'68 | 86'27 |
| " (Schönebeck a. E.) | 0'96 | 8'47 | 90'57 |
| " (Frankfort on Oder) | 1'23 | 10'16 | 88'61 |
| Old Pelton Main (Lübeck) | 1'02 | 6'45 | 92'53 |
| Ravensworth Pelaw (Wismar i. M.) | 1'14 | 9'96 | 88'90 |
| Silkstone, John Lockes (Schönebeck a. E.) | 4'26 | 11'17 | 84'57 |
| " P. u. P. Universal (Stassfurt) | 2'85 | 6'74 | 90'41 |
| Thorncliffe (Flensburg) | 1'65 | 7'35 | 91'00 |
| Kineil (Bremen) | 1'91 | 9'10 | 88'99 |

manufacturing stations—Avenham Street, Walker Street, and Moor Lane, with gasholder stations at Ribbleton, Walker Street, and Walton, and central offices in Fishergate, which rank among the most ornamental buildings in the town. The Avenham Street works were the first put down by the Company, and they have been enlarged from time to time, until to-day they are easily capable of manufacturing three-quarters of a million cubic feet of gas per day. The retorts are direct fired, and the primary mains of the dry type. The remainder of the plant does not call for mention in detail. There are, however, three styles of holders—namely, framed, spiral-guided, and wire-rope guided. At these works are the blacksmiths', joiners', wheelwrights', fitting, and meter-repairing shops; the headquarters of the gas-fitters and main and service workers being also here. Since the introduction of the carburetted water-gas plant at the Moor Lane works in 1895, the Walker Street works have not been utilized for manufacturing purposes. The old retort-house, which is 173 feet long and 54 feet wide, has been cleared of its settings, and a steel joist and concrete floor erected at a convenient height from the ground. When completed, this building will be used to accommodate the whole of the artisans employed by the Company; the ground floor being set apart for them, and the upper floor for stores of all descriptions.

The greater part of the time of the visitors on Saturday was spent at the Moor Lane works, where important extensions and alterations are now being carried out under the direction of Mr. Tagg. The party, which numbered about fifty, were met by Mr. Tagg and his Assistant, Mr. W. L. Heald, under whose guidance an exhaustive inspection was made of the new works and plant being put down by Messrs. Robert Dempster and Sons, of Elland. Before the present alterations were commenced, these works were capable of producing about one-and-a-quarter million cubic feet of coal gas and some one-and-a-half million cubic feet of carburetted water gas. The old settings are of the generator type, originally from the designs of Mr. Charles Carpenter. There is one furnace to two through arches; the furnace itself being a notable feature. The primary mains are dry. The condensers, exhausters, washers, and scrubbers are of the ordinary type; while the purifiers are the original "Green's," six in all—two being 90 ft. by 35 ft. by 5 ft. 3 in. deep, and four 35 ft. by 30 ft. by 5 ft. 3 in. deep. The travel of the gas being from the top to the bottom is claimed to be a special advantage. Oxide only is used; and the cast-iron pieces fixed round each cover are the late Mr. Green's idea for testing the rubber joint with water for leakage. Adjacent to the purifiers are housed two station-meters. The carburetted water-gas plant has condensers, scrubbers, exhausters, and meter of its own. The coal and water gas meet at the inlet to the purifiers. The sulphate of ammonia plant is of original design. The liquor, after passing through the superheaters, enters the rectangular trough, through the interior of which is a 3-inch steam-pipe without any perforations. Lime joins the liquor at the outlet of this trough, and the whole enters a circular still, which is 1 ft. 7 in. deep only. Three circular compartments cause the liquid to pass from the outer to the inner ring; steam being blown into each compartment by means of the radial arms, which are constantly rotating. The second still is similar to the first. The saturator is of copper. It was explained that the plant will easily make 2 tons of excellent salt per day. Sixteen hours are allowed for drainage.

The alteration to the carbonizing plant consists of the erection of fourteen through arches of six retorts each, fittings, floors, coke conveyor, elevator, and screening plant, coal breaking, elevating, and conveying plant, two chimneys, and a Fiddes-Aldridge retort-charger. The bench is 134 feet long; the pier-walls being 9 ft. 3 in. centres. Thirteen generators are on the Klönne system, and one is of the Dempster-Brookes type, put in for experimental purposes. The retorts are 24 in. by 16 in. by 22 ft. long, six in each arch, in three tiers. The floors are of concrete and expanded metal. It was pointed out that the new floor, being about 6 feet below the old one, has the advantage that the coal hopper and conveyor are larger than usual; no part approaching the tie-bars of the roof. The chimneys are 4 ft. by 2 ft. 6 in. inside by 70 ft. high; each chimney dealing with seven retort-beds. A noticeable feature of the bench fittings is the primary main. Liquor will be in the main to a depth of 3 inches from the top of the inverted dip-pipe; a cast-iron bonnet 5½ inches deep being dropped over the pipe end to seal off the retort. The two 8-inch governors are of ordinary type; and the tar-towers have had to be built up as they are by force of circumstances. The De Brouwer coke conveyor delivers on to a tray elevator, and this on to a jiggling conveyor, which can drop coke into either of the receiving hoppers. Under each hopper are a breaker and jiggling screens giving four sizes of coke. The capacity of the storage hopper is 200 tons. A locomotive crane on the gantry places any excess coke into stock, and also supplies the coal plant out of the adjacent stores of coal when necessary. The coal plant will deal with the necessary coal during eight hours. From the receiving hopper, of a capacity of 35 tons, the coal passes on to a shaker feed, and thence to a jiggling screen, and into the breaker. The elevator is of the single chain type; and the push-plate conveyor has a single chain. The hoppers will hold 200 tons; and the 84 retorts will deal with 150 tons per 24 hours.

In the carrying out of the alterations and extensions, the existing walls, excavations, heights, and widths have been utilized. The cost has been kept down, too, by the use of the old girders, and the preparation of practically all the plans in the drawing

TABLE II.

Chemical Composition of the Coal Substance of English Gas Coals.

| Description. | Coal Substance. | | | | | | | |
|---------------------------------------|------------------------|------|------|------|------|-----------------------|---------------------------------|--|
| | Composition. Per Cent. | | | | | Coke, Per Cent. | Volatile Matter, PerCent. | Calorific Power B.Th.U. Per Lb. |
| | C | H | O | N | S | | | |
| Durham Coals. | | | | | | | | |
| Londonderry | 84'48 | 5'49 | 6'14 | 1'99 | 1'90 | 69'15 | 30'85 | 14,600 |
| Londonderry | 84'72 | 5'34 | 5'99 | 1'97 | 1'98 | 69'58 | 30'42 | 14,609 |
| Lambton | 84'90 | 5'38 | 6'05 | 1'92 | 1'66 | 69'36 | 30'64 | 14,567 |
| Lambton | 84'97 | 5'44 | 6'37 | 1'94 | 1'28 | 67'48 | 32'52 | 14,600 |
| Deans Primrose | 85'43 | 5'44 | 5'08 | 1'92 | 2'13 | 69'54 | 30'46 | 14,729 |
| Deans Primrose | 85'61 | 5'43 | 5'45 | 1'98 | 1'53 | 72'10 | 27'90 | 14,706 |
| Wearmouth. | 85'10 | 5'06 | 6'37 | 1'95 | 1'52 | 69'53 | 30'47 | 14,558 |
| Wearmouth. | 85'19 | 5'24 | 5'96 | 2'00 | 1'61 | 70'49 | 29'51 | 14,665 |
| Wearmouth. | 85'57 | 5'32 | 5'57 | 1'96 | 1'58 | 70'60 | 29'40 | 14,596 |
| New Leversons. | 85'77 | 5'31 | 5'19 | 2'04 | 1'69 | 70'76 | 29'24 | 14,814 |
| New Leversons. | 85'24 | 5'27 | 5'95 | 2'04 | 1'50 | 70'87 | 29'13 | 14,666 |
| New Leversons. | 86'33 | 5'20 | 5'03 | 1'99 | 1'45 | 71'99 | 28'01 | 14,812 |
| Leversons Wallsend | 85'21 | 5'38 | 5'88 | 1'97 | 1'56 | 71'13 | 28'87 | 14,636 |
| Leversons Wallsend | 86'37 | 5'31 | 4'98 | 1'93 | 1'41 | 71'96 | 28'04 | 14,881 |
| Leversons Wallsend | 86'25 | 5'44 | 4'95 | 1'96 | 1'40 | 72'00 | 28'00 | 14,814 |
| Old Pelton Main | 86'73 | 5'23 | 4'88 | 1'84 | 1'32 | 71'86 | 28'14 | 14,940 |
| Ravensworth Pelaw | 85'02 | 5'17 | 5'98 | 1'92 | 1'91 | 72'12 | 27'88 | 14,672 |
| Yorkshire Coals. | | | | | | | | |
| Silkstone, John Lockes | 83'59 | 5'31 | 7'53 | 2'09 | 1'48 | 66'38 | 33'62 | 14,216 |
| Silkstone P. u. P. Universal. | 83'66 | 5'48 | 7'00 | 1'96 | 1'90 | 66'39 | 33'61 | 14,438 |
| Thorncliffe un-screened | 83'88 | 5'33 | 6'57 | 1'97 | 2'25 | 67'77 | 32'23 | 14,580 |
| Scotch Coal. | | | | | | | | |
| Kineil | 84'45 | 5'55 | 7'05 | 1'88 | 1'07 | 66'95 | 33'05 | 14,330 |

MANCHESTER JUNIOR ASSOCIATION.

Visit to the Preston Gas-Works.

The members of the Manchester and District Junior Gas Association who availed themselves of the arrangements made by the Council for an inspection of the works of the Preston Gas Company on Saturday, had an instructive, if somewhat laborious, time. The visit was looked forward to with peculiar interest for a variety of reasons. To begin with, the Preston Gas Company are just now engaged in the completion of an extension of plant at the principal manufacturing station, involving an expenditure of about £17,000; and the Engineer, Mr. S. Tagg, has had a close and active connection with the Manchester Junior Association. Then, again, members of the party were reminded of the part Preston played in the early days of the gas industry, and of the inventive genius of the late Mr. Henry Green, who for so many years held the position as Engineer to the Preston Gas Company.

It was in 1815 that the Preston Gas Company was founded, and it has the distinction of being the first provincial company formed for the supply of gas for public lighting. It is on record that the Preston Parish Church and the Fulwood Barracks were the first institutions of their respective kinds in this country to be lighted by gas. At the present time, the Company have three

offices of the Company. It is hoped to have the new plant in working order for the coming winter; and Mr. Tagg, to use his own words, is aiming at achieving a record of being able to carbonize at 9d. or thereabouts.

At the conclusion of the inspection of the works, the party proceeded to the Fishergate offices, where, by the invitation of the Directors, "High Tea" was partaken of. The meeting held subsequently was presided over by Mr. James Taylor, Past-President of the Association, in the unavoidable absence of Mr. F. Thorp, the President.

Mr. TAYLOR expressed the pleasure it had given the party to visit a works engineered by one of their own members, and said the occasion had been rendered more particularly interesting through their being able to inspect the new plant which the Company were having put down. The Directors and Engineer were to be complimented on their selection of plant; and he was sure when the work was completed the results obtained would be admirable. He had been particularly interested in the hydraulic main, which was, he believed, Mr. Tagg's own invention; and he would look forward to the results obtained from it.

Mr. A. L. HOLTON, Vice-President, in moving a vote of thanks to the Directors for their hospitality, and to Mr. Tagg and his staff for their services in showing the party over the works, said the visit and inspection had been of great interest.

Mr. J. TOWNSLEY seconded the motion—observing that both Mr. Tagg and Mr. Heald were known to them more as men of deeds than of words.

Mr. TAYLOR, in putting the resolution, said the fact that, though the Manchester Junior Gas Association was started only some six years ago, about thirty of the members were now holding senior positions, must reflect greatly to the credit of the Association and its work. Mr. Tagg's work was well known to them before he went to Preston; and they were certain the Company would materially benefit by his services.

The motion was carried with acclamation.

Mr. TAGG, responding, said he would be pleased to convey to his Directors the members' thanks for the hospitality extended to them. As soon as the Board knew that the members were to visit Preston, they expressed their earnest desire that the party should be properly looked after; and he was pleased to think that the arrangements made had met with appreciation. As to the Junior Association, he was satisfied it was doing a very useful work indeed—providing facilities for the members not available by the ordinary avenues. The Association encouraged the spirit and desire for extended knowledge and study which, in his opinion, was invaluable to the industry at large. The Junior Associations generally were undoubtedly doing very good work; and he would always be glad to do anything in his power to extend their usefulness. In this connection, a thought occurred to him. Would it not be possible for the Council of the Association to institute something in the way of improving upon these visits by inviting members to contribute at the following meeting (say) a written or spoken description of anything that had particularly interested them at the works inspected? There was just the danger of the visits and inspections growing into picnics—a pleasant round. It was his opinion that everyone joining such parties should go prepared for active thought, and inspect what there was to see in a practical spirit. Of course, it would be impossible for them to grasp the whole thing; but they might at the next meeting deal with something seen, which was of special interest to them. It should result in useful little discussions. He was obliged for the thanks extended to him and to Mr. Heald for showing the party round the works. In this connection, he desired to acknowledge the help he was receiving in carrying out the alterations and extensions at the works from his staff—specially mentioning Mr. Heald to Mr. Lowther Nicholson.

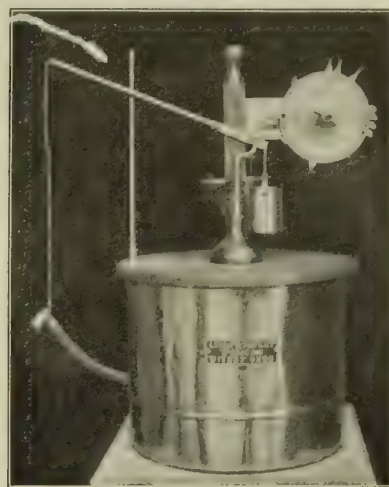
Mr. HEALD also responded, as did also Mr. F. J. NEWBOUND, the Secretary to the Company.

LEIGH'S AUTOMATIC PRESSURE CHANGER FOR STATION GOVERNORS.

In the "JOURNAL" for Feb. 15, p. 442, an illustrated abstract appeared of a patent specification (No. 5242 of 1909) filed by Mr. Francis Leigh, of Witney, Oxon; and the apparatus, manufactured for the patentee by a first-class firm of brass founders and engineers, is now finding its way into every-day use on gas-works. One of the pressure changers has been fitted at the Kenilworth Gas-Works, and another at Witney.

Those who read the patent abstract above referred to will remember that the apparatus consists of a copper tank (to be mounted on the governor), into which a stream of water, regulated by a tap, is continuously falling. The outlet is near the bottom of the tank, and consists of a short length of copper pipe, with a piece of flexible metallic tube fixed to it; and it is by the mechanical raising or lowering of the free end of this tube that the weight and depth of water in the tank are controlled. The free end of the tube is connected to a lever, working easily on a steel bearing; the lever being fixed so that five-sixths of its length is on one side of the bearing and one-sixth on the other—thus securing an intensified movement when the short portion of it is moved. A counterbalance weight is hung from the short end in

such a manner that the long end, together with the flexible tube it supports, is slightly the heavier, and will remain at the lowest position at which it is allowed to fall, and if raised will fall again as soon as the raising force is removed. The lever is raised by tappets fixed on a dial, which is rotated by clockwork once every 24 hours. The tappets are of different lengths, so that they disengage themselves from the lever at different positions as it is raised. Thus the lever may be raised only a small portion of its full range by one tappet, or it may be raised its full range by a longer tappet. After the lever has been raised its required distance, it is caused to remain in this position (until it is released) by a catch, which, working on a hinge, is pulled by a weight working on a pulley over the lever, and engages one of a number of notches in the catch. The tap fixed in the overflow pipe is used for regulating the amount of water which can be discharged in a given time after the lever is lowered, and is used (in conjunction with the inlet tap running a continuous stream into the tank) in such a manner as to ensure a gradual reduction of pressure. The lever is guided and kept in its position by rising and falling against a guide-rod fixed near the centre of its length; the rod being drilled at frequent intervals so that a pin may be inserted at any point to prevent the lever falling below that point. This is in case it is necessary to temporarily prevent the minimum pressure being applied without interfering with the dial or tappets. The usual lowest position of the lever is arranged for by inserting a pin at the correct position through the guide-rod on which the lever rests when released and allowed to fall.



Leigh's Apparatus.

In order to meet the requirements of those whose water supply might fail, the patentee has brought out a device for ringing an alarm bell immediately this happens. The simple and compact apparatus is complete in itself, and may be fixed to the pressure changer in a few minutes. One of the features of the changer is that it may be hand operated at any time, to meet exceptional demands, without interfering with the clock or tappets. Another feature is that a machine made for (say) an 8-inch governor could be altered to suit a 10-inch or a 12-inch governor—a larger tank being the only change necessary.

Removing Sulphur from Gas.

Last week's American mail brought an interesting letter from Mr. Frederic Egner, who writes from Portland, Oregon, and in the course of his communication gives some information with regard to a process which he has seen in successful operation on quite a large scale at the gas-works there. "This process," he says, "takes practically the last trace of sulphur out of illuminating gas by reheating it to about 1200° Fahr., and then again passing this gas through an auxiliary set of oxide purifiers. The reheating results in converting the sulphur present in ordinary purified gas into removable sulphur compounds. Is that all? you may ask. No; it is not. By means of this process, coals and oils now unsuitable for the manufacture of gas, by reason of containing too much sulphur, can be employed in gas making as well as the non-sulphurous material, which, on account of this, is sold at a much greater price than the low-grade coal and oil. In this way, while the reheating and second purification of the gas costs here about 1 c. per 1000 cubic feet in addition to the primary cost of manufacture, they are able to use raw material which costs less by 5 c. or more per 1000 cubic feet of gas made, and produces gas which does not contain as many grains of sulphur per 1000 cubic feet of gas as the most stringent regulations ever imposed upon a gas company permitted. I would like to go into greater detail; but if any one of your readers is sufficiently interested, I dare say the desired information can be had from parties who are actually concerned with the process."

Miss Agnes Armitage, the younger daughter of Mr. Charles Armitage, the Engineer and Manager of the Lancaster Corporation Gas-Works, was married on Wednesday last to Mr. Fred. Bleasdale, of Lancaster. Mr. Cecil R. Armitage, the Manager of the Morecambe Gas-Works, was "best man."

Among the Birthday Honours, His Majesty has been pleased to confer a Baronetcy of the United Kingdom upon Mr. Alfred Mond, M.P., who is a Director of Brunner, Mond, and Co. and the South Staffordshire Mond-Gas (Power and Heating) Company, and Chairman of the Power Gas Corporation.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Mr. Reid and the Gas Institution Proceedings.

SIR,—In the portion of your "Review of Proceedings" at the annual meeting of the Institution of Gas Engineers which deals with the discussion on Mr. Ward's paper on "Management of Small Gas Undertakings and Works," and under what is as near an approach to a "scare" heading as the columns of the "JOURNAL" would permit—"One Objector, but General Approval"—I was surprised to find that my contribution to the discussion appeared to your reviewer as a "terrible denunciation" of the paper and the Council. Fearing I know not what, I turned to your report of the discussion, and was relieved to find I had not after all been guilty of any grave indiscretion such as your review indicated.

On the contrary, I would appear to have congratulated Mr. Ward and the Council on the part they jointly took in the production of such a paper before the Institution. My words were not intended to convey any other meaning; and I cannot therefore understand the view of them taken by your reviewer. Any adverse criticism was directed against the non-inclusion in the paper of much that would have afforded scope for a better discussion, and which omission I was not aware at the time was due to the curtailment of the paper at the wish of the Council.

I do not think any of those present (including Mr. Ward) considered that my remarks were in any way denunciatory, as I had nothing but praise for the results obtained by the writer of the paper.

I consider, therefore, that the portion of the review in question is incorrect; and not justified by the facts as given in your own report of the discussion. One can almost trace a little resentment in the review, whether due to the manner of my criticism or the geographical source from which it is alleged the "terrible denunciation" came, is not clear.

Ballina, June 24, 1910.

T. J. REID.

The Discussion of Mr. Shoubridge's Paper.

SIR,—On reading the report of the discussion on the paper I submitted to the Institution last week, I notice Mr. Allen made an error in his calculation to arrive at the cost of our carbonizing wages.

Instead of doubling the charge of 1.17d.—the cost of handling a ton of coke—he should have divided this by two; seeing it takes two tons of coal to produce one ton of coke, less the quantity used for fuel.

As the mistake does an injustice to the conveyor, I shall be glad if you will allow this correction to appear in your next issue.

Lower Sydenham, June 22, 1910.

SYDNEY Y. SHOUBRIDGE.

SIR,—My attention has been called to an error made in my remarks on Mr. Shoubridge's excellent paper, and which does an injustice to the coke-conveyor.

Instead of doubling the figure given as the cost of handling one ton of coke (1.17d.), it should have been halved, to represent the cost per ton of coal. It would appear, therefore, that with the D.B. conveyor, the costs of labour and materials, per ton of coal carbonized, were 0.585d. and 1.34d. respectively. These figures represent very satisfactory working. On the other hand, the figure of 8.4d. per ton of coal, given as the cost of all labour from coal in the breakers to coke in stock, must be reduced by 0.585d., to find the cost of carbonizing inside the retort-house, which leaves 7.665d. This is higher than the figure given by me, and not so creditable to the D.B. machines (stoking).

I regret the error, inadvertently made in the haste of the moment.

Liverpool, June 22, 1910.

EDWARD ALLEN.

Logarithms and Tables for Chemists.

SIR,—While out on my holiday, I have received a copy of the "JOURNAL" containing a well-thought-out review of my "ABC Five-Figure Logarithms and Tables for Chemists."

In reference to the important point of saturated gases, to which your reviewer calls my attention, I would point out that while a factor might be used, the more convenient plan for reduction to 60° Fahr. and 30 inches mercurial pressure for a saturated gas would be to find the equivalent of 60° Fahr. as 15.5° C. and of 30 inches as 762 mm. Subtracting from 762 the aqueous vapour tension for 15.5—viz., 13.2 mm.—we have the partial pressure of 748.8, the log. for which and temperature 15.5 is given, in Table IV., as 3.06668. Naturally those requiring this constant would substitute the co-log. 2.93332 to be used instead of 2.90285.

I will certainly refer to this point in the next edition of the book.

Birmingham, June 25, 1910.

C. J. WOODWARD.

The Coalite Process.

SIR,—I very much regret to see that a misleading paragraph on the subject of "Coalite," which was unfortunately inserted in the "Journal of the Royal Society of Arts" of June 10, has been copied into the "JOURNAL OF GAS LIGHTING" of the 21st inst.

Immediately I read the paragraph, which had unfortunately been inserted without my seeing it, I expressed to the Coalite Company my extreme regret that a statement of this sort should have appeared in the Society's "Journal." I am informed, on the best authority, that the statement is based on entirely inaccurate information; and without entering into the legal question as to whether it is really libellous or not, I have not the slightest hesitation in saying that the paragraph is of a character which certainly ought not to have appeared in the Society's "Journal," and that I am anxious to prevent any further mischief which may arise from its having appeared.

I shall be grateful if you can publish this letter in your next number.

John Street, Adelphi, W.C., June 27, 1910.

H. T. WOOD, Secretary,
Royal Society of Arts.

PARLIAMENTARY INTELLIGENCE.

STANDARD BURNER BILLS.

Second Reading of Nos. 1 and 2 Bills in the House of Commons.

The Gas Companies (Standard Burner) (No. 1) Bill came before the House of Commons last Thursday, when the motion was made and the question put that the Bill be read a second time.

Mr. R. D. HOLT said that some of those who were opposing the Bill had been very much dissatisfied with the method of procedure adopted by the promoters. They felt that the grouping together of different companies in one Bill did not give the opponents a fair opportunity of putting their view before the Committee. He was glad to say, however, so far as he was concerned, that they had been able to come to an arrangement with the promoters under which they were ready to accept an instruction to the Committee in the following terms: "That it be an instruction to the Committee on the Bill that they do hear the case of the promoters, the Liverpool United Gas Company, separately, and do, on the request of any of the petitioners, consider the expediency of dividing the Bill in order to remove any difficulty that may, in their opinion, be proved to exist (by reason of the inclusion of several cases in the Bill) in the submission separately of any of the cases in opposition." He could give very excellent reasons to prove that the case of the Liverpool Gas Company was on quite a different footing from the other companies in the Bill; but since the matter had been arranged in the way he had indicated, it was not necessary for him to take up the time of the House.

Mr. RYLAND ADKINS, on behalf of the promoters of the Bill, desired to say that their object in grouping a considerable number of companies together was merely to save the time of Parliament and the expenditure of public money. They frankly and promptly accepted the suggestion that they should form not one Bill, but three, and an instruction to the Committee, in the names of Sir Daniel Goddard (the Member for Ipswich) and himself, to consider whether in any case there ought or ought not to be separate and special treatment. He fully agreed with the further suggestion of Mr. Holt. If, under these circumstances, the House was prepared to assent to the second reading, and his honourable friend moved his instruction, he (the speaker) would ask leave to move the adjournment of the debate, in order that an amended instruction might be moved, providing that there should of necessity be a separate Bill for Liverpool, and that any other place might have separate treatment if they could satisfy the Committee that there were grounds for it. In this form he hoped the instruction would recommend itself to the House. He was sure it would be agreed that there were aspects of this highly technical question which were common to a large number of authorities. In this case, one decision might be most economical and at the same time proper; while, on the other hand, in the case of Liverpool there were exceptional circumstances which he cordially agreed justified the suggestion that had been made. As to any other local authority, if they could satisfy the Committee that their case was in any way special, the instruction, if agreed to, would secure that that local authority should have special treatment. This having been agreed to by the promoters in conference with his honourable friend and other members, he hoped the House would agree to the second reading in accordance with the almost universal rule of sending to Committees upstairs, Bills dealing with technical matters requiring an attention which the House would not perhaps be willing or specially adapted to give.

Colonel SANDYS said he would be sorry to oppose the motion; but although he was glad to hear that special treatment had been accorded to Liverpool, there were other places, notably a borough in his own constituency, very deeply interested. He understood that the more usual proceeding in a case of this kind was that each borough or city interested should promote a separate measure dealing with the question on its merits, or else should seek to obtain a Provisional Order. The advantage of this procedure was that very often a conference took place between the petitioners seeking certain advantages such as the promoters of these Bills, and the cities or boroughs affected by the clauses of which they disapproved. There was a broad, general principle involved. It was extremely difficult for the House to pass any measure applicable to all the circumstances of individual portions of the country, although the general principles of the measure approved on the second reading might be in themselves most excellent. Under these circumstances, a portion of his constituency took exception to many of the technical points in the three Bills, notably that their time would be largely wasted in attending the Committee. While all the provisions of the separate Bills relating to the different companies were gone into, he opposed the second reading; and he asked the House to allow the usual procedure, under which the parties concerned obtained separate Bills or Provisional Orders.

Mr. G. R. THORNE (Wolverhampton) said that he found himself in a somewhat difficult position. The course taken by Mr. Holt had come upon him as a surprise, because he understood that Mr. Holt, in common with others who had petitioned against the Bill, was going to oppose it. This course was entirely new, and involved considerable difficulty. If the result in the case of Wolverhampton were to be what it already was in the case of Liverpool, he could understand the position. It would be like an individual Bill which would be individually opposed. But other cities and towns, so far as he could understand, were not to have the same privilege as Liverpool. Liverpool was to be treated as a distinct place at once; but other places were to go through the expense of appearing before the Committee, and waiting possibly many days in hearing the various discussions. If this were the case, it meant considerable expense to the Corporation he represented. If the result of the proposal were that Wolverhampton had to put forward its case in the same way as if the Company promoted an individual Bill, he could not offer the slightest opposition; but if it meant that they had first to prove that they had special claims, and afterwards go to the expense of urging these special claims, it seemed to him that they had

to incur double expense, and were placed in a very difficult position indeed. Unless these difficulties were overcome, he saw no alternative, on behalf of the interests which he represented, and according to the views which had been represented to him, than to oppose a second reading. He took it that others who were similarly situated as himself would be compelled to adopt the same course. But he did not understand why other towns had not been approached in the same way as Liverpool had been, to see whether it was possible to make equal terms. He did not in the slightest degree wish to offer factious opposition to the Bill—what he did was purely in the public interests. Unless he could be satisfied on the point of expense, he was bound, in justice to his constituents, to oppose the second reading.

The SPEAKER having pointed out that Wolverhampton was not included in the Bill at all,

Mr. THORNE said he would wait till the third Bill was produced.

Mr. PERCY ILLINGWORTH then proceeded to inform the House why the Board of Trade thought that Liverpool should be given preferential treatment, and should be regarded as a case by itself. Liverpool was differentiated in this case, in so far as their supply was of 20-candle power, which was the highest supplied by any company or any town in the United Kingdom. The rest of the towns, authorities, and gas companies all, he believed, supplied gas of from 14 to 16 candle power. Their circumstances were on all-fours; and it was considered desirable to group all the cases together. He held no brief for one side or the other. In these matters, the Board of Trade took up an attitude of benevolent neutrality; but it should be said, in justice to the promoters of the Bill, that they did in the first instance approach the Speaker's Counsel, who told them that it would be perfectly competent for them to introduce all these undertakings and companies under one Bill, but that it would be more agreeable and more easy to group the different cases in separate Bills. And this was done, not with any desire to prejudice any local authority, but with a view of saving expense. He did not see that in any way the representatives of the local authorities were prejudiced, because they might place before the Committee reasons which would induce them to give separate treatment. He asked the House to read the Bill a second time, and let the instruction go forward to extend the same treatment to the second and third Bills, and at the same time accept the instruction which was down in the name of Sir Daniel Goddard.

Mr. H. S. FOSTER said that he had been specially requested by the Lowestoft Corporation to oppose the second reading of the Bill. In doing so, he voiced the view expressed at a conference of the local authorities dealing with all three Bills, not upon the ground of injury to any particular locality, but on the broad principle that, in the first place, 43 different companies had combined together in the three Bills. The companies were very differently circumstanced, both with regard to the conditions of supply and to the prices, testing-places, methods of testing, standards of illuminating power, and other matters. They had totally different areas of supply; and it was almost impossible—and this was the view of the local authority—for any authority to deal separately in a joint promotion of this character with the various circumstances of the companies supplying within its jurisdiction. Any particular local authority, whether interested in these particular Bills or not, was likely to be prejudiced in the future in the case of legislation, whether it be by gas companies, railway companies, or others, who might adopt a similar procedure in promoting Bills in Parliament if the precedent set by these Bills was allowed to be established. The main object is to enable these companies to adopt a new form of burner which would have the effect of reducing the illuminating power and of increasing the cost—notably to the poor, who were much larger users than they used to be of gas for heating and other purposes. He did not think it was seriously denied by the promoters that this would be one of the direct effects of the Bill if granted. They pleaded that they were limited by Act of Parliament to a maximum—he believed that was the only answer—and that they were bound to reduce the cost to the consumer. Therefore they said that what the consumer lost in one way by the loss of illuminating power he would regain in another way by the reduced cost of his gas. This was no answer. In the first place, there was no guarantee that the amount which the consumer would continue to pay on a reduced bill would be equivalent to the reduced article that he was consuming at the increased price, and, in the second place, they all knew there was a limit to dividend beyond which the reduction had to be made. It was quite possible that it was conducive almost to extravagant depreciation and other charges, which would not go into the pockets of the consumer and which would increase the cost. He was told the cost of the new burner was something like two guineas; and it therefore would be beyond the powers certainly of the poor for purposes of testing. The circumstances under which the Bill had been brought in, the powers it proposed to give, and the difficulties in which every local authority would be placed if it was to seek *locus standi* to appear before the Committee, gave, he ventured to hope, sufficient ground as to why the Bill should not get a second reading.

Mr. J. F. L. BRUNNER said that, if the House did not accept the second reading, they would be stopping progress. The three Bills proposed to substitute for an antique instrument the most modern form of testing gas. The Hon. Member who had just spoken seemed to think that poor consumers would have to purchase the burners. But this was not the case; it was the gas companies. He thought the public had been enabled by the progress of science to improve upon the burners used by gas companies heretofore; and provided the gas was good, the burners were better than they used to be. Therefore, if the gas was kept to a certain standard, it was better to-day than originally. In the Metropolitan area, more than half the gas used was for heating and power; and therefore gas of the lower illuminating standard was just as good for the majority of users as gas of the higher standard. So much was this so, that the Committees upstairs had allowed gas companies to lower their standard. The Welsbach burner, as a matter of fact, which was practically universal, was better if used with poor gas than with rich. Therefore, this Bill would enable the companies to give cheaper gas; and if the gas was well burned, it would be better for the public than the dear gas. He was in no way interested in gas companies, but he hoped the House would not insist upon an antiquated instrument instead of a more modern one.

On a division, the "Ayes" were 80; and the "Noes," 61.

The No. 2 Bill.

In the case of this Bill also, the motion was that it be read a second time.

Sir CLEMENT HILL said the Corporation of Shrewsbury objected to the No. 2 burner because they considered it a disadvantage to the gas consumers. Their Act of 1901 provided that Sugg's No. 1 burner should be used to test the gas; but the Bill proposed to alter that. If this was necessary, if it was altered to the Company's advantage, the sliding-scale should be altered too. It was also considered that no efficient method was provided in the Bill as to the heating value of the gas. Strong objection was also felt to the general principle of an omnibus Bill for these various companies. It was desirable that each borough should have an opportunity of presenting its own Bill, so that its own particular circumstances and conditions might be brought before the House.

Mr. ADKINS remarked that, so far as the borough of Shrewsbury was concerned, the points mentioned by the Hon. Member could be dealt with in the ordinary way before the Committee. There was nothing in the grouping of the Bills in the second group to prevent the particular case of Shrewsbury being put before the Committee—a thing which was done very often in cases of this kind. If the second reading of the Bill were rejected, they would have the extraordinary position that whereas these Bills were brought into the House with a large number of opponents, a very large proportion of them had now withdrawn. The Committee had decided that there was no adequate reason for dealing with each Bill separately. The course he would suggest by no means precluded the possibility or certainty of dealing with any particular argument. When the Bills came there, those who were anxious to have the business done in a way fair to the local authorities and gas companies put down an instruction which would enable those representing the borough of Shrewsbury—if they could show that the special interest of the borough was distinct and separate, and ought to have special consideration apart from the general one—to put their case. With reference to the remarks of the Hon. Member for Wolverhampton, he did not think it was an accurate forecast to say that this proposal would impose special expenditure either upon the borough of Shrewsbury or upon Wolverhampton, because, if they thought they could prove that their case was really special in essence and distinct from the others, they could conduct their opposition as in a Special Bill. The object of these Bills was not to injure the poor, as was inaccurately stated by one Hon. Member. The object was merely to get an accurate measurement of the quality of the gas; and it was in the interests of the community, quite as much as in the interests of any company, that they should have precision and accuracy in any tests applied to gas. Under the uniform practice of both Houses of Parliament for years past, no fresh company or municipality had been allowed to sell gas without the provision of the standard burner. The object of the Bill was to extend universally what Parliament had extended invariably to all new applications. The House would see that what was aimed at was not to benefit gas companies at the expense of the public, nor to benefit the public at the expense of legitimate and lawful undertakings, but to clear up the matter and see that there should be as good a test in the interests of the public and the undertakers in all parts of the country as there were now in many parts of the country. The instruction they had put down and the view taken by Mr. Illingworth would, he hoped, satisfy the House that they were endeavouring to save cost and time where the issue was common, and to allow special treatment where the circumstances were special. It was the object of the Bill to make uniform the very best test of gas, so that companies might not waste money nor the public get an article which was improperly tested. Under these circumstances, he hoped the second reading would be given, and that the other questions bristling with technicalities should be decided by a Committee upstairs.

Sir C. HUNTER said his objections were very similar to those made by Sir Clement Hill. It appeared to him that if the Bill became law it would be quite possible for a gas company to reduce their illuminating power by 25 per cent., which would be much more to the benefit of the company than the consumer. His constituents also thought that the cost of changing the burner should be provided by the gas companies and not by the consumers. The Bath Corporation considered—and he thought rightly—that if the Bill became law the testing instruments should be undoubtedly under the control of the municipality, and also that any expense of altering the system should be borne by the gas companies. An enormous amount of gas was used for heating purposes; and it was possible the calorific power might be reduced.

Sir DANIEL F. GODDARD thought there was a great deal of misconception as to the whole meaning of the Bill. The speeches which had been made were really full of inaccuracies. Mr. H. S. Foster had seemed to think that this was going to be particularly hard on the poor. A more ridiculous theory was never put forth. Supposing the operation of the new test-burner was to the advantage of the gas companies, how was that going to be charged upon the consumer? If a company could save money, it could reduce the price of gas; and surely everybody knew that the course of recent legislation was to put gas companies on the sliding-scale standard—that before they could obtain the slightest extra profit from any advantages in the cost of manufacture, they had to give the larger proportion of the profits to the public. Thus, if the cost of gas was reduced by 1d. per 1000 cubic feet, all that would go to the shareholders by way of extra profit would be $\frac{1}{2}$ per cent.; the whole of the rest would go to the public. If the cost of gas were reduced, by far the greater portion of the saving went to the consumers. Sir C. Hunter seemed to think that by the adoption of the Bill a gas company would be able to reduce the illuminating power of their gas by 25 per cent.

Sir C. HUNTER: I say they might.

Sir DANIEL GODDARD said that was quite impossible. He would frankly admit, as an expert on test-burners, that this was an improvement on the old standard, and would give a better illuminating power to gas; but the only saving he ever heard named was something like a candle or a candle-and-a-half illuminating power. The candle power of the gas in an up-to-date city like Bath would not be less than 15, and a reduction of $1\frac{1}{2}$ candles could never be interpreted as 25 per cent. It was quite a misconception to imagine that the cost of the burner would be charged to the consumer. If they studied Acts of

Parliament, they would find that the apparatus for testing gas had to be provided at the cost of the gas company. The local authority would be put to no extra expense in regard to the matter. It was laid down by the Gas Referees that the gas companies were entitled to have their gas tested by a burner which would be the most suitable for obtaining the greatest amount of light. This was the principle on which they were going; and this was why they were insisting upon the No. 2 argand. The companies had grouped themselves together with the object of getting a common factor; and it would be clear to those representing the working classes in Parliament that it was not in the interests of members to impose legislation which would be of a most costly description. It should be always their aim to reduce the cost of Private Bill legislation. If, instead of putting these Bills into three groups, every one of the companies had to come to Parliament for powers, it would be an enormous cost to them individually. Who was going to pay that cost? The gas company might not care to undertake the expenditure of promoting the Bill. There might be differences of opinion and of circumstances; but by the instruction on the paper it would be perfectly possible to remove the difficulty. He hoped, with the instruction in view, the Bill would be allowed to go to second reading.

Mr. H. S. FOSTER said he had been faced with a charge of inaccuracy with reference to his statement that the tendency of the Bill would be to increase the cost of gas. Sir Daniel Goddard had admitted quite frankly that the effect of testing the gas with the No. 1 argand had been to give better results. He was told that practically the effect of the burner, as compared with the No. 1 argand, was to show that, when the gas was tested, it was of better quality when tested by a No. 2—the comparison varying about 2 candles in 15-candle gas, and a considerably higher increased ratio in the lower-grade gas. He was told that in the case of Liverpool it was decided to allow a reduction to the extent of 6 or 7 candle power; and therefore Sir C. Hunter would see that the difference might amount to 20 per cent. He was told that the practical effect of adopting the burner would be to enable gas companies to sell gas of considerably lower value for illuminating, heating, and motor purposes than they were at present allowed to do under their Acts. It was obvious that, if the companies were to be permitted to supply gas of lower power than was required by Act of Parliament, it would necessitate having a greater number of cubic feet, and therefore the user would consume a larger quantity.

Sir DANIEL GODDARD asked whether the Hon. Member had read the evidence given before the Committee of the House of Lords, in which it was conclusively shown that there might be a trifling loss of calorific power.

Mr. H. S. FOSTER said he had not done so. But he was told that they got better results from the No. 2 burner than from the No. 1. He was informed, however, from a source upon which he thought he could rely, that the effect of the use of the new burner was to decrease the calorific power in regard to the lower and poorer quality of gas; and the effect of this would be obviously to increase the price of gas to the poor, because they would have to use a larger amount to get the same calorific results.

Mr. JAMES PARKER said he had just an elementary knowledge of the testing of gas; and he did not think that some of the things which had been stated in the debate on the side of the promoters could be borne out in fact. He opposed the Bill, not from any factious opposition, but because he believed that it would be a disadvantage to the very poorest class of the community. If he did not think so, he would not go into the lobby to vote against the Bill. The very poorest class of the community did not buy incandescent burners. They had to be satisfied with the ordinary burner; and therefore this measure would be a distinct disadvantage to them. It was a well-known fact that in many gas-works, owned both by companies and corporations, the engineer tried to get the best production results he could, and endeavoured to save as much money as possible in regard to the purification of gas. For the purposes of the poor in regard to heat, he admitted it did not make a great amount of difference; but for the purposes of light, in the cases where gas was used without incandescent mantles, it made a great deal of difference to the poor if they did not make use of mantles. But there was another difference, to his mind, which was of equal importance to the poor who burnt gas, and who had not the advantage of the invention, and that was that they usually lived in the smallest rooms; and if the gas was foul and not purified, these people were breathing much more poisonous air. He contended, therefore, that there was a case which could be made on the other side. He did not think that the House had been properly informed with regard to this particular Bill. As to the promotion and amalgamation of the Bills, he agreed entirely with the promoters, because if anything could be done to decrease the cost of promoting Private Bills, or to decrease the cost of opposition to them, he considered it ought to be done. On the other hand, he thought there was really a case to be made out—a genuine case on behalf of the poor; and they were going to suffer unless they took advantage of the incandescent burner and of the latest inventions in order to get from bad gas the same illuminating power that they could get without incandescent burners from good gas. The companies admitted that this was going to be an advantage to them; and that it was all right, because they could not have more than a certain dividend under their Act of Parliament. But their capital could go up in value, and there would be other advantages which were not represented in dividends. He thought these measures a disadvantage to the poor; and he would vote against the Bill.

Sir FORTESCUE FLANNERY said that if he thought the Bill was going to be a disadvantage to the poor, he would certainly vote against it; but as he happened to have some experience in connection with gas, he did not believe that the measure would be a disadvantage to them. The first point which the House ought to remember was the existence of the sliding-scale in practically every relationship existing throughout the country between the producers and sellers and the consumers of gas. The position was that before there could be greater profits there must be a lowering of the price of gas; but the sliding-scale provided that before a greater distribution of profits—before a greater dividend was possible to any company—the price at which the gas was sold must be lowered. Some years ago, the illuminating power of

gas was obtained by what was known as the flat-flame burner; but now they had the incandescent burner. They must therefore have gas which produced, not the first effect of a direct illuminant, but the new necessity of heat; and therefore the best illuminant was obtained now by gas which produced the greatest amount of heat. The old conditions were changed. The effect generally of having gas which of necessity was the production of heat rather than the production of light, was that the same quality of gas which was the best for producing heat through mantles was best also for producing heat for cooking purposes. Therefore, a gas company could not produce gas which was capable of the double use, and which was beneficial to the poor because it was cheaper (having had eliminated from it all those constituent parts of direct illumination which used to add to its cost; and so gas could now be produced mainly for the one purpose of heating, and so could be produced cheaper. At Wandsworth, gas was down to 1s. 10d. per 1000 cubic feet—something like half the price that it was within a very few years. The result, therefore, of this change in the constituent qualities of gas and the method of manufacture had been universally, among gas-works of considerable size, to reduce the cost of the gas itself; and this was one of great benefit, as the enormous extension of cooking by gas-heating stoves proved, to the poorest of the poor. Poor people who could not put their names down for quarterly payments in the ordinary way, and who had adopted the penny-in-the-slot system, were benefited beyond comprehension by the system, which had enabled the price of gas to be reduced, and had brought it within the reach of people who a very few years ago could not possibly use it. With regard to the flat-flame burner, it followed, from what he had said, that the increased calorific power of the gas reduced the direct illuminating power of it. He admitted that if they were to pay the same price per cubic foot of gas of modern manufacture, they would not get the same amount of illuminant for the money, whether they were rich or poor, as they would under the old system. But they did not pay the same they used to pay. If they compared the illuminating power, even the reduced illuminating power of modern gas burned in the flat-flame burner, against the cost of it in money, having regard to the reduced cost per 1000 cubic feet, they would find that the poor person was no worse off than before the change took place. He claimed that he had demonstrated that this was a matter in which the interest of the consumer and of the producer were indissolubly united. He claimed also he had proved that for cooking purposes the poor were benefited by the change that had taken place in the system of manufacture—a change that would be assisted by the adoption of the new burner. He claimed that, as regards illumination from the point of view of money expended, the poorest people were no worse off than they were before this new system.

Mr. G. R. THORNE said it seemed to him that, as a result of this procedure, a lower-power gas would be given to the people, and that the poorer classes of the population, who would not be able to use this particular burner, would necessarily suffer, and any reduction in the cost would not be sufficient to compensate them. If it was right that this burner should be the standard, it ought to be the regular standard all round. It should be standardized—not by a Bill brought forward by private companies in their own interests, but by a General Bill produced in the public interest. It might ease the companies combined together to do it more cheaply; but the opposition was certainly not eased to the individual corporation. It seemed to him that this was not a fair way of dealing with a public question.

Mr. ILLINGWORTH said he believed it was the common practice in the House, in the case of such a Bill as this, unless it traversed some accepted principle, to give it a second reading. He thought there was still considerable misapprehension as to what was the object of the Bill. Gas companies must have a standard burner; and so far back as 1868 it was laid down that the test-burner should be the most suitable for obtaining from the gas the greatest amount of light. There were several burners now in use for officially testing the illuminating power of the gas supplied by the various companies under the powers which had been given to them. The object of this Bill and of the other Bills was the adoption of the No. 2 argand burner, which was recently invented, and which satisfied the requirements of a test-burner. He reminded the House that the burner had been approved by the Gas Referees; and it was generally used, as recommended, so as to get a uniform standard test for all gas. This test-burner had been in use by the London Gas Companies since 1905; and it was provided for in all modern Gas Acts and Orders as a matter of course. The Board of Trade point of view was that they desired, in the place of the various test-burners now in use, to get the one recommended by their own scientific Committee in order to obtain an absolute standard of uniformity of gas in all parts of the country, so that one might be compared against another in the interests of economy and the usefulness of the article produced. He hoped the House would agree to the safeguard the instruction would give to any authority in the conditions which were laid down, and that the Bill would be given a second reading.

On the question being put that the Bill be read a second time, the "Ayes" were 96; and the "Noes," 56.

Sir DANIEL F. GODDARD then moved: "That it be an instruction to the Committee on the Bill that they do, on the request of any of the petitioners, consider the expediency of dividing the Bill in order to remove any difficulty that may, in their opinion, be proved to exist (by reason of the inclusion of several cases in the Bill) in the submission separately of any of the cases in opposition." Continuing, he said that the Liverpool Bill not being in this Bill, he thought it only fair that, if the companies concerned could show that there were circumstances which would make it desirable for them to separate themselves, the Committee should have power to do so.

Mr. RYLAND ADKINS seconded the motion; and it was agreed to.

The No. 3 Bill.

On Friday it was announced that the opposition to this Bill was withdrawn. It was read a second time without debate; and a similar instruction—moved by Sir Daniel F. Goddard—was passed permitting the Committee on the Bill, on the request of any of the petitioners, to consider the expediency of dividing the Bill.

BRIGHTON AND HOVE GAS BILL. THE QUESTION OF A CAPITAL REDEMPTION FUND.

House of Lords Committee.—Friday, June 24.

(Before the Duke of BEDFORD, in the Chair, the Marquis of BRISTOL, the Earl of WESTMORELAND, Lord BASING, and Lord DIGBY.)

Consideration of this Bill, which proposes to confer further powers on the Brighton and Hove General Gas Company, was commenced last Friday.

The promoters were represented by Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. CLEASE; the Hove Corporation by Mr. RAM, K.C.; the Brighton Corporation by Mr. TALBOT, K.C.; and the County Councils of East and West Sussex by the Hon. E. CHARTERIS.

Mr. BALFOUR BROWNE, in opening the case for the Bill, explained that the Company was incorporated in 1839, and had had various Acts of Parliament extending the limits of supply from time to time—the last Act being obtained in 1893. The objects of the Bill were to incorporate certain facilities which had been conferred on gas companies in the last fifteen years since they were in Parliament. Most of the clauses were those of the Model Bill; and there was no real opposition to the preamble. The whole question before the Committee was on two clauses which brought the Company into line with the modern practice of the House. As there was no opposition on the preamble, he would, with the permission of the Committee, take it that the preamble was proved and proceed with the clauses on which opposition arose.

Mr. RAM indicated that his case for Hove would be identical with that of Brighton.

Mr. TALBOT then proceeded with his objections to clause 12 of the Bill, which provides as follows:—

12.—Whereas under the provisions of sections 50 and 51 of the Brighton and Hove Gas Act, 1881, the Company were required to cease to manufacture gas or residual products at the Black Rock works of the Company or after a period of 10 years at any place within the parish of Hove, and have accordingly abandoned such works and ceased to manufacture at their then existing works in the parish of Hove, and in consequence thereof capital to the extent of £57,000 or thereabouts of capital expended in the works so abandoned has become unproductive, and it is expedient that the Company should cancel such unproductive capital, it is hereby provided as follows:

- (1) The Directors of the Company may, if they think fit, in any half year appropriate out of the revenue of the Company as part of the expenditure on revenue account any sum not exceeding £1800 to a fund to be called the "Capital Redemption Fund."
- (2) Every sum credited to the fund shall be applied by the Directors from time to time, and in each case as soon as is reasonably practicable after such sum has been credited, to the fund under the provisions of this section in purchasing ordinary or preference stock of the Company; and all stock so purchased shall immediately after the purchase thereof be cancelled, and shall thenceforth be and be taken to be extinguished; and the Directors shall cause the same to be duly noted as so cancelled and extinguished in the books of the Company: Provided always that all stock so purchased otherwise than in the open market shall be purchased at a price not exceeding the middle price of the then current official quotation for the same on the London Stock Exchange or at the price (as recorded in the Company's books) at which the last transaction in the same class of stock has taken place whichever of these prices shall be the lower.
- (3) This section shall cease to operate so soon as the Company shall have purchased and cancelled under the provisions of this section ordinary or preference stock of the Company of the aggregate nominal value of £57,000.
- (4) The Company shall not re-issue any stock which shall have been cancelled under the provisions of this section.

Counsel went on to say there was no precedent whatever for the clause. The Corporation had not the least objection to the shareholders of the Company redeeming or cancelling the capital which had not been represented for a great many years by any works used by them in the manufacture of gas. But the Corporation objected to the Company doing so at the expense of the consumer, at least for the next nineteen or twenty years. The immediate effect of the proposal would be to withdraw £3600 per annum from the divisible profits to which, under the sliding-scale, the consumer looked for a reduction in the price of gas. In the particular circumstances of the Brighton Company, it was common ground between them that the consumers' proportion of any revenue was about five-sixths to the shareholders' one-sixth. Under this proposal, the consumer would lose about five-sixths of the £57,000. After a time, the saving of the dividend which would otherwise have to be paid on this capital which it was proposed to wipe out would balance the charge on the redemption fund; but inasmuch as the annual saving would be about £170, it would be at least nineteen years before that equilibrium was attained. There was no question that the proposal would benefit the shareholders at once, and increase the value of their security immediately it was carried into effect; and there was equally no doubt that it must be at the expense of the consumer, at least for nineteen years. Even if it were proved that at the end of this time the future generation would benefit substantially, it was obvious that the shareholders were a much less fluctuating body than the consumers. The Corporation asked that the £57,000 should be provided by the shareholders and should not affect the sliding-scale.

Evidence was first given in support of the opposition to the clause by the Borough Accountant (Mr. Stevens), who said that the effect of the clause so far as the consumers were concerned would be to defer the time at which they would be able to secure a reduction in the price of gas under the sliding-scale. The first generation of consumers could receive nothing but harm; and they would have to find the whole of the £3600. With regard to the suggestion that the Company was seriously over-capitalized, he could not see that they were in any abnormal condition in this respect. At no time since 1876 had they been below what was the maximum and was now the standard.

Replying to Mr. Balfour Browne, witness agreed it was to the advantage of the consumer to have the capital of the undertaking as small as

possible. But it was not to the advantage of the consumer to pay interest in their price of gas on the £57,000 of obsolete capital, neither was it to their interest to be called upon to redeem it. He agreed that if the £57,000 were not redeemed, the consumers for all time would be paying interest on it.

The City Treasurer of Liverpool, called as a witness, said he (Mr. Richard Barrow) looked upon the clause as an entirely novel principle.

He agreed, in reply to Mr. Balfour Browne, that the price of gas must include the working cost; and in the working cost, repairs and maintenance, fuel and things of that sort, interest on capital, or dividend, must be included. Thus the smaller the amount of interest on capital, the better for those who had to pay the price for gas.

Mr. RAM then addressed the Committee on behalf of the Corporation of Hove. He said this was a proceeding which would be wisely taken, and the consumers in Hove had no objection at all. But the question was as to who was going to find the money. He contended that the shareholders should pay. They had had the advantage in the past, and would get the advantage in the future. The Company tried to make it appear that they were compelled to incur the removal of their works, which had put upon them a large expenditure. But even if this were so, they would not be justified in calling upon the gas consumers to pay. But it was not the fact that they were compelled to move the works. No doubt it was to the advantage of the Corporations of Brighton and Hove, as well as to themselves, that it should have been done; but the result was a saving of 3s. per ton in the price of coal. It was not the fact that, in order to benefit the two Corporations, the costly removal of the works thus put upon the Company entitled them to any exceptional treatment; and it was unreasonable to expect the consumers to pay a higher price for their gas during the years that would be taken in wiping out the capital as proposed.

Mr. BALFOUR BROWNE, in addressing the Committee in support of the clause, pointed out that everybody agreed that the redemption of the capital was the right thing to do. A similar clause had been given in the case of the Gaslight and Coke Company; and when Sir James Rankin's Committee inquired into that case, the Company were found in default, and no doubt they had been wonderfully extravagant. But the report of that Committee was that an effort should be made by any company having obsolete or unproductive capital to redeem that capital by a sinking fund or otherwise. In the case of the Brighton Company, if the capital were not redeemed the consumers would bear the burden for all time by paying five-sixths of the interest, while the shareholders would bear one-sixth. The consumers would have a delay for a very short time of the reduction in the price of gas; but when the capital was paid off, they would get the benefit to the extent of five-sixths. He admitted that this case was entirely different to that of the Gaslight and Coke Company, because they were not in default. But the real principle of a company was that it ought to have nothing but effective capital. The whole greedy object of the opposition was to force the shareholders to pay everything.

Mr. Arthur M. Paddon, the Chairman of the Company, said that after the decision of Sir James Rankin's Committee, the London County Council promoted a Bill with a view of forcing the Gaslight and Coke Company to get rid of their dead capital. The result was that the Council's Bill was withdrawn and the Gaslight and Coke Company's Bill passed; and a provision was inserted that the Council's costs should be paid. He was persuaded that it was good finance to get rid of the dead capital, and that it was far more in the interests of the consumer than the shareholder. The benefit would go on in perpetuity.

Mr. E. L. Burton, the Secretary of the Company, gave similar evidence. He said that in the first year there would be a saving of £180, and this would gradually increase year by year. A similar clause to this was inserted in the Bishop's Stortford Bill of the present session; but that clause was struck out when it was pointed out that they had no abandoned works in the same sense.

Mr. Joseph Cash, the General Manager of the Company, agreed that the clause was a new departure; but it was one which would be to the advantage of other companies in a similar position. When they put up any very extensive works, the capital expenditure might not be remunerative at once; but the consumers of to-day had, in that case, to pay something for the benefit that would accrue hereafter. Seeing that this £57,000 was a burden that ought to be got rid of, it should be done so that the consumers in after years might get a great benefit.

Mr. E. H. Stevenson considered that the operation of the clause would be an equitable one in its present form. The only difference between what was usually done and what this Company proposed to do, was that when works were moved and new ones erected, the value of the old works was paid by the consumer out of revenue over a series of years. In this case, the Company were not in a position to do this, and the matter had been postponed. It was quite fair that the money should be paid by the consumer. If the other process had been adopted and the amount of capital represented by the works had been written off year by year, it would have fallen on the consumer of that day in order that there might be no dead-capital for the consumer of to-day. It was impossible to carry on works such as these from hand to mouth, so that each consumer of a particular day found sufficient for himself and no more. The consumer of to-day had always to pay for the consumer of the future.

Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company considered there was no doubt that the redemption should come out of the pockets of the consumer. The money had already been laid down in the erection of plant for the manufacture of gas, and another set of plant had had to be provided in order to carry on the undertaking. It would be unfair for the shareholders to pay for their capital twice over.

The Committee decided that the clause should not be amended.

Mr. BALFOUR BROWNE pointed out that since clause 6 had been struck out of the Bill, the County Councils of East and West Sussex were no longer entitled to appear in opposition.

Mr. CHARTERIS, who appeared for the County Council, said he also objected to clause 8 of the Bill.

Mr. BALFOUR BROWNE thereupon promised to strike out this clause also; but, after a discussion, the Committee decided that Mr. Charteris should be heard.

Mr. CHARTERIS then proposed to amend clause 8, with regard to the

breaking-up of roads and bridges for the repairing of service-pipes. He asked that the notice given should be a month, instead of three days.

Mr. Wood, the County Surveyor, said the notice given under the Gas-Works Clauses Act had been found insufficient. He agreed (in reply to Mr. Honoratus Lloyd) that they were asking for a variation of the general law; and that their proposal had not been inserted in any previous Bill except by agreement.

Mr. Paddon, giving evidence against the proposed amendment, said the Gas-Works Clauses Act, 1847, was passed with the particular object of avoiding these special provisions; and when the Act was amended, the provision relating to this matter was not interfered with. The County Council had never called the Company's attention to the necessity of a longer notice; and their mains within the County area were 5 miles out of a total of 192 miles.

The Committee decided to amend the clause, and altered the period to 14 days.

Mr. CHARTERIS then proposed to amend sub-clause 3 of clause 8, which provided that the rights of the County Council were not to be affected with regard to the alteration or deviation of the main roads along which the pipes of the Company had been laid. The Company were to alter any such mains, and the Council were not to make any compensation to the Company for any expense or loss to which the Company might be put in consequence of any deviation or improvement. He said the clause appeared in numerous Gas and Water Acts, but, so far as he was aware, it had never been argued before a Committee of the House. As the road authority, the Council had to maintain the roads, whereas the Gas Company were working for a profit. As a rule, the pipes were laid in the roadside waste; and if the County Council desired to broaden the road, the effect was to diminish the amount of soil between the pipes and the surface of the road. Consequently the pipes were too near the surface for safety; and the County might or might not be held responsible for any damage done to the pipes. Another instance was where there was an angle in the road. In such a case, the Council purchased land from the adjoining owner, threw the land into the roadway, and the old roadway into the owner's property. But when there were pipes under the road, the owner would not be responsible for them, and the Council then removed the pipes—putting them under the road, and making the Company entitled to compensation from the County for the costs of the removal. He contended that the Gas Company should pay their share of the cost. A similar clause had been inserted in the Stourbridge Gas and Water Order, and the South Staffordshire and Watford Acts.

Mr. LLOYD contended that the clause in the Bill went a great deal beyond the General Law, but was limited in its application to the present Act. The Council were asking that it should be made applicable to former Acts. The clause provided that when the local authority carried out an improvement for the benefit of the public, it was to pay the incidental costs of so doing, and pay for the cost of the removal of the gas-pipes. They were now seeking to provide that they should not make any compensation.

Mr. CHARTERIS said that nowadays, on account of the motor-traffic, the Council had to be continually cutting off short angles in the roads and straightening them.

The Committee, however, declined to amend the clause in the Bill.

The proceedings were then adjourned till yesterday (Monday).

GARNANT GAS BILL.

Among the Bills before the Unopposed Bills Committee of the House of Commons last Thursday was one promoted for the purpose of supplying gas in Garnant.

Mr. BAKER (Parliamentary Agent) explained that the object of the Bill was to incorporate a new Company to supply gas in a district in South Wales which formed part of the anthracite coalfield. The capital was £18,000. There was a population of 5000 or 6000 needing a supply; and the district was very rapidly developing. The Bill had been through the House of Lords.

Mr. E. R. FISHER, a colliery proprietor and one of the proposed directors of the Company, said they were already making arrangements for laying down the mains, which would cost between £6000 and £7000 as a first instalment. In the first instance it was proposed they should take gas in bulk from the Ammanford Company, whose area adjoined theirs, and when the business developed, put up their own gas-works. He was a Director of the Ammanford Company, who were in full working order. They were prepared to lay a main to the boundary of the Garnant Company's district. The Ammanford Company bought up the works of the Amman Valley Gas Company by arbitration; but the works and mains had to be renewed. The Ammanford Company had now been in existence for some twelve months. In the Garnant Company they proposed that the price of gas should be 5s. per 1000 cubic feet on a sliding-scale. The mains would probably amount to some 9 miles in length. The price charged by the Ammanford Company was 4s. 3d. There was only a distance of some 2 miles between the works; but he thought that separate works were necessary.

Mr. BAKER remarked that when the supply in Ammanford was taken up, there would be no surplus for Garnant.

Mr. E. H. STEVENSON said he had instructed the Ammanford Company. The previous Company—the Amman Valley Gas Company—spent something like £25,000 in one way or another, the greater part of which went into certain pockets. Upon arbitration, the Arbitrator awarded a little over £4000 for the whole concern. The Ammanford Company would not be able to supply the Garnant Company after three or four years without very much enlarging the works.

The CHAIRMAN: Supposing the whole district was under your control, would you think it an economical thing to put up separate works so near together, rather than enlarge the existing works?

Witness replied that, if he could combine the whole thing in one, he should prefer to do so. He thought there was the possibility that the Ammanford Company might have taken up the supply of Garnant.

Mr. BAKER pointed out that there would be great difficulty in the Ammanford Company obtaining the capital. All the capital had been

subscribed privately. The Directors of this Company were Directors of the Ammanford Company.

Witness, replying to further questions, said that both Companies were a long way from the coalfield; but the two areas adjoined.

The CHAIRMAN: Do you not think that it is very enterprising of these Directors, before they have had their existing powers for one year, to form a Company in Garnant?

Witness: Well, it is a district that must have gas.

The CHAIRMAN said the Committee had considered the matter, and felt that it was really an extension of last year's powers rather than to be looked at as an entirely separate Company; and in view of the practice of Parliament in regard to the 10 per cent. dividend, they were not ready to grant the Bill. What they would be prepared to grant would be a capital of £10,000, which would seem to be quite adequate for mains, meters, and so on, for some years to come, and a maximum price of 4s. 3d., similar to the one granted last year to the Ammanford Company.

Mr. BAKER: Very well, Sir.

LONDON COUNTY COUNCIL (GENERAL POWERS) BILL.

Gas Companies and the Smoke Nuisance.

Further consideration was given last week by the Local Legislation Committee of the House of Commons to Part IV. of the London County Council (General Powers) Bill, which deals with smoke nuisance (*ante* p. 878). Sir FRANCIS LAYLAND BARRATT presided.

Dr. MILLSON, the Medical Officer of Health for Southwark, gave evidence. He said there was a tendency for the smoke nuisance to diminish; and in the case of manufactories it had been less noticeable. Since the decision in the Lots Road case, the difficulty had been largely increased of proceeding against manufacturers.

In reply to the Chairman, Mr. FITZGERALD, who appeared for the promoters, said there was no appeal in the case because it was a question of fact.

The CHAIRMAN remarked that it seemed to him they had a very interesting appeal on the question of what black smoke really was.

In cross-examination, witness said he thought the evidence in the Lots Road case was bad and unsatisfactory. By turning steam into a chimney, it was possible to change black smoke into grey or white; but the nuisance was the same.

Dr. OWENS was of opinion that smoke was never black. The smoke from blast-furnaces was practically white; but the nuisance depended upon the sooty and other matter contained in it. The emission of dense smoke could be prevented if proper precautions were taken; it depended upon the construction of the furnace and proper stoking. In London, he thought domestic chimneys emitted a greater volume of smoke than manufactories; but with the domestic grate, there was no possible way of preventing it, so long as bituminous coal was burnt. It could only be stopped by using smokeless fuel, which could be burnt efficiently in a grate, and which cost as much as coal. Improvements which had been made in the boilers in Lancashire rendered the use of a cheaper fuel possible. The nuisance then was not greater when the fuel was used with an efficient smoke-preventing device.

In reply to further questions, witness said he was not aware that in the fuel there were ingredients which could not be burnt and were a great nuisance to health. In the use of mechanical stokers, it was necessary that, in lighting a furnace, some smoke must be emitted at first.

Evidence was then given in opposition to this part of the Bill.

Mr. MEYER, a civil engineer, who stated that there were times when it was absolutely certain that smoke would be emitted which looked very dark; but this applied to large installations with a variable load. With a steady load, smoke ought not to be emitted. He thought, however, that the omission of the word "black" from the Act would leave the matter too much in the hands of the local authorities. If the word "black" were struck out, some perfectly definite clause ought to be given, so that the power companies would know where they were. The clause in the Bill was too indefinite.

Replying to Sir WILLIAM PRIESTLEY, witness said it was only a question of what was reasonable. It was impossible to have a hard-and-fast rule.

Mr. BALFOUR BROWNE pointed out that any such thing as a prohibition of all smoke would put an end not only to the manufactories of the country, but to the electric traction and the electric lighting of London. He agreed that they wanted to get at certain words which would have the effect of stopping the nuisance which was produced (which could be avoided) and at the same time to allow those who were doing their best to prevent a nuisance, and who, by reason either of an accident or an emergency or a sudden call, could not prevent smoke, to be free from penalty. If he had got the best practical installation, if he used it in the best practical way, and if, notwithstanding all his efforts, there was still smoke emitted on a certain occasion (not for days, but for a short period), he was not to be fined for what he could not prevent. He suggested to the Committee a clause which provided that the provisions of paragraph 13 of section 24 of the Act of 1891, and of the section in this Act relating to smoke nuisance, should not apply to the Lots Road Power-House of the Underground Electric Railway Company if (1) the furnaces therein are constructed in such a manner as to consume, as far as practicable, all smoke arising therefrom, or are constructed and managed so as to avoid, under normal conditions, sending forth from the chimney of the said power-house smoke in such quantities as to be a nuisance, and (2) the smoke sent forth from such chimney in such quantities as to be a nuisance was sent forth in consequence of sudden or exceptional demands for electrical energy, or as a result of accident or circumstances beyond the control of the Company.

The CHAIRMAN remarked that the Committee would not consider the question of granting any one works exceptional privileges.

Mr. BALFOUR BROWNE stated that, unlike electric power, the gas

companies had a store of gas in their holders, and could tide over temporary demands. But there were three matters in which they could not possibly avoid making some smoke; and because it was absolutely unavoidable, they asked to have even the protection of the existing Act, or some such clause as he had suggested to the Committee on behalf of the Electric Power Company. He thought the position had been fairly stated by Mr. Millson, who said they all admitted that nuisance meant continuous black smoke for five minutes, or at shorter intervals for ten minutes in the hour. This was a fairly good and reasonable standard, and one with which the gas companies would not have the least difficulty in complying, and avoiding all nuisance. But when they were drawing and charging the retorts, there must be emission of some smoke. Of black smoke there would be none; but there would certainly be some smoke. Accidents, however, might occur. A retort might crack, and by no possibility could they avoid the escape of smoke. In the heated condition they consumed all the particles which were combustible; but when a crack occurred, it was quite impossible to avoid smoke escaping. The only other case they could not deal with was that when hot coke was quenched there was an emission of steam and also of smoke. They had conducted their affairs with excessive care. The South Metropolitan Gas Company had never had any action brought against them; and there were a great many gas-works where there had been no report at all. These undertakings did all they could to get the most value out of the fuel. They had used every possible precaution; and in every respect, with the three exceptions he had mentioned, they could avoid the production of smoke. But in the present Bill they were providing against the emission of any smoke; and this, in the ordinary course of their business, was an every-day occurrence. It was felt that if the law was to be altered in such a way as to make smoke a nuisance and to make the emission of smoke a matter that was to be punished, they could not possibly carry on their undertakings.

Mr. Corbet Woodall's Evidence.

Evidence was then given in support of the opposition of the Gas Companies.

Mr. Corbet Woodall, the Governor of the Gaslight and Coke Company, said that, with the exception of the area of the Commercial Gas Company, they supplied gas north of the river, together with a small piece at Nine Elms and Lambeth. They had six manufacturing stations within London; and there were two outside. The Company had always been very sensitive with regard to smoke nuisance; and in consequence of their sensitiveness various of their works had been closed and the manufacturing works had been taken down to Beckton. This was done as a matter of public advantage, although to a certain extent the whole station had become economical. It was urged upon them at the time they abandoned the City of London works at Blackfriars that certain facilities would be given to them if their works were removed down the river. When Parliament dealt with the capital of the Company, there was a provision by which a million pounds was to be paid off in respect of these sites. When the works were removed to Beckton, a considerable number of the up-town stations were abandoned; and it was extremely difficult to write these off from the capital of the Company. It became a matter of reproach to the Company that the price of their gas was high, because the capital was high; and it was ordered that the Company should reduce their capital by a million sterling in order to bring the nominal capital more in agreement with the assets of the Company. Of this amount, they had already written off about £120,000.

In the ordinary process of gas making, they emitted no smoke whatever from their chimneys; but in the event of a retort breaking down, the gas which should go up the ascension pipes escaped into the flues, and went up the chimney. This, however, was of comparatively rare occurrence. Also sometimes a little tar which might rest on the mouth-piece of the retort was drawn into the furnace as the retorts were heated, and it got into the flues and chimneys. But these were all almost negligible matters. The main reason why there occasionally was smoke was that the coke, after the gas had been extracted from the coal, was drawn out and quenched with water. There was just a little gas left in the coke sometimes; and this went up with the steam in a brown-looking smoke, which came out through the ventilators in the roofs of the retort-houses. It never travelled beyond the walls. It condensed very rapidly; and on coming into the atmosphere, it fell upon the curtilage of the works. It would come out from the orifices in the retort-house; and these orifices were within the definition in the Bill of the word "chimney." They would not, up to the present time, have been considered at all with regard to the question of smoke, and they never had been considered.

The Gaslight and Coke Company and the South Metropolitan Gas Company claimed to be very largely interested in smoke abatement; and he thought nothing had been done in the direction of diminishing the smoke nuisance in large towns that would compare with the work of the Gaslight and Coke Company in issuing fires and cooking arrangements to their consumers. The Company had now about 150,000 gas-fires and 430,000 cooking-stoves, some 6,000 or 7,000 gas water circulators, and an enormous number of incidental apparatus—all of which had displaced fires, and led to a very large diminution in the amount of smoke emitted into the atmosphere. These stoves, &c., were to be found in the very poorest houses, where otherwise there would be a coal-fire. The Company had now some 400,000 prepayment meters, every one of which displaced a coal-fire.

About three sessions ago, the Company were applying to Parliament for permission to amalgamate with a suburban gas company. The Corporation and inhabitants of West Ham were very indignant at the idea of the gas-works being removed from the town; and as a result of a petition presented to both Houses of Parliament, the Company had to agree that for ten years at least they would keep their works in the centre of the district—the point being that if the works were removed, the amount of occupation and employment for labour would be reduced as well as the rateable value of the district.

If the regulations in the Bill were enforced, it seemed very likely that the effect would be in the direction of turning works away and sending them further afield. The cost of this would be enormous; and the effect upon the price of gas would be disastrous—at any rate, to his

Company. Recently he was attending a meeting in a suburban borough where the gas-works were spoken of as a "beauty spot" of the neighbourhood. (Laughter.) He pointed this out because it had been said that gas-works interfered with the growth of vegetation. The occasional trouble of the emission of smoke at one period or another would not compare with the advantage from the presence of the works in the places they occupied, and certainly was not to be weighed against the enormous advantage of distributing gas at a low price for the purpose of heating and lighting—particularly heating.

Cross-examined by Mr. J. D. FITZGERALD, who appeared for the promoters, Mr. Woodall said there had been no prosecution against the Company for smoke nuisance, but there had been a complaint which, he believed, was well founded. They were served with a notice of abatement, but were not taken into Court.

Mr. FITZGERALD: You could not be unless you committed a nuisance. You did not continue the nuisance, and nothing more was heard of it?—We did not continue the nuisance. It is always intermittent and for very short periods.

Is it not an axiom of all gas engineers that a properly-managed gas company creates no nuisance?—I think we may fairly claim that.

When a gas company is coming to Parliament to take certain lands for gas-works purposes, some neighbouring owners object on the ground that it may create a nuisance; and the answer always is that a well-managed gas-works creates no nuisance?—Yes; I think that argument always comes up. One sure way to make a nuisance is to cramp the works; and the way to avoid it is to give plenty of space.

Under the existing general law relating to gas companies, there is a distinct enactment that "nothing in this or the Special Act shall exonerate the undertakers from any indictment, action, or other proceeding for nuisance in the event of a nuisance being caused by them"?—That is so.

So that in the present state of the general law applying to gas companies, if a company creates a nuisance of any sort, they are liable?—Yes; but there is an understanding that it must be negligent creation of nuisance. That is to say, the emission of steam, and the kind of smoke I have been speaking of (being a necessary part of the business of a gas company), could hardly be proceeded against as a nuisance.

I think you may take it that for an accidental emission of smoke, or something of that sort, proceedings are not taken?—I cannot agree to "accidental." It is part of the operations of a gas company that we should make steam.

But you have just told us it does not create a nuisance?—I do not think it does.

And therefore you are not liable. You would only be liable for black smoke if it was emitted in such quantities as to be a nuisance?—Yes.

How is your position at all altered by this Bill? You are liable for a nuisance, and you remain liable?—I think in reckoning the ventilators, which would take the steam from the retort-house into the atmosphere, as chimneys, you would lay us open to trouble which at present does not attach; and the removal of the term "black" would also have that effect.

If in either of these ways you commit a nuisance, you are liable to be proceeded against?—Yes; but as I read the proposed Act, it is not necessary to create a nuisance to any neighbour. If we emit black smoke, we are liable to be prosecuted.

You are open to be prosecuted, and you cannot be convicted unless it is proved that a nuisance is created?—Is that so?

Yes; the Act says so, and the Court has so laid it down?—Yes, under the existing Act I admit that; but would it be so under this Bill?

The CHAIRMAN: Would not your proposed clause alter it by making the word "chimney" include any opening through which smoke is emitted. The local authority would be liable to take proceedings against the gas company under section 24, which they could not do at the present time.

Mr. FITZGERALD: It alters the procedure, but not the liability. They could take proceedings against any gas company now under the general law because under their Act of 1871 they are not allowed to create a nuisance. (To witness): So that really the only difference that the Bill makes to a gas company is that the local authority could proceed against the company under section 24 of the Act of 1891, though the smoke was not black, if it created a nuisance. But you say they would be able to proceed against you for a nuisance if you created one by sending smoke out of a ventilator?—Yes.

Is it not much better for you, if you create a nuisance, that the matter should be adjudicated upon by a summary tribunal, where at most you are liable to a small fine, instead of having an action in the Chancery Division with an injunction against you?—I should very much prefer to keep the procedure as it is.

What is the capital of the Gaslight and Coke Company?—About 26 or 27 million pounds.

What is your gross income?—About £2,000,000.

Under these circumstances, you do not mind a Chancery suit, even if it goes up to the House of Lords?—We do not lust after occupation of that sort.

But you would find a comparatively cheap procedure by which you might be brought to book if you were creating a nuisance?—What I very greatly dislike, and deprecate very much, is the prospect of frequent application to the Courts upon trivial matters that at present are not regarded as of sufficient importance to proceed against us.

Mr. HELME: When you take off the covering from the end of the retort, there is a momentary puff of dark smoke which escapes through the ventilators at the side of the building?—Generally, that is so; but I should say with 60 per cent. there is not even that.

Can the escape of that dark smoke be avoided?—That is what I referred to when I spoke of a little tar being deposited on the mouth-piece. When the hot coke gives off that, you get dark smoke.

And that is practically impossible to avoid?—Yes.

Mr. FITZGERALD: When the emission of smoke occurs by throwing water on the coke, the smoke did not go beyond the walls of the works?—Almost invariably it is thrown down within the walls.

And accordingly you would not be liable for nuisance?—Different views might be taken upon that.

Under the existing law, you must not create any nuisance, and being under an obligation to carry on your works without creating a nuisance, you want a clause in the Bill that would put you in an entirely different position, and allow you to create a nuisance unless negligence was proved?—I do not know the procedure that is proposed; but I want to leave matters as they are.

Mr. W. Doig Gibb's Evidence.

Mr. W. Doig Gibb, the Chief Engineer of the South Metropolitan Gas Company, said he agreed generally with the evidence given by Mr. Corbet Woodall. There had been no prosecutions against the South Metropolitan Gas Company. It was inevitable that on the three occasions mentioned by Mr. Woodall, smoke must be emitted.

Mr. BALFOUR BROWNE: There is the definition now in the word "black," but that is to be taken away and all smoke is a nuisance.

Mr. FITZGERALD: No; the Bill does not say anything of the kind.

The CHAIRMAN: Under the Bill, all smoke might be a nuisance.

Mr. FITZGERALD: I would rather say, may be a nuisance.

Costs of the Tipperary Gas Bill Opposition.

Before the Unopposed Bills Committee of the House of Commons last Thursday, the Tipperary Urban District Council sought to obtain the insertion of a clause in a Local Government Board (Ireland) Order referring to a number of other districts—the clause authorizing them to borrow money to pay the costs of their opposition to the Tipperary Gas Bill in the present session. A letter was read from the Irish Local Government Board stating that, while sympathizing with the object of the District Council, the insertion of the clause in such a Bill was outside their powers, and advised them to take the necessary steps to bring the matter before the Committee who considered the Bill. Mr. M'Donnell, the Parliamentary Agent, having addressed the Committee, they decided that it was outside the purview of the Bill before them, and that they had no power to insert such a clause.

Acton Public Lighting.

The Highways Committee of the Acton Urban District Council have under consideration the following communication from the Brentford Gas Company, in reply to a letter asking if they could make any further reduction in terms for street lighting on an extended agreement: "In view of the improvements in high-pressure gas lighting that have been made recently, we are now in a position to make you this proposal: (1) To light the whole of the Uxbridge Road and Churchfield Road (West) by 1300-candle power inverted lamps, fixed on the existing electric arc columns, at a cost for cleaning, lighting, and maintenance of £12 per lamp per annum. (2) To fix 300-candle power Welsbach self-intensified lamps in positions where there are now electric arc lamps, other than those specified above, for the sum of £5 10s. per lamp per annum. (3) The scheme will also include fixing, at the Company's expense, automatic controllers to all existing gas-lamps, the price of which lamps will be reduced to £3 each per annum. The high-pressure lamps would be extinguished at 1 a.m., and their place taken by 4-foot Kern lamps (the same as now fixed in most of the side roads), which would be lighted at the same time as the others were extinguished. These low-pressure lamps would be fixed on the existing gas-standards. This scheme would give the Council not only the best lighted main road anywhere outside London, but at the same time would effect a very substantial saving in the lighting account. We must, however, point out that, in view of the heavy capital expenditure involved, a contract for not less than ten years is essential."

Norwich Electricity and the Rates.

A Local Government Board inquiry was held into an application by the Norwich City Council for sanction to borrow a large sum for the purposes of their electricity undertaking; and in the course of the proceedings, Mr. E. Wild (the Chairman of the Electricity Committee) said he gathered that Mr. H. R. Hooper (the Inspector) deprecated the dispersion in rate-aid of money that might be made by the undertaking. The following dialogue then took place: The Inspector: Your Engineer would be able to give you better advice than I could; but the first principle is to be absolutely financially sound, and the next is to bring your capital down so as to be able to give the cheapest supply for the benefit of your consumers. Mr. Wild: I anticipated your answer. I asked the question really to strengthen our hands in the position we have taken up in Committee. The only time we departed from our principle was last year, when £1200 was practically wrung from us. The Inspector: It spoils your undertaking; and it does little or nothing for the rates—certainly not for the poor, because the poor do not, of course, pay directly in rates. They pay so much in rental; and therefore they are not affected at all. I take it your Engineer will know very much better than I do how necessary it is to build up a private reserve, especially having regard to the fact that you paid a considerable amount to the Company for the undertaking. Mr. Wild: On the whole, the Council have backed us up; but there was a large amount of clamouring about it a year or two ago. We have made up our minds to set our faces against any more of it; and I thought I should be glad to have your opinion. The Inspector: There can be no greater benefit to the ratepayers than that the undertaking should be sound in every possible way; and the next benefit will be for the ratepayers to have the best possible supply at the cheapest rate.

The Bilston Gas Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for one of their electrically operated combined stoking machines, consisting of the "Too-good" charger and the wire-rope discharger, to deal with 12-cwt. charges in 22 in. by 16 in. through retorts. The same firm have also an order for an identical machine for Dumfries, which makes the fourth machine they will have installed in Scotland; these being the only machines dealing with Scotch coals and coke from through retorts.

LEGAL INTELLIGENCE.

WORKMAN'S COMPENSATION CLAIM UNDER APPEAL.

The Southampton Gas Company Successful.

Last Tuesday the Supreme Court of Judicature (Court of Appeal) consisting of the Master of the Rolls and Lords Justices Farwell and Kennedy, had before them the case of Flower v. Southampton Gas-light and Coke Company. It was an appeal by the plaintiff from the judgment of Justices Darling and Bucknill, sitting in the Divisional Court, reversing the finding of the County Court Judge in a claim under the Workmen's Compensation Act. Plaintiff sustained an injury to his knee in lifting a gas-stove out of a cart about a mile from the works; and defendants, in ignorance of the true facts, for some time went on paying 11s. a week—plaintiff having elected to be compensated. But on discovering the true facts of the case—that the accident had not occurred "on or about" their works—they discontinued the payments.

The appeal was argued by Mr. BARRINGTON WARD; and, without calling on respondent's Counsel, their Lordships dismissed the appeal with costs.

The MASTER OF THE ROLLS said he had no doubt whatever that the decision of the Divisional Court was perfectly right. Judges must not allow themselves to be influenced by sympathy for persons who met with accidents, but must administer the law as they found it. Plaintiff met with an accident in December, 1906, at a place and under circumstances which did not give him the shadow of a claim to any compensation under the Workmen's Compensation Act, 1907. The accident happened at a place more than a mile from the works; it did not happen "on or about" defendants' works. The man went back to work shortly afterwards, and it was noticed there was something the matter with his knee; and apparently this fact was communicated to the Company. In a report which was made to them, it was stated that the accident happened when the person in charge was Conroy. This person was at the works, and on the premises of the Company; and the statement so made would lead to the belief that the accident had happened on the works when Conroy was in charge. The Company continued to pay until 1908, when they offered to compromise for £50 in full settlement, and which offer was not accepted. Plaintiff might consider himself very lucky to have got 11s. a week from 1906 to 1908. The agreement made in January, 1907, to pay 11s. a week was made in ignorance of a material fact. There was no consideration for it; and the County Court Judge ought not to have allowed it to be registered.

Lords Justices FARWELL and KENNEDY concurred.

A Claim for Gas Poisoning.

Last week, in the Liverpool County Court, his Honour Judge Thomas (who had the assistance as Medical Referee of Dr. Clarke) heard a claim under the Compensation Act which was brought by Mary Smith, a domestic servant, against her late employer. Evidence was called to show that the girl was poisoned by escaping gas from a newly-fitted bracket in her bedroom during the night of March 29, and that she had not yet recovered from the effects of the illness. It was said that she went to bed in good health, without noticing any smell of gas in the room. When she got up the next morning, she was sick and dazed, and vomited when she got downstairs. The girl was taken to Dr. Wallace, who, according to her evidence, said she had been gassed, and treated her for it. After several days, the girl was sent home, and was then attended by Dr. Walton, who gave evidence that the illness was quite consistent with gas poisoning, and that the girl would not have quite recovered for another month. In cross-examination, Dr. Walton said there was not the slightest sign of rheumatism about the patient. The defence was a complete denial of gas poisoning, and an assertion (backed up by medical evidence) that the girl was suffering from rheumatism and stomachic trouble. Mr. Edward Allen, Engineer to the Liverpool Gas Company, said he had seen a large number of cases of "gassing"; and invariably the sufferers recovered completely in an hour or so, or, at most, in a day. Judge Thomas remarked that the Medical Referee agreed with him that the girl had not established that her illness was due to gas poisoning; and his award must be for the respondent, with costs.

A Loss at Bradford.—The balance-sheet for the year ending March 31 was presented by the City Treasurer at the meeting of the Bradford Gas Committee last Friday; and this shows that the loss on the year's working has been £737, as compared with a loss of £5306 the previous year—the position of the department, therefore, having improved to the extent of about £4500. Among the more interesting items of the balance-sheet, are figures which show that there has been a saving in the expenses of manufacture and distribution of £8000; and increased incomes from the hire and sale of stoves and cookers of £1100, and from the sale of gas of £1000. This last-mentioned figure is regarded as very satisfactory, in view of the competition of electricity. There has been a decrease in the income from the sale of coke of £4000.

Matlock Bath Gas Finances.—At the last monthly meeting of the Matlock Bath Urban District Council, the recent trouble which led to the resignation of the Chairman of the Gas Committee (Mr. D. Palmer Pearson) was dealt with officially in the annual report received from the Government Auditor of the accounts (Mr. H. M. Hunt) to the end of March. Mr. Pearson, it may be remembered, complained that he did not get a proper detailed statement of the profits, &c., of certain departments of the Council. According to the Auditor, the improvement scheme (which includes the promenades, &c.) cost the ratepayers in rates 2s. 5½d. in the year, the sum being £1348, in addition to the 1d. rate for the band. He found that the gas profits had been properly dealt with; and he complimented the Council on the improved state of the book-keeping.

MISCELLANEOUS NEWS.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Annual Accounts.

It was reported to the Edinburgh and Leith Gas Commissioners yesterday that the balance carried to profit and loss account on last year's working amounts to £125,360. After paying annuities and interest, and contributing £15,636 to the special reserve fund in terms of the 1908 Act, the net balance amounts to £30,774. After meeting sinking and reserve fund charges, there remains £13,564 to be carried forward or added to the reserve fund. The quantity of gas sold was 80 million cubic feet more than in the previous year; but the revenue from gas was less by £2894, consequent upon the reduction in price. The return from residual products was greater by £2637.

PLYMOUTH GAS COMPANY.

Reduction in Price—The Coalite Company and its Difficulties.

The Annual Meeting of the Plymouth and Stonehouse Gaslight and Coke Company was held last Thursday, at the works—Sir JOSEPH A. BELLAMY presiding.

The report of the Directors stated that the price of gas had been reduced from 1s. 10d. to 1s. 9d. per 1000 cubic feet as from September last; and this permitted the paying of an increased dividend. From the credit balance of £30,228, the Directors recommended the payment of a dividend for the half year ending March 31 at the rate of 6½ per cent. per annum on the ordinary stock, with corresponding amounts on the additional and new shares. This would absorb £9961, and leave £20,267 to be carried to the credit of the next account. The increased assessment of the Company's undertaking a year ago caused the Directors to lodge notice of appeal; but this was ultimately withdrawn after due consideration had been given to the advice obtained, and to the altered conditions that had meanwhile arisen with regard to the manufacturing charges. The report also referred to the Standard Burner Bill; and with reference to the coal contracts, it stated that great anxiety has been caused to directors of gas companies and all large users of coal by the unsatisfactory state of the coal market, brought about by the restlessness of the miners and friction between them and the colliery owners since the Eight Hours Act came into operation. The price of coal had considerably advanced in consequence, and higher prices than last year would have to be paid for the Company's supplies.

The balance-sheet showed that the total receipts for the year were £119,751—£90,443 from the sale of gas, £7283 from rentals of gas meters and stoves, and £20,246 from residuals. The expenditure was £88,509, including £70,517 for manufacture of gas, £6376 for distribution, £5159 for rents, rates, and taxes, and £5199 for management. The cost of manufacture was £8520 less than last year; and there were also savings under the other heads, except that of rates and taxes and law and parliamentary charges—the total expenditure being £5201 less than in 1908-9.

The CHAIRMAN said that some saving had been effected in the manufacturing charges by a lower price for coal, and through a proportion of the gas being received from the British Coalite Company. On the other hand, rates and taxes showed considerable increase—indeed, they were practically doubled. This was due to the new assessment to which they had to submit. Law and parliamentary charges were also higher by about £600; the expenditure having been incurred in connection with the rating appeal, and the promotion of the Standard Burner Bill. On the credit side of the account, they had to note the loss of revenue due to the reduction in the price of gas to 1s. 9d. per 1000 cubic feet, which absorbed £4500. The net profit on the year's working was £31,242—an increase of about £2400 over last year. From the amount to the credit of the profit and loss account, £1135 had been allowed for depreciation on investments, £3500 was carried to the revenue fund, and £1000 to the fittings account—a total of £5635; leaving a balance to be carried forward of £30,228.

STANDARD BURNER BILLS.

Describing the proceedings in Parliament with reference to the Standard Burner Bills, Sir Joseph said the big battle had been between the Liverpool Gas Company and the Liverpool Corporation. Like other municipalities, the Liverpool Corporation had an electricity undertaking, while the Liverpool Gas Company worked on a different basis from that of most other English gas companies, and to this extent the other companies had been handicapped. Apparently the Liverpool Corporation were determined to prevent the Bills passing. He understood that they had circulated various members of Parliament, urging them to oppose the second reading. In view of the fact that the opposition of nearly one-half of the corporations that opposed in the first instance had now been withdrawn, and that of the other half nearly all were owners of competing electricity undertakings, he thought that if the House of Commons refused permission for a Committee to hear the evidence, and decide these Bills on their merits, it would be most unfair to the gas undertakings of the companies. To the Plymouth Gas Company it would not be a matter of overwhelming importance. They might save a few hundred pounds in the first instance; but after all they could not hand that over to their shareholders, because by far the greater part of it would have to be to the consumers in the reduction of the price of gas before they earned any dividend for the Company.

COAL AND OIL CONTRACTS.

It was stated in the Directors' report that the price of coal was likely to be higher. Contracts had now been made which showed an increase of 10d. to 1s. per ton in the price of coal. They were, however, paying less for oil; and from the results they hoped to obtain they were well satisfied with the contracts.

THE COALITE PARTNERSHIP.

With reference to coalite, he might say at once that the Directors had no cause to regret that they had entered into partnership with the British Coalite Company. Up to this point he might go. The process had been surrounded with difficulties. Like many other inventions, the idea was good; but when it came to be put into practical working for commercial purposes, for profit, the difficulties were found to be very great, and it had taken considerable time to get over them. He could say this—that the prospects had been steadily improving, and they promised to still go on improving. The results, he thought, justified the experiments made; and a new plant would shortly be put in, by which they hoped to economize 50 per cent. on the charges hitherto incurred. The Coalite Company deserved all the co-operation they could give them, for the pluck they had shown in face of adverse criticism of a most drastic character. He was not going into the point whether or not the "GAS JOURNAL" should have been quite so bitter in opposing the British Coalite Company; but that had certainly not lessened the trials of the Coalite Company. Let them hope they would ultimately receive a proper reward for all the courage they were showing, and for the very large expenditure they were making. Plymouth had become, so to speak, the trial place of this invention; and the trial had not yet reached completion. It was still going on. The prospect was improving all the time; and he trusted ere long that the result would be of such a financial character as would justify the expenditure made and produce dividends for the shareholders.

THE PRICE OF GAS.

The Directors had gone into the figures very carefully; they had made good contracts; they had made economies, and still more were to be brought about; and taking everything into consideration, they had decided to reduce the price of gas. This would be breaking the record. It had been his ambition to bring the price of gas below 1s. 9d. per 1000 cubic feet; and in this the Directors and everyone else had co-operated. They were now able to reduce the price from 1s. 9d. to 1s. 8d. to ordinary consumers, from 1s. 6d. to 1s. 5d. for gas-engines, and to increase the discount to slot consumers. This reduction would entail a falling-off of revenue from ordinary consumers of £600, and from slot-meters of £1500—making £5500 in all. This was equal to more than a twopenny rate for the borough of Plymouth—a very satisfactory result for a gas company in these days to bring about. The shareholders might be congratulated on the prosperity of the Company, especially in view of the strenuous opposition from the municipal electricity undertaking. He thought they might now consider the Company as producing the cheapest gas in the country, when they took into consideration that they were 300 miles from the coalfields. And this had been done without any harm to the efficiency of the gas-works. The buildings and plant were maintained in such a state of efficiency that they were never better than to-day. The officials and the men had all worked with a will; and the feeling of mutual sympathy and regard which had existed for a long time had been fully maintained. For many years the Company had had a system of paying a bonus of 10 per cent. on the salaries of officials—everything being satisfactory. With regard to the men, the bonus took the shape of a pension scheme for long service and good conduct. He thought gas companies generally might be congratulated upon the stand they were making against the competition of electricity. In London a striking victory had been gained by the Gaslight and Coke Company against electricity used for public lighting. In a contest there as to which was the better, gas light or electric light, the Gaslight and Coke Company had beaten their competitors hollow. This spoke volumes for the energy and ability of gas engineers, and the enterprise of gas companies generally. They must go on, not leaving a stone unturned. These things could not be done without work, and every possible opportunity being laid hold of to take advantage of new ideas, of things which required the risking of a little money to try so as to take the best and be up to date; for no gas company could hold its own that remained behind the times. He should like to see Plymouth streets better lighted. With gas so cheap as it was, he would be pleased to see a larger sized mantle introduced; and he was sure the difference in cost to the ratepayers would be infinitesimal, because even now in many of the lamps where the light was reduced to the size of a thimble the gas consumed was just the same as if the mantle had been three times the size. After all, the lamps had to be put up, and the gas run there to light the thoroughfare; and one could not see the wisdom of the cheeseparing that trimmed these little mantles almost to the vanishing point, and still consumed and paid for the gas. He would like to see larger mantles adopted throughout the town, and Plymouth made one of the best-lighted places in the country. This could be done at practically little extra cost. In conclusion, the Chairman announced that the Directors had decided to extend the Company's mains to the districts of Plymstock, Oreston, Turnchapel, and Hooe, in accordance with the parliamentary powers they obtained some years ago.

In answer to a shareholder, the CHAIRMAN stated that the reduction in the price of gas would be as from March 31 last.

The report and balance-sheet were adopted, and the dividend declared.

Messrs. R. B. Johns, H. S. Wilcocks, and T. Wolferstan were re-elected Directors.

Street Lighting in Hackney.—The Works Committee of the Hackney Borough Council report, with regard to the decision of the Council at their last meeting (*ante*, p. 644) in respect to improved street gas lighting by the substitution of inverted incandescent burners for the existing upright incandescent burners, that they have considered the result of tests made in reference to the suggested adoption of a regenerative lamp instead of the ordinary type of inverted burner, and are of opinion that the increased expenditure of approximately £230 per annum, which would be involved by the adoption of the regenerative lamp, would not be justified. The Committee have therefore, acting under the authority conferred upon them by the Council at their last meeting, given instructions for the ordinary type of inverted burner to be used, in accordance with the offer made to the Council by the Gaslight and Coke Company.

SOUTHWARK PUBLIC LIGHTING.

At a Meeting of the Southwark Borough Council last Wednesday, the Works Committee reported having had under consideration the necessity of some improvement being effected in the lighting of the main roads of the borough. The Committee pointed out that at the present time Southwark compares very unfavourably with the other Metropolitan Borough Councils in the amount expended per mile on street lighting. In April last, 54 lamps in Blackfriars Road were fitted with twin inverted burners, at an additional cost per annum for lighting and maintenance of £122 17s. As a result, the illumination of the thoroughfare had been greatly improved.

The Committee have now had before them the desirability of substituting inverted burners in ten main roads in the South Metropolitan Gas Company's district (244 lamps), in four main roads in the Gaslight and Coke Company's district (65 lamps), and as regards 69 lamps in side-streets in the latter Company's area. In the district supplied by the South Metropolitan Gas Company, the present cost of the upright burner is £3 2s. 10d. per annum; while the cost of the twin-burner lamps would be £5 5s. a year. The cost of conversion is 9s. per lamp. The total cost of conversion will amount to £109 16s., and the additional cost per annum to £515 3s. 3d. In the Gaslight and Coke Company's area, however, the cost of the upright burner is £3 4s. 9d. per annum; while the cost of the twin inverted burner lamp would be £4 18s. 3d., and of the single inverted burner lamp £2 15s. a year. The cost of conversion is 9s. per lamp. There are 134 lamps in the district of the Gaslight and Coke Company, 65 of which will be fitted with twin inverted burners, and 69 lamps in the side streets with single inverted burners. The cost of conversion will be £65, and the extra cost per annum £75 9s. 8d. The total extra cost of lighting the main roads in the borough will be £590 12s. 11d. per annum.

The Committee recommended that the lamps referred to be fitted with inverted burners at the cost named. This was agreed to.

MANCHESTER CORPORATION GAS UNDERTAKING.

Annual Report and Accounts.

We have received from the Superintendent of the City of Manchester Gas Department (Mr. F. A. Price) the report and accounts of the Gas Committee for the year ending March 31; and from them the following particulars have been gathered. The report bears the signature of Alderman R. Gibson, the Chairman of the Committee.

The quantity of coal and cannel carbonized (including the equivalents of enriching materials) was 504,145 tons, compared with 514,446 tons in the previous year; the quantity of gas made per ton being 11,034 cubic feet, against 10,962 cubic feet. The residual products made per ton of coal were: Coke, 13.4 cwt.; tar, 11.55 gallons; ammoniacal liquor, 29.28 gallons. The quantity of gas sent out from the works (5,565,414,000 cubic feet) shows a decrease of 73,037,000 cubic feet, or 1.29 per cent., compared with a decrease of 139,065,000 cubic feet, or 2.41 per cent., the preceding year. The quantity of carburetted water gas produced during the year was 1,053,754,000 cubic feet, compared with 1,125,745,000 cubic feet the previous year. In the production of this gas 2,008,602 gallons of oil and 23,754 tons of coke were used, against 2,541,571 gallons and 24,039 tons respectively for the year ending March 31, 1909. The illuminating power of the gas sent from the works, as tested by the "Metropolitan" No. 2 burner, was 17.63 standard sperm candles. The unaccounted-for gas was 3.34 per cent., which compares with 3.24 per cent. for the previous year.

The number of consumers on March 31 was 178,490, of whom 10,431 were outside the city. The previous year the number was 174,290, of whom 23,160 were outside the city. The total increase was thus 4200. The falling off in the number of consumers outside the city is explained by the fact that the Gorton and Levenshulme urban districts were incorporated in the City of Manchester last November. Of the consumers, 61,046 use prepayment meters. This compares with 58,041 in the previous year—an increase of 3005; and of this increase, 2807 were fixed in the city and 198 in out-townships. The quantity of gas passed by these meters was 539,757,000 feet—an increase of 12,905,000 feet, or 2.45 per cent., on the previous year. The meters were inspected once every five weeks; and the amount collected during the year was £75,304. This is represented by 18,072,950 pennies, weighing 161 tons 7 cwt. 1 qr. 7 lbs.

The number of gas-cookers owned and fixed by the Committee at March 31 was 49,948, compared with 46,391 for the year ending March, 1909. The total quantity of gas that was consumed by cookers is estimated at 656,000,000 cubic feet—being an increase of 43,000,000 feet, or 6.55 per cent., on last year's figures. There have also been fixed 30,559 grills in connection with prepayment and small ordinary meters. About 45 per cent. of the consumers now have the free use of a cooker or grill. On March 31 last, the number of gas-engines in use was 1613, compared with 1733 in the previous year. The quantity of gas consumed by these engines was 378,642,000 cubic feet—a decrease of 11,995,000 feet, or 3.07 per cent. The cost of coal, cannel, and oil per ton carbonized was 10s. 10.16d., against 11s. 9.14d. the previous year—a reduction of 10.98d. per ton, which, on the total carbonization of 504,145 tons, amounts to £23 06s.

The total income was £750,700, against £761,363; and the expenditure £582,808, against £621,341. The gross profit on the year's working was £167,892, out of which the sum of £46,701 was paid for interest on loans, &c. The net profit therefore amounted to £121,191, compared with £89,873 in the previous year. The appropriations for the year exceed the net profit by £8553, towards which sum the balance of the reserve fund (£150) has been applied; and the deficit of £8403 is carried forward to next year's account. The details of the appropriation are as follows: To the sinking fund for redemptions of loans, £67,885; paid over to the city fund, £50,000; extension of carburetted water-gas plant, £379; Cambridge Street depot, £2162; general

extensions, £6240; premiums, &c., on purchases of consolidated 4 per cent. stock for cancellation, £3078.

On Nov. 9, 1909, the Gorton and Levenshulme urban districts were incorporated in the city; and the consequent reduction in the price of gas from 2s. 6d. to 2s. 3d. per 1000 cubic feet means a loss of revenue to the department of £3740 per annum on the consumption at the date of incorporation.

During the year to March 31, 1910, the construction of the eighteen beds of inclined retorts forming the second section of the No. 2 retort-house at the Gaythorn station was completed, and the retorts put to work in November last. A coke-conveyor has been installed for the removal of coke from this section of retorts, which has resulted in a great saving in cost of working the retort-house. An extension of the elevated railway alongside the Manchester South Junction and Altrincham Railway for a length of 200 feet was completed, giving much required additional siding-room for railway waggons. The condensing plant at this station was enlarged and extended, resulting in an increased production of ammoniacal liquor per ton of coal carbonized. The roof on the "B" retort-house at the Rochdale Road station was renewed, and the side walls raised, so that this retort-house can be adapted for any new system of carbonization which it may be considered advisable to instal in the future. These works have been equipped during the year with a telfer coke-conveying plant, which has been of great advantage and economy in the storage of coke. The construction of the gas-holder tank at the Bradford Road station, which was commenced on Oct. 9, 1907, was completed on Dec. 31, 1909. It was tested with water, and found to be perfectly tight. During the year, very good progress was made with the construction of an installation of vertical retorts at the Droylsden station, which will be a guide to the Committee in deciding as to the future method of carbonizing to be adopted in the department.

The total length of mains now laid is 1,650,112 yards, or 937½ miles and 112 yards; being an increase of 12 miles and 212 yards during the year. The number of public lamps within the city is 20,073, and outside the city 1288—a total of 21,361. The incandescent system of lighting has been applied to all the lamps within the city; and the number of burners fixed thereto is 25,377.

The following are the principal items in the accounts:—

REVENUE ACCOUNT.

INCOME.

| | | | |
|--------------------------------|----------|----|----|
| Gas-rental— | | | |
| Ordinary meters | £491,002 | 6 | 10 |
| Prepayment meters | 75,304 | 0 | 6 |
| Public lamps | 40,690 | 7 | 8 |
| Residual products— | | | |
| Coke | £80,947 | 19 | 1 |
| Tar | 27,088 | 10 | 7 |
| Sulphate of ammonia | 34,605 | 13 | 10 |
| | 142,642 | 3 | 6 |
| Rents of cottages, &c. | 1,061 | 1 | 3 |
| | £750,699 | 19 | 9 |

EXPENDITURE.

| | | | |
|--|----------|----|----|
| Manufacture— | | | |
| Cannel, coal, and oil (including cost of unloading, &c.) | £273,423 | 14 | 3 |
| Coke, water, &c. (carburetted water gas) | 8,264 | 9 | 5 |
| Carbonization (wages) | 43,541 | 12 | 11 |
| Retorts, fire-bricks, &c. | 7,886 | 9 | 1 |
| Repairs and maintenance of works, &c. | 44,340 | 3 | 7 |
| Salaries of Engineer and works staff (less proportion transferred, £1731 4s. 2d.) | 6,862 | 8 | 6 |
| | £384,318 | 17 | 9 |
| Less received for spent oxide in excess of cost of purification | 397 | 10 | 7 |
| | £383,921 | 7 | 2 |
| Provision for renewal of works plant (less £1269 17s. 11d. charged to sulphate of ammonia) | 20,101 | 0 | 0 |
| | £404,022 | 7 | 2 |
| Distribution— | | | |
| Repair and maintenance of mains, services, meters, and stoves | £34,097 | 6 | 8 |
| Salaries (less proportion transferred, £500) | 27,125 | 1 | 2 |
| | £61,222 | 7 | 10 |
| Provision for renewal of distribution plant | 34,592 | 0 | 0 |
| | 95,814 | 7 | 10 |
| Rents, rates, and taxes | 56,870 | 19 | 7 |
| Management— | | | |
| Salaries | £16,154 | 7 | 9 |
| General charges | 5,790 | 1 | 5 |
| | 21,944 | 9 | 2 |
| Law and parliamentary charges | 955 | 12 | 11 |
| Subscriptions, donations, &c. | 2,284 | 14 | 9 |
| Bad debts | 915 | 6 | 7 |
| | £582,807 | 18 | 0 |
| Balance carried to profit and loss account | 167,892 | 1 | 9 |
| | £750,699 | 19 | 9 |

The accounts are followed by the usual appendices, furnishing particulars in regard to the progress of the undertaking.

Appendix A is an abstract of the capital, revenue, and profit and loss accounts. It shows (*inter alia*) the amount of gross profit made from the gas undertaking, and the mode of its appropriation, also the amount of borrowed money owing, excess of assets, &c., from March, 1890, to March last. The figures for the past financial year are as follows: Gross profit, £169,244; net profit, £121,191; contributed to sinking fund for redemption of debt, £67,885; paid over for improvement purposes and city fund, £50,000; applied in extension of works, £11,859; borrowed money owing, £1,212,684; and excess of

assets, £1,748,744. From June 24, 1843, the date when the works were taken over by the Corporation from the Commissioners of Police, the gross profits on the gas undertaking have amounted to £6,229,567, out of which £1,514,658 has been paid for interest—leaving a net profit of £4,714,908. Of this total, £1,536,729 has been placed to the sinking fund, £2,639,383 has been handed over to the Improvement Committee and added to the city fund, £329,202 has been paid for street lighting (making £2,968,585 used in relief of rates), and £219,100 applied to extensions of works.

Appendix B is a comparative statement of the gas transmitted from the works in the daytime and during the twenty-four hours, for the past two years. Summarized, the figures are as follows:—

| | Daytime. Cubic Feet. | Twenty-four Hours. Cubic Feet. |
|--|-------------------------|-----------------------------------|
| Year ended March 31, 1910 . . . | 1,842,103,000 | 5,565,414,000 |
| Do. Do. 1909 . . . | 1,869,399,000 | 5,638,451,000 |
| Decrease | 27,296,000 | 73,037,000 |
| | | Cubic Feet. |
| Gas transmitted from the works | | 5,565,414,000 |
| Do. accounted for | | 5,379,439,000 |
| Loss (by condensation and leakage) | | 185,975,000 or 3·34 per cent. |

In Appendix C, particulars are given as to the results of the working from March 31, 1890, to March 31, 1910. The table contains statistics as to the number of tons of coal and cannel carbonized, the total make of gas, the percentage unaccounted for, the yield per ton of coal, the illuminating power of the gas, the quantity of residual products, &c., each year in the above-mentioned period. The particulars for the past financial year are as follows: Coal and cannel carbonized, 504,145 tons; gas made, 5,562,679,000 cubic feet; yield per ton of coal carbonized, 11,034 cubic feet; illuminating power, 17·63 candles; quantity sold, 5,319,644,000 cubic feet; quantity sold per ton, 10,552 cubic feet; percentage of output unaccounted for, 3·34; coke for sale, 208,333 tons; do. per ton of coal, 10·21 cwt.; make of tar, 26,787 tons; do. per ton of coal, 11·55 gallons; ammoniacal liquor (10-oz. strength) made, 11,956,613 gallons; do. per ton of coal, 29·28 gallons; sulphate made, 4259 tons; do. per ton of coal, 24·97 lbs.

Appendix D shows the number of stoves and of each size of meter in use during the year in the city and out-townships. At the close of the past financial year, there were 45,758 stoves within, and 4190 beyond, the city—together 49,948, compared with 39,359 and 7032 (together, 46,391) at the corresponding date in 1909; so that there was an increase of 3557. The number of meters in use was 178,490 in 1910 and 174,290 in 1909. There was last year a net increase of 4200 on the number for the preceding year. The number of prepayment meters in use on March 31 last was 61,046—an increase of 3005 on the number at the close of the preceding year.

From Appendix E, we learn that the gas-mains laid last year within the city extended to 26,554 yards, and beyond the city to 4716 yards; being 17½ miles and 30 yards. The mains taken up were 9747 and 191 yards respectively—a total of 9938 yards, or 5½ miles and 258 yards. The total net increase during the past year, therefore, was 21,332 yards, or 12 miles and 212 yards. The total length of mains on March 31 last was 1,650,112 yards, or 937½ miles and 112 yards.

At a meeting of the Gas Committee last Wednesday, the report and accounts were presented.

Alderman GIBSON said that the report might be considered as fairly satisfactory. The percentage of profit on capital was 5·83 as against 4·98 in 1909. The department had 4200 more customers in 1910 than in 1909; but there had been a decrease in consumption of 1½ per cent. The Committee had been enabled to buy coal on better terms this year than last year; but in a greater degree, however, the increased profit was due to economies of management and administration. The manufacturing charges in 1910 were 11·79d. per 1000 feet of gas sold, against 12·92d. in 1909. Distribution charges came to 4·32d., against 4·8d. in the corresponding period; and management charges to 1·18d., as against 1·20d.—the total charges being 17·29d., as against 18·92d., a reduction of 1·63d. The Gas Department felt to some extent the competition of the Electricity Department. Questions arising between the two Committees were, however, being threshed out; and he did not doubt that a satisfactory conclusion would be arrived at. In the meantime, he thought the Gas Committee might be congratulated upon having had a successful year. The prospects for the year before them were quite promising. In his long experience of the Gas Committee's undertaking, he believed it was never in a more sound financial position than it was to-day from every point of view. The public were never better served, they never had gas at a less price, and the streets were never better lighted. Their debt was being rapidly paid off; and the works were being maintained in a thoroughly efficient state.

STOURBRIDGE GAS UNDERTAKING.

In his fifth annual report to the Stourbridge Urban District Council on the working of the gas undertaking for the year to March 31 last, Mr. C. H. Webb, the Engineer and Manager, says that the sales of gas (ordinary, prepayment, and public lighting) show a considerable increase of 7,431,200 cubic feet, as compared with the previous year. At the same time, the make of gas has only increased 3,825,000 cubic feet, which means that the gas unaccounted for has been reduced by more than 3½ million cubic feet, or almost 2 per cent. on the amount of gas made. The revenue account shows increased income from the sale of gas, and also from tar and sulphate of ammonia; but coke has realized slightly less—the total increase on this side of the account being £928. The expenditure for the year is less by £255; coal having been somewhat cheaper. These differences increase the balance carried to profit and loss account by £1183; the gross profit being £11,931. After due deduction of income-tax, annual instalments, and interest—which items are all greater than last year, as is also the expenditure on stoves—there

remains as a surplus £2508, or an increase of £299. The usual percentage to be devoted to relief of the rates (75 per cent.) gives £1881. There have been laid about 2 miles of mains in the year; and 22 ordinary and 201 prepayment meters and 344 stoves have been fixed.

The accounts show that the gas made amounted to 216,676,000 cubic feet, of which 197,989,000 feet were sold, 2,832,900 feet used on the works, &c., and 15,853,200 feet, or 7·31 per cent., were unaccounted for. The expenditure on revenue account was £24,637; and the receipts were £36,569. The make of gas per ton of coal carbonized was 10,909 cubic feet; and the net proceeds of residuals came to 66·99 per cent. on the cost of the coal.

SMETHWICK GAS SUPPLY.

The Annual Report.

At a Meeting of Smethwick Town Council last Tuesday, there was submitted the report of the Secretary (Mr. W. J. Sturges) on the work of the Gas Department for the year ending March 31.

The loan indebtedness stands at £178,819; a reduction during the year of £13,388. There remains in the sinking fund the sum of £36,225; and deducting this from the outstanding debt, there is left a net indebtedness of £142,594. The capital outlay account has not been added to during the year; the total expenditure remaining at £217,048, equivalent to 10s. 2d. per 1000 cubic feet of gas sold, as against 10s. 4d. the previous year. The total income for the year on revenue account was £65,108, an increase of £1464. The set-back in the sale of gas experienced for the first time in the previous accounts has been arrested, and an increase of £1669 in the revenue from that source is now shown. This is mainly due to the prepayment consumers, whose consumption has gone up 9·28 per cent. Small ordinary consumers have taken 2·28 per cent. more; and there is an increase of 2·03 per cent. in the quantity supplied for public lighting. While a slight reduction is shown in the large consumers for lighting, the quantity of gas sold for motive power and manufacturing purposes shows signs of recovery. The total quantity of gas sold and accounted for was 426,712,860 cubic feet, an increase of 8,131,500 cubic feet, or 1·94 per cent. The quantity unaccounted for, due to leakage and condensation, was 22,648,200 cubic feet, equal to 5·04 per cent. of the gas sent out from the works, compared with 23,244,700 cubic feet, or 5·26 per cent. The total number of collections from prepayment meters during the year was 101,959, an increase of 28,977. The average amount per collection was 3s. 1d.; the average amount collected per meter for the year, 38s. 11d.; and the average consumption per meter, 11,675 cubic feet. The number of ordinary meters fixed at the end of the year was 3737, an increase of 83; and the number of prepayment meters was 8298, an increase of 680. The number of cooking-stoves fixed on hire was 1602, an increase of 592. There were also fixed on hire purchase during the year 89 outside lamps for shop lighting. The income derived from residual products has not expanded with the gas revenue. On the contrary, there is a decrease in the total receipts amounting to £252. The total trading expenditure during the year amounted to £47,001, an increase of £1369. The total charges for the manufacture of gas, including maintenance and renewals of works and plant, show an increase of £615. The cost of coal is £1302 higher. Less water gas having been made during the year, the items for oil and coke are lower by £344; and repairs and maintenance of works cost £299 less. Distribution expenses have risen during the year; the total expenditure under this head showing an increase of £497. The total value of the public lighting supplied free of charge is £4367; and the number of lamps in use at the end of the year was 1233, an increase of 23. The gross profit for the year amounts to £18,107, as compared with £18,012, an increase of £95. The balance standing to the credit of profit and loss account at the commencement of the year was £7108; and to this is added the gross profit from revenue account—£18,107. Against the gross profit has been charged the necessary provision for interest on loans and for redemption and extinction of debt, amounting in the aggregate to £10,704, leaving a balance of £7403 as the net profit for the year. After deducting the cost of public lighting, £4367, contributed by the Gas Committee in aid of the district rate, and £1000 for the fifth and final instalment of the Committee's contribution of £5000 towards the cost of the Council House, there remains a balance of £2035, which has been transferred to depreciation and suspense fund account; and the profit and loss account closes with £7108 in hand. The depreciation and suspense fund has been charged with expenditure on account of new exhausters £1041, and for the purchase of new meters £1652; leaving a balance of £391 to carry forward.

Alderman PINKNEY (the Chairman of the Gas Committee) said the system of free fixing of services, meters, and stoves which had been adopted was very satisfactory. They were determined to make every improvement possible to keep to the front. At the present time, many of the gas-works were carrying out their street lighting more cheaply than Smethwick; and while they considered sentiment, they must not allow it to govern them altogether. He believed that eventually they would have to adopt automatic street lighting, which would reduce labour considerably. The Committee were also considering the question of an automatic system of carbonization. They were spending about £2000 in the installation of new machinery; and all improvements and alterations would be carried out from the revenue account. He was hopeful that the Committee would later on be able to sell gas for domestic purposes other than lighting at a very cheap rate. Since they began to contribute to the rates, they had relieved them to the extent of about £40,000; while during the same period the price of gas had been reduced to nearly all classes of consumers.

The report was adopted.

Brighton Water-Works Profits.—The whole of the past year's profits on the Brighton Water-Works are to go to relieve the rates. The recommendation of the Committee was that £2000 should be paid to the relief of the rates, and £889 be placed to the contingent fund, which now stands at some £14,500. The idea of members of the Town Council appeared, however, to be that the contingent fund was already quite large enough.

GAS-WORKS RESULTS AT OSSETT.

The report of Mr. A. E. Mottram, the Gas Manager, which was adopted at the monthly meeting of the Ossett Town Council, stated that during the year to March 31 there had been made 116,259,000 cubic feet of gas, of which 109,511,400 feet (or an increase of 2,236,000 feet) were sold. The proportion unaccounted for was 5½ per cent. The make per ton was 10,978 cubic feet, compared with 10,910 feet. The gross profit was £7247; while the interest and sinking-fund charges amounted to £6493, and there was paid off the balance of slot-fittings account £425. This left a balance of £329, which was carried to the reserve fund. The price of gas was reduced 3d. per 1000 cubic feet as from Oct. 1, 1908; so that for the first two quarters the previous year the price was 3d. per 1000 cubic feet more than had been charged throughout the past year—the reduction amounting to £447. The general trade of the district has been better; and this has led to an increased consumption of gas. The increase has, however, been checked by the more general use of incandescent burners. The ordinary consumers number 3862, and the slot-meter users 3582—a total of 7444, or an increase during the year of 239.

In moving the adoption of the Gas Committee's minutes, the Chairman (Mr. H. Robinson) said that the results of the past year were among the best they had had. The success from every standpoint was as great as they could expect; and he paid a tribute, not only to the marked ability, but to the intense interest, devotion, and enthusiasm that had been displayed by all parties concerned, from the Manager down to the humblest workman. There were two outstanding features of the balance-sheet that were unique in their history, and as pleasing as they were exceptional. They saw the end of the last suspense account. Two years ago the slot-fittings account stood at £1040; last year £624 was paid off, and this year the account was discharged by applying £425. The other striking feature, about which he was more pleased, was the initiation of a reserve fund. The necessity for such a fund everybody would admit. Though the sale of gas last year was a record one, the make was not. This spoke well for the improved condition of the undertaking. There had been a great saving in unaccounted-for gas.

Other members expressed themselves as being equally well satisfied with the condition of affairs; and the minutes of the Committee were adopted.

HEBDEN BRIDGE GAS UNDERTAKING.

At a Meeting of the Hebdon Bridge and Mytholmroyd Gas Board, Mr. A. Sutcliffe, dealing with the annual report of the undertaking, said that the gross profits for the year had been £4618, which, compared with 1909, was £386 more. This increase was due partly to the decrease in the contract prices of coal, which had effected a saving of something like £200, and partly to the fact that the gas made per ton was better than in 1909. On the other hand, they had to set against this a reduction in the price of gas in 1909. In the early part of that year, the price was considerably higher than it was at the present time.

The Board were satisfied that the period under review had been one of the best years. Their output had been something like 90,000,000 cubic feet, which, with one exception (1908), was the maximum. From the gross profits they had to deduct the amount of the year's dividend on the 3 per cent. redeemable stock, and interest on mortgage loans. They had also to provide for instalments to the redemption and sinking fund account (£1013); and £249 had to be allocated to the repairs and renewals fund for cooking-stoves. After making these deductions, they were left with a net profit of £805, as against £435 last year—an increase of £370. The amount of stock up to the present issued was £86,300. They had set aside towards the liquidation of this sum £18,422, in accordance with the provisions of the Board's Act of 1895; while the profits accumulated from the date of the taking over of the undertaking from the old Gas Company to March 31 last amounted to £5936. They had paid over to the two Councils since 1895 profits amounting to £1800; and altogether something like £30,556 had been set aside out of revenue. The capital account was now £92,863, whereas in 1895 it stood in the balance-sheet at £70,890; so that during the past fourteen years about £22,000 had been added. The gas-mains extended for about 50 miles. Turning to the revenue account, they would find that the sale of gas had realized £11,102; and it spoke well for the management that the total of bad debts for the year only amounted to £11. On the whole, he took it that the report and balance-sheet were very favourable indeed.

EXPLOSION AT THE WAKEFIELD GAS-WORKS.

Alarm was caused in the vicinity on Monday afternoon of last week by an explosion at the gas-works in Vicarage Street, Wakefield. It appears that while some men were riveting a plate on one of the purifiers, one of them put a pair of red-hot tongs near a spot where there was obviously a leakage—air having become mixed with the gas. The resultant explosion did a good deal of damage, and more or less seriously injured three men who were near. After receiving first-aid attention on the spot, the sufferers were removed to hospital; but fortunately it was found necessary to detain only one of them. Considering that a number of men were at work near the scene of the accident, it is matter for congratulation that the list of those who received injury was so short. The Engineer and Manager (Mr. H. Townsend), his sons, and others were soon on the spot directing operations; and the fire brigade promptly extinguished flames which broke out among a portion of the wreckage. The damage caused was somewhat extensive—being estimated at several thousand pounds. It is, however, covered by insurance.

The Thorney Gas, Coal, and Coke Company is the re-registration as a limited company, under the Companies (Consolidation) Act, 1908, of a Company originally registered in 1865, as an unlimited company. The capital is £1400 in £5 shares, all of which were taken up and fully paid prior to the re-registration. The registered office is at Thorney, Cambs.—Another old Company re-registered is the Tring Gaslight and Coke Company, Limited, with a capital of £11,000 in £10 shares. The offices are Parsonage Place, Tring.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 935.

| Issue. | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest- ment. | Issue. | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest- ment. |
|------------|--------|-----------------------|-------------------------------------|---------------------------|--------------------|---------------------------------|-----------------------------------|-----------|--------|-----------------------|-------------------------------------|----------------------------|--------------------|---------------------------------|-----------------------------------|
| £ | Stk. | Apl. 1 | p.c. | Alliance & Dublin Ord. | 82-84 | .. | £ s. d. | £ | Stk. | May 12 | p.c. | Imperial Continental | 178-180 | + | £ s. d. |
| 1,474,000 | Stk. | Jan. 13 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 5 19 1 | 4,940,000 | Stk. | Feb. 10 | 3½ | Do. 3½ p.c. Deb. Red. | 94-96 | .. | 4 8 11 |
| 310,000 | 5 | May 12 | 7 | Bombay, Ltd. | 6½-6½ | .. | 5 9 10 | 1,235,000 | Stk. | Mar. 16 | 6 | Lea Bridge Ord. 5 p.c. | 122-124 | .. | 4 16 9 |
| 200,000 | 5 | .. | 7 | Do. New, £4 paid. | 4½-5½ | .. | 5 9 3 | 195,242 | Stk. | Feb. 25 | 10 | Liverpool United A. | 219-221 | .. | 4 10 6 |
| 40,000 | 10 | .. | 15 | Bourne- 10 p.c. | 29-30 | .. | 5 0 0 | 561,000 | " | .. | 7 | Do. B. | 164-165 | .. | 4 4 10 |
| 50,000 | 10 | .. | 7 | mouth Gas B 7 p.c. | 16½-16½ | .. | 4 3 7 | 718,100 | " | Dec. 29 | 4 | Do. Deb. Stk. | 166-168 | + | 3 14 1 |
| 311,810 | 10 | .. | 6 | and Water Pref. 6 p.c. | 15-15½ | .. | 3 17 5 | 306,083 | " | Nov. 26 | 6 | Malta & Mediterranean. | 4½-5 | .. | 6 0 0 |
| 75,000 | 10 | .. | 12½ | Brentford Consolidated | 251-254 | .. | 4 18 5 | 75,000 | 100 | Apl. 1 | 5 | Met. of 5 p.c. Deb. | 100-102 | .. | 4 18 0 |
| 380,000 | Stk. | .. | 9½ | Do. New | 183-190 | .. | 5 0 0 | 250,000 | 100 | .. | 4½ | Melbourne 4½ p.c. Deb. | 100-102 | .. | 4 8 3 |
| 300,000 | " | .. | 5 | Do. 5 p.c. Pref. | 120-122 | .. | 4 2 0 | 451,920 | 20 | May 27 | 3½ | Monte Video, Ltd. | 12½-13 | .. | 5 7 8 |
| 50,000 | " | Aug. 12 | 5 | Do. 4 p.c. Deb. | 93-101* | .. | 3 19 3 | 1,775,892 | Stk. | Feb. 25 | 4½ | Newcastle & Gt. Sh. d. Con | 105-104 | .. | 4 8 11 |
| 206,250 | " | June 10 | 14 | Brighton & Hove Orig. | 214-217 | .. | 5 1 5 | 529,435 | Stk. | Dec. 29 | 3½ | Do. 3½ p.c. Deb. | 91-93 | .. | 3 15 3 |
| 220,000 | Stk. | Mar. 16 | 11 | Do. A Ord. Stk. | 152-155 | .. | 5 3 3 | 55,940 | 10 | Feb. 25 | 7 | North Middlesex 7 p.c. | 124-124 | .. | 5 1 10 |
| 246,320 | " | .. | 10 | British | 41-45 | .. | 4 14 8 | 300,000 | Stk. | Apl. 29 | 8 | Oriental, Ltd. | 138-140 | .. | 5 14 4 |
| 460,000 | 2½ | Apl. 1 | 10 | Bromley A 5 p.c. | 118-120 | .. | 5 0 0 | 60,000 | 50 | Apl. 1 | 8 | Ottoman, Ltd. | 6-6½ | .. | 6 8 0 |
| 109,000 | Stk. | Feb. 25 | 6½ | Do. B 3½ p.c. | 88-90 | .. | 5 0 0 | 31,800 | 53 | Feb. 25 | 13 | Portsea Island A. | 134-136 | .. | 5 1 0 |
| 165,700 | " | .. | 5½ | Do. C 5 p.c. | 105-107 | .. | 5 2 10 | 60,000 | 50 | .. | 13 | Do. B. | 126-128 | .. | 5 1 7 |
| 82,278 | " | .. | 3½ | Do. 3½ p.c. Deb. | 87-89 | .. | 3 18 8 | 100,000 | 50 | .. | 12 | Do. C. | 119-121 | .. | 4 19 2 |
| 55,000 | " | Dec. 29 | 3½ | Buenos Ayres (New) Ltd. | .. | .. | .. | 114,800 | 50 | .. | 10 | Do. D and E. | 100-102 | .. | 4 18 0 |
| 500,000 | 10 | Oct. 14 | 7 | Do. 4 p.c. Deb. | 98-100 | .. | 4 0 0 | 398,490 | 5 | Apl. 29 | 7 | Primitive Ord. | 74-74½ | .. | 4 13 4 |
| 250,000 | Stk. | Dec. 29 | 4 | Cape Town & Dis., Ltd. | 3½-4½ | .. | .. | 796,983 | 5 | Jan. 27 | 5 | Do. 5 p.c. Pref. | 58-58½ | .. | 4 8 11 |
| 100,000 | 10 | .. | — | Do. 4½ p.c. Pref. | 5½-6½ | .. | .. | 489,903 | 100 | June 1 | 4 | Do. 4 p.c. Deb. | 57-59 | .. | 4 0 10 |
| 100,000 | 10 | .. | — | Do. 6 p.c. 1st Mort. | 49-50 | .. | 6 0 0 | 1,000,000 | 10 | Oct. 14 | 8 | River Plate Ord. | .. | .. | .. |
| 50,000 | 50 | May 3 | 6 | Do. 4½ p.c. Deb. Stk. | 90-92 | +1 | 4 17 10 | 123,650 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 100,000 | Stk. | Dec. 29 | 4½ | Chester 5 p.c. Ord. | 109-111 | .. | 4 10 1 | 250,000 | 10 | Apl. 1 | 9 | San Paulo, Ltd. | 151-152 | .. | 5 14 3 |
| 157,152 | Stk. | Feb. 25 | 5 | Commercial 4 p.c. Stk. | 107-109 | .. | 4 15 5 | 65,000 | 10 | .. | 6 | Do. 6 p.c. Pref. | 111-112 | .. | 4 18 0 |
| 1,513,280 | Stk. | Feb. 25 | 5½ | Do. 3½ p.c. do. | 103-105 | .. | 4 15 3 | 125,000 | 50 | Jan. 3 | 5 | Do. 5 p.c. Deb. | 50½-51½ | .. | 4 17 1 |
| 560,000 | " | .. | 5 | Continental Union, Ltd. | 81-83 | .. | 3 12 3 | 135,000 | Stk. | Mch. 16 | 10 | Sheffield A. | 232-234 | .. | 4 5 5 |
| 475,000 | Stk. | June 10 | 5 | Do. 7 p.c. Pref. | 91-96* | -1 | 5 4 2 | 269,981 | " | .. | 10 | Do. B. | 232-234 | .. | 4 5 5 |
| 800,000 | Stk. | .. | 7 | Derby Con. Stk. | 135-137* | .. | 5 2 2 | 523,500 | " | .. | 10 | Do. C. | 232-234 | .. | 4 5 5 |
| 200,000 | " | .. | 1½ | Do. Deb. Stk. | 121-123 | .. | 4 9 5 | 70,000 | 10 | May 27 | 7 | South African | 11-11½ | .. | 6 1 9 |
| 493,270 | Stk. | .. | 4 | East Hull 5 p.c. Ord. | 104-105 | .. | 3 16 2 | 6,429,895 | Stk. | Feb. 10 | 5/94 | South Met., 4 p.c. Ord. | 120-122 | .. | 4 9 7 |
| 55,000 | " | .. | 12 | European, Ltd. | 56-98 | .. | 5 2 0 | 1,895,445 | " | Jan. 13 | 3 | Do. 3 p.c. Deb. | 80-82 | .. | 3 13 2 |
| 143,995 | " | Apl. 1 | 15 | Do. £7 ios. paid. | 24½-24½ | .. | 4 17 10 | 209,823 | Stk. | Mar. 16 | 8 | South Shields Con. Stk. | 157-158 | .. | 5 1 3 |
| 486,092 | 10 | Jan. 27 | 12 | Gas 4 p.c. Ord. | 181-183 | .. | 4 16 0 | 605,000 | Stk. | Feb. 25 | 5½ | Sth Suburb'n Ord. 5 p.c. | 121-123 | .. | 4 12 0 |
| 354,060 | 10 | .. | 12 | light 3½ p.c. max. | 104-105 | +½ | 4 8 10 | 60,000 | " | .. | 5 | Do. 5 p.c. Pref. | 121-123 | .. | 4 1 4 |
| 16,198,671 | Stk. | Feb. 10 | 3½ | and 4 p.c. Con. Pref. | 88-90 | .. | 3 17 9 | 117,058 | " | Jan. 13 | 5 | Do. 5 p.c. Deb. Stk. | 122-124 | .. | 4 0 8 |
| 2,600,000 | " | .. | 3½ | Coke 3 p.c. Con. Deb. | 104-106 | .. | 3 15 6 | 502,310 | Stk. | May 12 | 5 | Southampton Ord. | 110-112 | .. | 4 9 3 |
| 4,531,706 | " | Dec. 29 | 3 | Hastings & St. L. 3½ p.c. | 81-93 | .. | 3 12 3 | 120,000 | Stk. | Feb. 10 | 5½ | Tottenham 5 p.c. | 133-135 | .. | 5 1 9 |
| 258,740 | Stk. | Mar. 16 | 5 | Do. do. 5 p.c. | 93-95 | .. | 5 5 3 | 453,940 | " | .. | 6½ | and B 3½ p.c. | 113-115 | .. | 4 13 6 |
| 68,500 | " | .. | 6½ | Hongkong & China, Ltd. | 117-119 | .. | 5 9 3 | 149,470 | " | Dec. 29 | 4 | Edmonton 4 p.c. Deb. | 99-101 | .. | 3 19 3 |
| 70,000 | 10 | Apl. 29 | 11 | Ilford A and C | 17-17½ | .. | 6 5 9 | 182,380 | 10 | June 10 | 11 | Tuscan, Ltd. | 9-9½ | .. | 8 8 6 |
| 131,000 | Stk. | Mar. 16 | 7 | Do. B | 145-147 | .. | 4 15 3 | 149,900 | 10 | Jan. 3 | 5 | Do. 5 p.c. Deb. Red. | 99-101 | .. | 4 19 0 |
| 65,782 | " | .. | 5 | Do. 4 p.c. Deb. | 103-110 | .. | 5 0 0 | 236,476 | Stk. | Feb. 25 | 5 | Tynemouth, 5 p.c. max. | 113-115 | .. | 4 0 11 |
| 65,500 | " | Dec. 29 | 4 | Do. 4 p.c. Deb. | 100-102 | .. | 3 18 5 | 255,636 | Stk. | Feb. 25 | 6½ | Wands- 1 B 3½ p.c. | 139-141 | .. | 4 14 0 |
| | | | | | | | | 79,416 | " | Dec. 29 | 3 | worth 3 p.c. Deb. Stk. | 74-76 | .. | 3 18 11 |

Prices marked * are "Ex div."

CHARGE FOR PUBLIC GAS LIGHTING AT TOTTENHAM.

At the Meeting of the Tottenham Urban District Council last Tuesday, a letter was received from Mr. E. Topley, the Secretary to the Tottenham and Edmonton Gas Company, in reference to the request of the Council for a reduction in the charge for public lighting.

The writer said that the matter had had the careful consideration of his Directors, who, in the first place, desired him to thank the Council for their notification that they were asking the Electric Light Company for a competitive tender for the public lighting of the district. To this the Gas Company could have no possible objection, provided, of course, that in making the comparison the relation of the total effective candle power to cost was taken into consideration in both cases, that maintenance charges for both systems were included, and that the hours of lighting and period of contract were the same. In this regard, the Directors ventured to point out that lamps giving (say) 1000 candles placed 20 feet from the ground gave only at each angle the same light as 250 candles would give at 10 feet from the ground; the proportion being inversely to the square of distance. The price charged by the Gas Company for public lighting was at present so low, compared with the charge to the general public, that there was little margin for a reduction; but anticipating that during the next ten years economies would be made in gas manufacture, which would enable the Company to reduce further their charges to ordinary customers, they offered to supply the whole of the "C" or "Howellite" duplex lamps, of 60 to 70 candle power, at present existing, for a period of ten years at the rate of 51s. per lamp per annum, less 4 per cent. for prompt payment. This would be a reduction of 2s. per lamp, and would bring the net price to 48s. 11½d., which, divided by 365 days, gave the Company 16½d. per lamp per night for supplying gas, mantles, and other accessories, for cleaning each lamp weekly, for lighting and extinguishing, and for supervision, office charges, and profit. For special lamps, the prices upon a ten years' contract would be: No. 4 Kern, £3 2s. 6d.—a reduction of 3s. 6d.; 700-candle Lucas, £11 5s.—a reduction of 13s.; 400-candle Lucas, £6 10s.—a reduction of 8s.; and 200-candle Lucas, £4 10s.—a reduction of 7s.

A letter from the Metropolitan Electric Lighting Company was read stating that they were not prepared to offer a tender for the lighting of the whole district, unless allowed to submit a price for a minimum period of five years; but if permitted to tender for those areas in which their mains were laid, they could do so for a minimum period of three years. The Council referred both letters to Committee.

The Local Government Board have granted the application of the Petersfield (Hants) Rural Authority for the borrowing of a further £800 for the water supply for Liss; but stipulation is made that the loan is to be applied only for the extension of mains.

ELECTRICITY V. GAS IN HORNSEY.

A Protest from the Tradesmen's Association.

Mr. J. Howard Dunn, Secretary of the Borough of Hornsey Tradesmen's Association, has addressed the following letter to the Town Clerk.

I am desired by my Association to call the attention of your Council to the report, as received from the Finance and Works Subcommittee, in regard to the improvement of artificial lighting at the Stroud Green School. On March 21, my Association sent a letter to the Chairman of that Committee asking them "to very carefully consider the cost of lighting, by electricity and by the modern method whereby gas may be used with efficiency, both as regards heating and ventilating, as well as for lighting, and this at a very much less cost than by electricity; and my Association urge that your Committee consider the fact that gas is much cheaper in its maintenance than electricity. They feel sure that just now, when traders have not recovered from the depression so generally prevalent, you will not consider a scheme which will add to their burdens."

To this letter, no reply was received until I wrote again, when my Association were referred to a report published by the Press. This report states that the Committee were of opinion that the electric light should be installed in the Stroud Green School. My Association are very much surprised that this decision has been arrived at, and respectfully call the attention of the Council to the differences in the estimated expenditure necessary to instal (a) electricity and (b) gas:—

| TO INSTAL ELECTRICITY. | | £ | s. | d. |
|--|--|------|----|----|
| Not less than | | 300 | 0 | 0 |
| Consumption for (say) 400 hours, and 11 units per hour, at 3d. | | | | |
| Renewals, one lamp per year, or 342, at 2s. | | 55 | 0 | 0 |
| Interest and repayment of capital, 20 years, at 7 per cent. | | 34 | 0 | 0 |
| | | 21 | 0 | 0 |
| Total cost first year | | £110 | 0 | 0 |
| GAS. | | £ | s. | d. |
| Offer from Gaslight and Coke Company | | Nil. | | |
| Consumption of gas at 1s. 8d. per 1000 cubic feet | | | | |
| Renewals as per offer for first year | | 33 | 6 | 0 |
| Interest, &c. | | Nil. | | |
| Total cost first year | | £33 | 6 | 0 |
| Maintenance annually after first year. | | 22 | 0 | 0 |
| Total cost each succeeding year | | £55 | 6 | 0 |

My Association are further advised "the additional sum for decorative repairs" cannot be a serious item, as in a public school ceilings

IN DEVISING

The "Super-Acme"

Gas Cooker

One of the points on which we have expended the greatest thought and effort is MAINTENANCE!

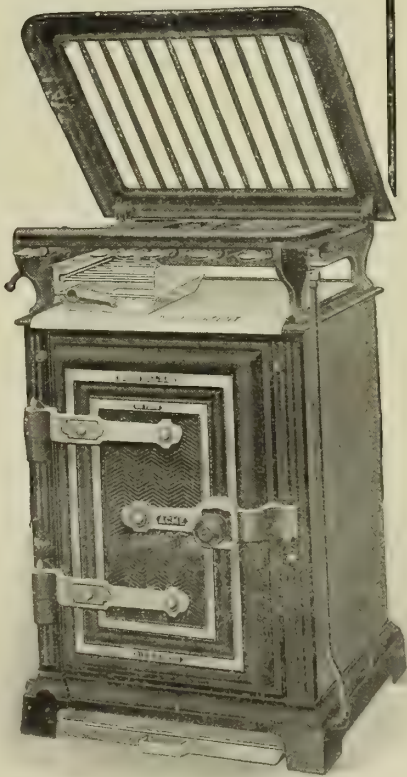
Cheapness! The needs of Gas Undertakings, equally with those of consumers, have been carefully studied.

The extent of our success is a matter of pleasing surprise to those Gas Authorities who have given the "Super-Acme" a trial. **Convenience!**

Utility! The Interchangeability principle is here carried to finality. The speed at which the Cooker can be dismantled is another feature of the "Super-Acme."

"ACME"—the highest point attained.
"SUPER-ACME"—the very pinnacle of the topmost peak.

ARDEN HILL & CO.,
ACME WORKS,
ASTON, BIRMINGHAM.



must be redone each three or five years; and they would further point out that in the use of inverted burners very little discoloration of ceilings occurs. There are, so my Association are informed, other advantages that gas has over electricity as an illuminant; it being well known that it is better for children's eyes, that there is no fear of sudden failure (with the possibility of panic arising thereby), that the gas-light is better distributed, that the circulation of air is better effected, that greater heat accrues for the winter (when it is needed), and that there is no fear of wires fusing and thereby causing a fire. The plea that "the Borough are the owners of the electricity undertaking" is no doubt one to be remembered; but my Association have reason to believe that gas companies are large ratepayers, and, furthermore, pay rates according to the quantities of gas consumed. There is, therefore, in this plea a little of the principle of "rob Peter to pay Paul."

SHUTTING-OFF GAS FROM BUILDINGS IN CASE OF FIRE.

In a recent number "Progressive Age" pointed out that, in case of conflagrations, one of the serious features is the breaking of gas-pipes and escaping gas which will not be quenched by water. This always has been considered a menace, and years ago the use of curb-cocks was quite common. However, non-observance of this precaution is now more the rule; and it seems that the fire departments are agitating the question to some slight extent, and vendors of patented devices to a great extent, with the result that proposals have been made to deal with the trouble both in Kansas City and in New York.

An ordinance has been proposed governing, *inter alia*, the construction and erection, alteration, repair, remodelling, rebuilding, moving, securing, and inspection of buildings and structures in Kansas City, and providing for their safety when so erected, and which proposes (section 269) the compulsory use of some gas combination shut-off and turn-on device. A very similar clause is suggested for New York City (section 89) and may here be quoted:

"Every building within this city in which gas is used for illuminating, heating, or other purpose, shall be equipped with a mechanical device or devices that will enable any person to shut off or turn on the supply of gas to such building from the outside or vestibule of said building by breaking the glass cover of the shut-off or turn-on keys which operate the gas-valves in the basement. Such device or devices shall be placed at such point or points in or on such building as may be designated by the Chief of the Fire Department of this city, and shall be of such design and construction as to be easily operated by manual power and with reasonable certainty and safety, and to do the work required to be done thereby.

"The device or devices installed under the provisions of this section shall be approved by the Chief of the Fire Department,

and shall be so installed as to operate automatically in case of heat from fire. All pull rods or chains must be enclosed in conduits, and at all angles run over axle pulleys and operate with ease.

"After the installation of such device or devices, the control thereof shall be under the supervision of the Chief of the Fire Department.

"Any person who, without written authority from the Chief of the Fire Department, shall meddle or tamper with any such device or devices installed upon any building or buildings under the provisions of this section shall be deemed guilty of a misdemeanor."

Our contemporary adds: This measure has been referred to the Committee on Buildings, and not yet passed upon finally. It probably will not be reported favourably, for it was afterward discovered by its introducer that he was being used by a firm manufacturing a device sold for the purpose the ordinance specified. The ordinance was resisted by the real estate interests. The Kansas City ordinance was passed some time ago against the opposition of the Company. The New York City ordinance was resisted by all but its introducers. When the dangers of such a device were pointed out, the city officials would have nothing to do with it.

PUBLIC ELECTRIC LIGHTING CHARGES AT HASTINGS.

The following criticism upon the above question is made by Mr. Chas. F. Botley, Assoc.M.Inst.C.E.:

In an editorial article in the "Hastings and St. Leonards Observer" for June 18, the remarkable statement is made that "mainly owing to the additional revenue through the extension of the lighting of the public lamps in the streets," the finances of the Corporation electricity works for last year show an improvement. This is certainly not correct; the improvement being accounted for by the increased charge made to private consumers, and more especially by the increased charge made for public arc lamps. For on July 1 last, when the prices to private consumers were increased, the charge for current to public arc lamps was also increased to 4d. per unit; and thus the revenue contributed by these (for 113 lamps) in 1909 was £2260 and (for 115 lamps) in 1910 £2706—an increase of £446. Less current was sold with the continued adoption of metallic filament lamps to private consumers. But nevertheless an increased revenue of £281 was obtained; and these two increases more than accounted for the increase in the gross profit of £589, which is the best criterion of the success or otherwise of a year's trading, because it is easy to conceive the revenue side might be inflated by most unprofitable business, which would not assist the gross profit which has to be earned to meet the interest and the sinking fund charges. For instance, it would require the sale of an additional 350,000 units of current at 2d. (the price now obtained for power, and for the converted

NEW SHOW-ROOMS.

R. & A. MAIN, LTD.,

HAVE NOW REMOVED FROM

49, Queen Victoria Street, London, E.C.,

TO

25, PRINCES STREET,
OXFORD CIRCUS, LONDON, W.

street lamps and half as much again as was sold last year) to make good last year's deficiency, even assuming no increase on the expenditure side, which is, of course, not possible.

The "Observer" points out that last year's loss was £882 less than the loss in the previous year. The figure is correct; but this is absolutely no criterion in the altered conditions of last year, and, indeed, if we go back a year previous, we find that the loss was £2982, against £2919 last year.

The increased charges to private consumers made in July last appear more than justified, because excluding current at 2d., and that sold under contract, the average return per unit sold in the three months at the old price was 4'54d. per unit, whereas the average return in the nine months of the new price is 6'17d. per unit. Indeed, the figure now being obtained from private consumers would soon make the concern self-supporting, but for the fact that current is being sold for public arc lamps at 4d. per unit, and for the converted street lamps (of which the "Observer" thinks so highly) at about 2d. per unit, and to power consumers also at 2d. per unit. Seeing that the average cost per unit sold for generating and distributing electricity for the past year was 2'11d. per unit without management and capital charges, it is fairly obvious that commercially these prices are unremunerative, and cannot be deemed good management.

The following average figures, which are, of course, obtained from an analysis of the accounts, will be of interest; and they are in all cases per unit of current sold.

| | |
|---|--------|
| Total cost including everything. | 6'74d. |
| Total cost of working expenses only. | 3'18 |
| Gross profit—i.e., to meet interest and sinking fund charges. | 2'60 |
| Loss to be met out of the rates. | 0'96 |
| Generating and distributing only. | 2'11 |
| Working expenses less public lamp charges. | 2'96 |

Even if some consumers of electricity are so much favoured as to excuse them all the capital charges on the undertaking, it will be seen that, on a business basis, public lighting cannot be charged at less than 2'96d. per unit. The lamps converted at a cost to the ratepayers of £500 or more showed some revenue; but as the return for current was only 2d. per unit, the business must be done at a loss. If these lamps can be supplied at 2d. per unit, why not the new arc lamps on the new Caroline Parade, for the arguments put forward in the one case would apply with equal force to these if commercially sound? But obviously they are not.

The testing of gas-meters at Coventry is undertaken by an official who is also the Inspector of Weights and Measures. The number of meters tested in the last twelve months was 4776, compared with 2499 last year. The income from fees for testing and stamping amounted to £134, as against £75; and the expenditure was £30 10s. 7d., compared with £22—leaving a balance of income over expenditure of £104.

RADCLIFFE ELECTRICITY SUPPLY.

Lancashire Electric Power Company and the Council.

A couple of months ago, there was reported in the "JOURNAL" (ante, p. 259) an inquiry which was held at Radcliffe, by Mr. Archibald Read, on behalf of the Board of Trade, as to an application made by the Lancashire Electric Power Company for a Provisional Order to enable them to supply electricity in the area of the Radcliffe Urban District Council. The Council have the monopoly of the supply of electricity in their district; and the Power Company, who erected a generating station just outside the boundary six years ago, sought to deprive them of it. They have latterly made many efforts to supply current in Radcliffe; but the Council have declined to allow them to enter into unrestricted competition with their municipal works. The application was opposed both by the Council and by the Radcliffe and Pilkington Gas Company. The Board of Trade decision has now been given.

The Power Company contended it was to the commercial interest of the town that there should be a large and cheap supply of electricity for motive purposes. The District Council's reply was to the effect that if large supplies were needed, the Council could come to terms with either the Bury Corporation or the Power Company; but in the interest of the ratepayers, the Council ought to maintain their monopoly powers. The decision is in favour of the Council; the Company's application for a Provisional Order having been refused. The Board of Trade, however, say that, from the evidence that was produced at the inquiry, it appears to them the facilities afforded to power users in Radcliffe to obtain a supply of energy at a reasonable rate were inadequate and, in the opinion of the Board, should be promptly extended. In the event of the Company making fresh application for a Provisional Order in respect of the district at some future date, and on it being shown to the Board that the demand for energy for power purposes is not being adequately met, the Board may find it necessary to arrive at a different conclusion from that now conveyed.

SKIPTON WATER SUPPLY.

New Works Inaugurated.

The formal inauguration took place last week at Skipton of a new scheme of water supply which has been carried out at a cost of about £80,000, and for which the Engineers were Messrs. George H. Hill and Sons, and the Contractors Messrs. H. Arnold and Sons, of Doncaster. A large company was entertained at luncheon by Mr. W. Farey, the Chairman of the Skipton Urban District Council; and afterwards Mr. T. Duckett, the Chairman of the Water Committee, invited Mr. Farey to perform the inaugural ceremony of bringing the Embsay Moor reservoir into use, by raising one of the valves in the valve-tower, and

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thus allowing the water to flow into the mains. For this purpose, Mr. Farey was presented by Mr. E. P. Hill with a key of the valve-tower; and he at once declared the works open. Mr. W. S. Arnold presented a rose bowl to Mr. Duckett in recognition of his services as Chairman of the Water Committee. This completed the ceremony; and the party subsequently made a tour of inspection of the works, under the guidance of the engineering staff.

The Act was obtained in 1904; and as Skipton at that time was suffering from serious shortage of water, Parliament gave power to the promoters to provide a temporary supply from the new source at the foot of Embsay Moor, about 2 miles from Skipton. It was absolutely necessary that the additional supply should be provided without delay; and as events turned out, the tapping of the springs on the newly-acquired site, and the conveying of the water to Skipton, undoubtedly averted a water famine. The laying of the pipe-track was carried out by administration under the supervision of the late Mr. J. Mallinson, the Town Engineer. In July, 1905, less than a year after the Act was obtained, the Embsay Moor water was first conveyed to Skipton; and since that day all difficulties in the way of supply have vanished. The contract for the construction of the reservoir and the subsidiary works was let in October, 1905; and Mr. C. M. Norrie was appointed Resident Engineer to superintend all the work except the pipe-line. The scheme provides that an excellent supply of water from Whitfield Sike Spring can at all times be carried round the reservoir without being contaminated by the peaty flood water which in rainy seasons comes down freely through the gathering-ground above. By a simple arrangement of valves, the spring water can be sent direct to Skipton at all times; while the flood water is passed on to the reservoir to be stored and purified by settlement. Prior to the construction of the embankment across the valley, it was necessary to divert the stream that runs through the reservoir site. A tunnel was driven through the solid shale beneath the site of the embankment; and by this means the stream was diverted. The raising of the embankment took nearly three years of incessant work. The materials for the puddle embankment were obtained from the inside of the reservoir. In all, there have been used in the construction of the embankment 53,750 cubic yards, or 55,250 tons, of puddled clay, and 204,430 cubic yards, or 245,320 tons, of earth. Under the trench, about 206,260 cubic feet of timber was used for propping up the sides. The surplus water is disposed of by means of a waste weir or overflow on the east side of the valley. This water falls over stone steps, and then enters a long, sloping channel, which ends in the old stream bed in the bottom of the valley below the embankment. The works for the drawing off of the water for Skipton were designed so that the surface water can be taken in preference to the water in the bottom of the reservoir.

Swadlincote Gas Management.—In view of the continued illness of their Gas Manager, Mr. G. B. Smedley, the Gas Committee of the Swadlincote Urban District Council have decided to pay him a yearly sum as Consultant, and advertise for another Manager.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

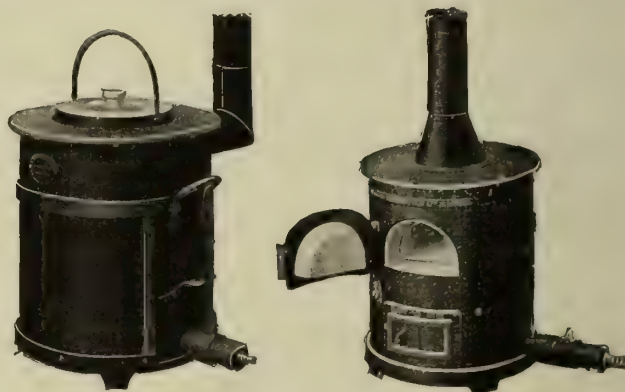
Saturday.

In the Glasgow Town Council on Thursday, Mr. A. Kennedy asked the Convener of the Gas Committee if he would bring under the notice of his Committee the advisability of installing a carburetted water-gas plant to assist in meeting exceptional and sudden demands for gas, such as were experienced last winter, and would assuredly occur again. Bailie Kirkland stated, on behalf of the Convener, that at Provan there was an installation of oil-gas plant for this purpose; but he would ask the Convener to consider the question of installing a carburetted water-gas plant.

On Monday evening, the Town Council of Carnoustie paid a visit of inspection to the gas-works recently acquired by them. Mr. J. Wynne, the Manager, showed the company over the works. The Gas Convener—ex-Provost Soutar—afterwards entertained the Council and officials in the Municipal Chambers. Provost Walker, who presided, said they had all been much interested in what they had seen that evening. There was no doubt that they had secured a concern up-to-date and complete in character. A pleasing feature of the gas purchase had been the very fine way in which they had been able to carry it through. It had pleased the sellers, and it had pleased the buyers; and it was now their duty, as a Council, to try to do their best to make the thing a success, so that they might justify the confidence of the ratepayers. Ex-Provost Soutar said he was proud, as Convener of the Committee, to have played a part in the taking over of the concern; and it was now for them to see that they worked smoothly and prosperously. There had been three very outstanding transactions since Carnoustie became a burgh—the purchase of the links, the water scheme, and the gas purchase. Their golf course was not to be surpassed; their water arrangement with Dundee was very fortunate; and as for the gas undertaking, although he personally was opposed to it when originally proposed, he was ready to admit now that it would have been better to have taken over the works earlier. Since then, the Company had spent £10,000 on reconstruction. The works were now up-to-date; and the increased consumption would more than pay the outlay. Mr. Wynne said they had doubled the gas concern in seven years; and he hoped that in other seven years they would double it again, and that gas would be very much cheaper than at the present time.

The Town Council of Moffat have resolved, at an estimated cost of £450, to adopt an automatic system of lighting and extinguishing the public lamps. Controllers have already been tried as an experiment, in the lighting of the town clock and some of the lamps in High Street, with satisfactory results. It is calculated that the saving to the burgh by fixing controllers on the whole of the lamps will be about £50 a year. Under the existing arrangements, the average cost per lamp per annum is 17s. 2d.; whereas under the new system it works out at 10s. 4½d. The cost of maintenance and repair is reckoned at 3s. per lamp, as against 5s. 9d. at present. Under the new arrangement, it is

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estimated the annual expenditure will be £154, compared with £195; the former sum including interest as well as the repayment of the loan of £450.

It is doubtless in reference to this announcement that the statement is published in the "Aberdeen Free Press" on Thursday of this week that: "A southern burgh has adopted a system for automatically lighting and extinguishing street lamps, whereby, at an estimated initial cost of £450, about £50 per annum would be saved to the burgh. Mr. Lewis Anderson, the Inspector of Lighting at Aberdeen, states that, on account of the cost of its introduction, a scheme of automatic lighting would be of no benefit to Aberdeen. He pointed out that the cost of lighting was not an item which had to be taken into serious consideration, whereas if automatic lighting were resorted to, meters would have to be installed at each lamp. The initial cost of these meters would be about 30s.; but there were also other matters which had to be considered. He had two automatic meters on trial; and while one worked satisfactorily, the other went wrong frequently. By the other system of lighting direct from the mains, new mains would have to be laid for the purpose, in order to keep private lighting and street lighting separate. If this were not done, when the street lamps were lighted or extinguished the same would also happen with house lamps. Another difficulty would be experienced with regard to mantles, because a man would have to be employed going round the lamps when lighted, in order to see that the mantles were all correct. He considered that the scheme was quite practicable in small towns; but in the case of larger towns, like Aberdeen, it would be of no benefit. Several large towns had tried a scheme of automatic lighting; but in most cases they had had to throw it out." It would be interesting to know in what large towns an automatic system of lighting public lamps had been tried and thrown out. I know of none. The statement which I have quoted is evidently the outcome of an interview with Mr. Lewis Anderson. Mr. Anderson is the Inspector of Lighting, and as such does not necessarily understand everything relating to gas supply. His observations as to separate mains being required—if the interviewer has correctly represented his views—are not intelligent. Very much otherwise. A gas-lamp in a private house, even with a pilot-light, would not, unless fitted with the automatic appliance, be affected by the raising and reducing of the pressure; and so the separate main bogey goes by the board. Had the interviewer taken the opinions of Mr. S. Milne, the Gas Engineer, on the subject, his report, it may be assumed, would have been very different. It is disappointing to have a pronouncement like this made, and especially from Aberdeen, where, about twenty years ago, when the late Mr. A. Smith was Gas Engineer, so much was made of the great saving there was to the community by the fitting-up of Peebles governors in the public lamps. In those days, Aberdeen led the way. To-day, if Mr. Lewis Anderson be taken as the mouthpiece upon lighting problems in Aberdeen, the city has fallen greatly behind. I may be mistaken, but I think the case of Moffat is unique in Scotland, in this respect—that the introduction of automatic lighting of the street lamps is being introduced by a Corporation who do not own the local gas undertaking.

A very good exhibition of the gas cooking and heating appliances of the Carron Company and Messrs. R. & A. Main, Limited, and of the lighting appliances of Messrs. Falk, Stadelmann, and Co., was held in the Falkirk Town Hall this week. It was opened on Monday evening by Mr. W. Wilson, the Gas Engineer to the Corporation of Falkirk. Bailie Bogle, the Convener of the Gas Committee, who arrived later, said the exhibition had been got up by the Carron Company and Messrs. R. & A. Main at the request of the Town Council. The Council had taken the initiative in the matter for two reasons. The first was to help to a larger sale of their gas; and the second was to enable the community of Falkirk, and particularly the female portion of it, to learn how to cook better than they did. It had been a by-word among the nations that, of all countries, unfortunately, their female compatriots of Scotland were the worst cooks in the world. Miss E. M. Dods, late Principal of the Dundee School of Cookery, gave lectures and demonstrations during the week.

There has been a long spell of dry and, of late, very warm, weather in Scotland, which has considerably dried up water sources. Even in Glasgow, with its abundant supply, the pinch has been felt. In the Town Council on Thursday, Bailie Alston asked if it was the case that during the last fortnight the daily consumption of water had risen to 70 million gallons. In some districts of the city there was a scarcity of water. Was this due to waste? Bailie Campbell said the average normal consumption of water in Glasgow was 63 million gallons per day; but during the past fortnight it rose to 70 million gallons. This was due to the very hot weather and to the people using the water recklessly. He hoped the citizens would be more economical, otherwise there must be a scarcity. It meant a severe strain on the reservoirs at Milngavie.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, June 25.

The volume of new business during the past week has not been large; but the requirements have nevertheless been sufficient to absorb the present reduced output and to sustain values at the recent level, the closing quotations still being £11 16s. 3d. per ton f.o.b. Hull, £11 17s. 6d. per ton f.o.b. Liverpool, and £11 18s. 9d. per ton f.o.b. Leith. In the forward position, no fresh transactions are reported; the fact of makers having lately advanced their limits 2s. 6d. per ton apparently tending to deter consumers from operating further.

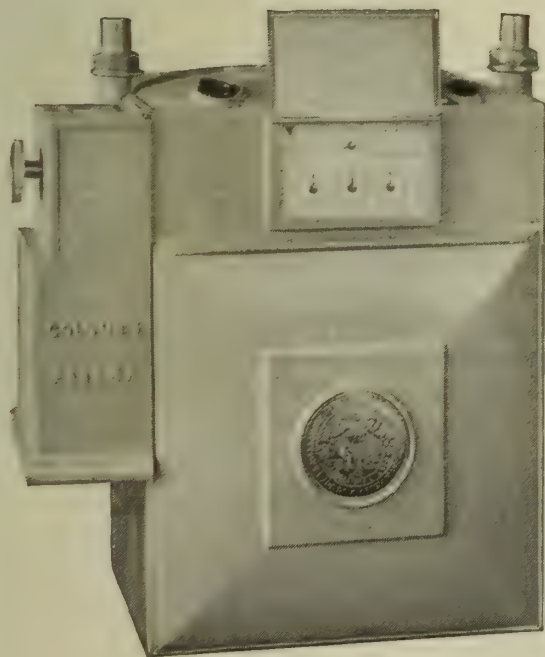
Nitrate of Soda.

The prices of this article remain unchanged at 9s. 4½d. per cwt. for ordinary and 9s. 7½d. per cwt. for refined quality, on spot, and the tone of the market is quiet.

Tar Products.

LONDON, June 27.

The markets for tar products have been very dull during the past week, and prices have declined in many instances. In pitch, makers



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do not seem inclined to sell for forward at the reduced prices ; but on the other hand, buyers are waiting before making any further purchases, in the hope that they will be able to do better. There has been a decided weakening in benzols, and considerable business has been done at reduced prices. Creosote remains steady. Carbolic acid does not seem of any interest, though in some quarters makers report that they are able to obtain as much as 1s. 0½d. to 1s. 0¾d. per gallon for the 60's quality.

The average values during the week were : Tar, 17s. 3d. to 21s. 3d., ex works. Pitch, London, 39s. 6d. to 40s. ; east coast, 37s. 6d. to 38s. 6d., west coast, 36s. 6d. to 37s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7½d. ; North, 6½d. ; 50-90 per cent., casks included, London, 7½d. ; North, 7½d. Toluol, casks included, London, 10d. ; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 3¾d. ; North, 3½d. to 3¾d. ; solvent naphtha, casks included, London, 1s. 3d. ; North, 1s. 2½d. to 1s. 3d. ; heavy naphtha, London, 1s. to 1s. 1d. ; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d. ; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2¾d. Carbolic acid, 60 per cent., casks included, east and west coast, 11½d. to 1s. Naphthalene, £4 10s. to £8 10s. ; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The sulphate market has remained in about the same position ; and though there are several inquiries of a fair size, they do not lead to definite business. To-day, actual Beckton is quoted £11 18s. 9d., and outside makes upon Beckton terms at £11 10s. In Hull, £11 13s. 9d. to £11 15s. is quoted ; in Liverpool, £11 15s. to £11 16s. 3d. ; and Leith, £11 17s. 6d. to £11 18s. 9d. In Middlesbrough, £11 15s. is asked.

COAL TRADE REPORTS.

Northern Coal Trade.

The chief local holidays of the year have since the last report interfered with both the production and the consumption of fuel, though the effect on the prices has not been great. In the steam coal trade, best Northumbrians are quiet at from 10s. to 10s. 3d. per ton f.o.b. ; second-class steams are about 9s. 3d. to 9s. 6d., and steam smalls from 5s. 9d. to 6s. 9d. per ton—the output being now fair. In the gas coal trade, there is naturally a limited local consumption ; but the exports are fully an average. Durham gas coals vary in price, according to quality ; the usual classes being from about 9s. 1½d. to 9s. 10½d. per ton f.o.b., while for Wear specials up to 10s. 6d. is quoted. Among the few contracts reported this week are two for Italy—one for Genoa, at about 16s. 3d. per ton at that port ; and the other, of 30,000 tons, delivered over next year, at Venice at about 17s. per ton—both of best Durham gas coal. Other contracts are in the market ; and these prices, possibly yielding near 9s. 10d. per ton f.o.b., are expected to rule the market much. Coke is quiet ; but gas coke is firm, being in limited make, and with a good export demand. From 13s. 6d. to 14s. per ton f.o.b. seems now to be quoted for good gas coke.

Scotch Coal Trade.

Trade has been more active ; ell for shipment being in better request. Splint, with the exception of inferior qualities, is finding a ready market. The prices now quoted are : Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow ; splint, 9s. 9d. to 10s. ; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 341,914 tons—an increase of 30,787 tons upon the previous week, and 3613 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,279,500 tons—an increase of 667,606 tons upon the corresponding period.

Fylde Water Board Accounts.—The eleventh annual report of the Fylde Water Board shows that the receipts on gross revenue account for the past year amounted to £66,181, as compared with £64,229 in 1909 ; while the expenditure was £15,349, against £13,778. The gross profit is an increase of £308, as against an increase of £2123 in 1909 over 1908 ; and the net profits increased by £652, against an increase of £1559 in 1909 over 1908. The diminution in the profit increase is accounted for by special expenditure. The number of consumers supplied by the Board during the year was 28,014, or an increase of 795 over the previous twelve months.

Coventry Water Supply.—The Coventry Corporation have expended during the year £6086 on capital account in respect of their water undertaking—chiefly on works connected with the Birmingham supply—bringing the total expenditure to date to £214,813. The receipts from water-rents amounted to £27,155, an increase of £7140. The total revenue was £29,228. The working expenditure amounted to £14,629, as against £12,100 in the previous year ; and the net result was a profit for the year of £5577, whereas twelve months ago it was only £2133. The Engineer (Mr. J. E. Swindlehurst) assures the Water Committee that the department is on a sound working basis.

Birmingham Gas Department Figures.—We have received from Mr. Thomas H. Clare, the City Treasurer of Birmingham, a copy of the detailed accounts prepared by him for the twelve months to March 31. Those relating to the Gas Department furnish some figures in addition to those which were given in the "JOURNAL" for May 17 (p. 449). The revenue account shows a balance of income in excess of expenditure of £189,934 for 1909-10, carried to profit and loss account. After providing for annuities, interest, and redemption of debt, the balance of the profit and loss account was £72,492. The amount of capital expended during the year was £48,278 ; and the value of buildings and plant abandoned, &c., was £63,636. The total expenditure on capital account to March 31 was £2,460,967. The amount of the reserve fund provided out of revenue, with accumulations, was £100,000 ; while the gross total of loans negotiated, including annuities, was £2,908,949. The amount provided from revenue for redemption of debt during 1909-10 was £46,661 ; and the gross amount provided for redemption of debt to the end of the year was £926,095. The balance of loans remaining to be provided for was £1,982,854.



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Hull Water and Gas Supplies.

The Mayor of Hull (Alderman H. Feldman), when presenting the past year's accounts to the Corporation Water and Gas Committee, said he considered the results of both undertakings were eminently satisfactory. It was decided, after some discussion, to consider at the next meeting the question of the advisability of reducing the price of gas in the Old Town. With reference to the gas undertaking, the income was £12,041, and the expenditure £8678; leaving a gross profit of £3363. The net profit is £1063, and the balance on net revenue account amounts to £3722. The usual contributions have been made to the sinking fund, which now stands at £6894. On the reserve fund, there is a credit balance of £4434. No expenditure has been incurred during the year on capital account. On the water undertaking, the report stated the income for the year ended March 31 amounted to £65,317, and the expenditure to £27,951, leaving a gross profit of £37,366. The profit has been applied as follows: Annuity to city fund, £2600; interest charges, £11,638; sinking fund instalments, £1772; income-tax, £939; relief of city fund rates, 1910-11, £12,000; and transferred to reserve fund, £8416. After reserving £12,000 to the relief of rates and transferring £8416 to the reserve fund, the working balance is £9441. The sinking fund now reaches £67,309. On construction account, there is an adverse balance of £5040.

Price of Gas at Haverhill.—The Haverhill Gas Committee, having considered the advisability of lowering the price of gas, recommended that a reduction of 2½d. per 1000 cubic feet be made as from the end of the Midsummer quarter (the slot-meters to be adjusted accordingly), and the contract rate for street lighting to be reduced 1s. 5d. per lamp per annum. They also intimated that, provided the new plant continued to work satisfactorily during the ensuing twelve months, they expected to be in a position to make a substantial reduction in the price of gas next year. The condition of affairs thus revealed was regarded as eminently satisfactory by members of the Urban District Council; and the recommendation was agreed to.

Electric Light Failure at Wrexham.—Last Saturday week (it is so often on a Saturday that these occurrences are experienced!) much inconvenience was caused to shopkeepers and others in Wrexham, by the failure of the electric light, caused by a cable fusing. Great trouble was experienced by those unwise tradesmen who had entirely dispensed with gas-fittings; for the failure occurred just when business was very brisk. Most serious of all, however, was the loss sustained by the places of entertainment. At a cinematograph entertainment, the audience, numbering nearly 1000 persons, were informed that it would be impossible to give the usual display; and their money was returned. In many shops and licensed houses, business was conducted by the aid of candles.

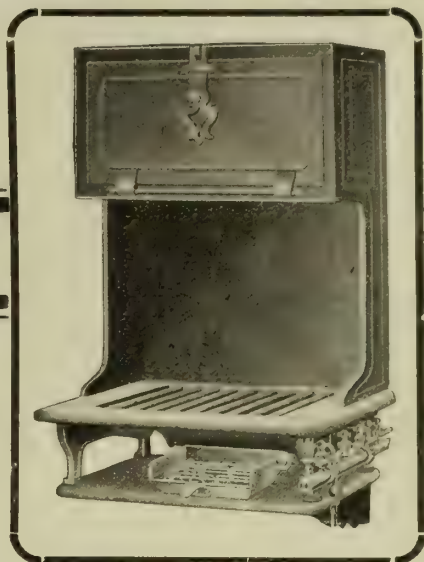
Progress of the Portsea Island Gas Company.—By the death at Portsmouth, on the 20th inst., of Mr. Edmund Chiverton, at the age of 76, the progress of the Portsea Island Gaslight Company is recalled. Mr. Chiverton, who originally was employed by the Portsmouth Water-Works Company for three years, became Surveyor of Mains to the Gas Company in 1861, at which period the largest of their three gasholders was for 600,000 cubic feet—having been erected three years previously. The deceased superintended the substitution of a 24-inch main for a 7-inch one, and when public lighting came into vogue in 1865, he had the 780 lamps under his control. He also superintended the relaying of all the mains when the new holder at Rudmore for 1½ million cubic feet was erected in 1873. During the period of his surveyorship, it is estimated he superintended the laying of 90,800 yards of mains.

East Surrey Water Company.—In their report for the year ended March 25, the Directors state that they have debited the renewal and contingency fund with £1764, this amount having been expended in the year upon the completion of alterations necessary at the Caterham works for the conversion of these into a reservoir, and have placed £2000 to the credit of the fund out of the balance of profits. The fund therefore now stands at £11,937. The profit for the year is £27,481, which, with the balance of £3651 brought forward, makes £31,132. Out of this, the Directors recommend dividends for the year of 5 per cent. upon the preference shares, 7 per cent. upon the ordinary "B" shares, and 10 per cent. upon the original ordinary "A" shares (less income-tax in all cases). This will leave a balance of £4133 to be carried forward. During the year, 463 new customers were added; and about 2½ miles of new mains were laid.

Stamford Public Lighting.—At a recent special meeting, the Stamford Town Council considered a recommendation of the Lighting Subcommittee that a contract should be entered into with the Gas Company for the public lighting for a period of five years, and that no contract be entered into with the Electric Supply Company. It seems that the latter Company have at the present time five large arc lamps in the main streets; and that a great number of complaints had been received with regard to these. The Deputy-Mayor (Mr. T. S. Duncomb) pointed out that the Committee had decided to go back to the gas-lighting system, with a greater distribution of lamps, and a saving to the borough of £42 a year. The recommendation was adopted, with an amendment to the effect that the Gas Company should be interviewed with a view to securing the same terms for a three-year contract as the Company offered for a term of five years.

The Leicester Vacancy.—Referring to the vacancy which has unhappily been created at Leicester by the death of Mr. Alfred Colson, the "Nottingham Daily Express" says: Following the death of the Leicester Corporation Gas Engineer, the Gas and Electric Lighting Committee of that town have decided to recommend the Council to obtain a new Engineer and Manager for the Gas Department. Up to the present, gas and electricity have been under one Manager; and the general opinion in Leicester is that the time is opportune for separating the two departments so far as managerial control is concerned. The action of the Committee is regarded as an indication that the separation policy has been decided upon. The question of the management of the Electric Lighting Department, however, remains in abeyance, pending expert advice as to the desirability and feasibility of running the two electrical stations under one control.

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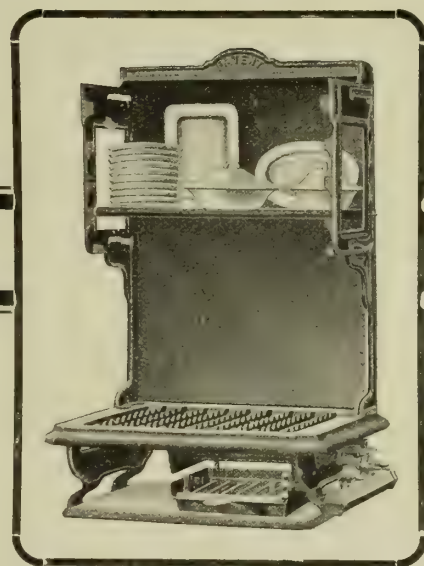


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129, HIGH HOLBORN, LONDON.

Birmingham Water Supply.—In his epitome of the accounts for the year to March 31, Mr. T. H. Clare, the City Treasurer of Birmingham, says the revenue account of the water undertaking for 1909-10 shows a balance of income in excess of expenditure of £205,022, carried to profit and loss account. The profit and loss account shows a loss of £81,059, which has been provided for as follows: Contribution from the borough rate, £65,000; a transfer from capital under section 22 of the Birmingham Corporation Water Act, 1902, £11,236; balance carried forward, £4823. The amount of capital expended during the year under the 1892 Act was £52,507. The total expenditure on capital account to March 31 under the 1875 and 1879 Acts, was £2,094,260; and under the Act of 1892, £6,205,569. The gross amount of loans negotiated, including annuities, under the 1875 and 1879 Acts, was £2,097,860; and under the 1892 Act, £6,212,500. The amount provided from revenue for redemption of debt during the year, under the 1875 and 1879 Acts, was £17,322; and under the 1892 Act, £3579. The gross amount provided for redemption of debt to the end of 1909-10, under the 1875 and 1879 Acts and the 1892 Act was £241,540. The balance of loans remaining to be provided for, under the 1875 and 1879 Acts, was £1,889,284; and under the 1892 Act, £6,179,536.

Coventry Gas Supply.—The extensive use of prepayment meters in the consumption of gas at Coventry is shown by the fact that during the year ended March 31 last 188,622,100 cubic feet out of a total gas consumption of 808,840,700 cubic feet were consumed in this way. The price of gas varied within the municipal boundary of Coventry from 1s. 9d. to 2s. 5d. per 1000 cubic feet; while in the outside area it ranged from 2s. 6d. to 2s. 11d. The undertaking is now beginning to experience the benefit of the more economical methods of working which it is possible to follow at the new works. The transfer, however, involved considerable extra pressure upon the staff of the department; and the Gas Committee think it is right that this should be recognized financially. They are therefore including among their recommendations a proposal that a bonus should be paid to employees.

The Pulsometer Engineering Company have moved their London offices to Broad Sanctuary Chambers (opposite Caxton House), Westminster—formerly the offices of Messrs. Easton and Anderson.

The Richmond Gas Stove and Meter Company, Limited, have declared interim dividends for the six months ending June 30 at the rate of 6 per cent. per annum on the preference shares and at the rate of 10 per cent. (free of income-tax) on the ordinary shares.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Swadlincote Gas Department. Applications by July 12.
ASSISTANT GAS MANAGER. No. 5256.
CANVASSER. No. 5257.

Patent Licences.

GENERATING AND USING HYDROCARBON VAPOURS FOR HEATING AND LIGHTING. L. Duvinage, Brussels.

Meeting.

EUROPEAN GAS COMPANY. London Offices, July 12, Two o'clock.

Stocks and Shares.

BARNET GAS AND WATER COMPANY. July 12.
LOWESTOFT WATER AND GAS COMPANY. July 12.
SOUTHEND GAS COMPANY. July 12.
SOUTHEND WATER COMPANY. July 12.
TONBRIDGE GAS COMPANY. Tenders by July 16.

TENDERS FOR

Coal and Cannel.

BANGOR (Co. Down) URBAN DISTRICT COUNCIL. Tenders by July 18.
BURY GAS DEPARTMENT. Tenders by July 8.
EXMOUTH GAS COMPANY. Tenders by July 4.
ILKESTON GAS DEPARTMENT. Tenders by July 6.
MANCHESTER GAS DEPARTMENT. Tenders by July 7.

Tar and Liquor.

CONGLETON GAS DEPARTMENT. Tenders by July 2.
RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by July 5.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to
WALTER KING, II, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

PENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,

PALMERSTON HOUSE,

OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

VOLCANIC FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE OF EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND CONTRACTORS,

18 & 20, FARRINGDON ROAD, LONDON, E.C.

Telegrams:

"Dacolight London."

Telephone: 2336 HOLBORN.

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E. WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 815 Oldham, and 2412 Hop, London.

Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

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110, CANNON STREET, LONDON.

BENZOL

AND

CARBURINE FOR GAS ENRICHING.

ALSO

THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to

THE GAS LIGHTING IMPROVEMENT CO., LTD.,

7, BISHOPSGATE STREET WITHOUT,

LONDON, E.C.

Telegraphic Address: "Carburine, London."

KRAMERS AND AARTS WATER-

GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

89, VICTORIA STREET, S.W.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhaustors, Scrubbers, Washers, Purifiers, Gas-holders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DUNDEE.

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(NATURAL.)

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BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD.

86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.

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GASHOLDERS, OIL-TANKS, ROOFS, and all kinds of LOFT and other PAINT WORK.

70, Balcarne Street, Well Street, HACKNEY, N.E.

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SPECIALLY prepared for Sulphate of AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, AND STAFFORD.

Address Correspondence and Inquiries to OLDBURY, WORCS.

Telegrams: "CHEMICALS, OLDBURY."

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSS
MOUNT IRON-WORKS, ELLAND.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, and WAKEFIELD.

TAR WANTED.
Telephone: Central Manchester, 7002.
Telegrams: "UPRIGHT."
Apply, **THOMAS HORROCKS,**
Albert Chemical Works, BRADFORD,
MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
Naphtha, Carbolic, Sulphate of Ammonia.

J. E. C. LORD, Ship Canal Tar Works,
J. Waste, Manchester, Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

**BRISTOL RECORDING GAUGES
AND THERMOMETERS.**

J. W. & C. J. PHILLIPS, 28, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

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Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

SULPHURIC ACID for Sale, specially
suitable for making Sulphate of Ammonia,
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKE-
FIELD.

**"GAZINE" (Registered in England and
Abroad). A radical Solvent and Preventative**
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
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Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National
Telephone No. 2497.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS,
CONTRACTORS, &c.
RETORT SETTINGS, COAL-TESTING PLANT,
BOILER FIRING.

Communications should be addressed to
UNDERWOOD HOUSE, PAISLEY.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding
Oxide Lightly.
See Illustrated Advertisement, June 21, p. 914.

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges
at One Stroke.
See Advertisement, June 21, p. IV. of Centre.
ALDRIDGE AND RANKEN,
89, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: "MOTORPATRY, LONDON," Telephone: 5118 WESTMINSTER.

IT is Worth Your While to Buy Direct.
The RELIANCE LUBRICATING OIL COMPANY
supply the best value in NON-CORROSIVE LUBRI-
CANTS—viz., Motor Wagon Oil, 1s.; Motor Car Oil,
2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil,
10d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;
650 T. Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas
Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;
Renown Engine Oil, 11d.; and Astral Disinfectant,
2s. 6d. per gallon. Barrels free, carriage paid. Solidified
Oil, 25s. cwt.
THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20,
Water Lane, Tower Street, LONDON, E.C.

EDGAR OF HAMMERSMITH
FOR
AUTOMATIC GAS FLASHING SIGNS.
BIENHEIM WORKS, LONDON, W.
Telegrams: "GASOSO LONDON." Telephone: 14 HAMMERSMITH.

GAS-WORKS requiring Extensions
should Communicate with **FIRTH BLAKELEY,**
SONS, AND CO., LIMITED, Dewsbury, who make a
Speciality of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
faction Guaranteed.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

APPOINTMENTS.—Ambitious Men of
Parts invited to write—
HERBERT GREATORIX,
APPLICATION SPECIALIST,
BEECHWOOD, MATLOCK.
Specimen of many results:—
"Have got the job. Quite a good start.
To you the credit is due, and I think your
fee the best Investment I ever made."
BUSINESS IS REVIVING. WRITE NOW.

THE Numerous Applicants for the
Appointment of "DRAUGHTSMAN FOR
CANADA," which was advertised in the "JOURNAL"
on May 24, last, under No. 5242, are Hereby THANKED,
and informed that the APPOINTMENT HAS NOW
BEEN MADE.

WANTED, for a 100 Million Works, an
ASSISTANT GAS MANAGER. Must be
Technically Qualified.
Applicants are requested to give full Particulars of
their Training and Qualifications, and to send Copies
of not more than Three recent Testimonials, to No.
5256, care of Mr. King, 11, Bolt Court, FLEET STREET,
E.C.

GAS Company in the Eastern Counties
requires the Services of a Young Man as CAN-
VASSER. Applicants must be Capable of Advising
Consumers as to the most modern methods of using
Gas for Lighting, Heating, and Power.
Apply, by letter, stating Age, Experience, and Salary
required to No. 5257, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

**SWADLINCOTE DISTRICT URBAN DISTRICT
COUNCIL.**

THE above Council invite Applications
for the Position of MANAGER (under a Con-
sulting Engineer) of the Council Gas-Works.
The Annual Make of Gas approximates about
47,000,000 Cubic Feet.
The Salary offered is £150 per Annum; and the Ap-
pointment will be terminable on Three Months' Notice
from either side.
The age of Applicants must not exceed 35 Years.
Applications, stating Age, Experience, and present
Position, and accompanied by copies of not more than
Three recent Testimonials, to be addressed to me, en-
dorsed "Gas-Works Manager," so as to reach me not
later than Twelve Noon on Tuesday, the 12th of July,
1910.

W. A. MUSSON,
Clerk to the Council.
Council Offices,
Swadlincote.

GASHOLDERS—Splendid 45 feet di-
ameter and New STEEL TANK, fixed Complete
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap for
immediate Sale.
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

**RADCLIFFE AND PILKINGTON GAS
COMPANY.**

TO TAR DISTILLERS.
THE Directors of this Company invite
TENDERS for the Purchase of 1060 Tons of the
Surplus TAR to be produced at their Works in Rad-
cliffe during the ensuing Twelve Months.
Particulars may be obtained from the undersigned,
to whom Tenders must be delivered not later than
Tuesday, the 5th of July.

JAMES BRADDOCK,
Manager and Secretary.
Gas Offices, Radcliffe,
Manchester, June 24, 1910.

BOROUGH OF CONGLETON.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for
the Purchase of Surplus TAR and AMMONIACAL
LIQUOR for the Twelve Months ending June 30, 1911.
Forms of Tender and Conditions may be obtained
from the undersigned.
Tenders, endorsed "Tar and Liquor," to be delivered
at the Office of E. A. Plant, Esq., Town Clerk, Congle-
ton, on or before Saturday, July 2, 1910.
The Committee do not bind themselves to accept the
highest or any Tender.

JOSEPH T. BROUGHTON,
Engineer and Manager.
Gas-Works, Congleton,
June 13, 1910.

COUNTY BOROUGH OF BURY.
THE Corporation of Bury are prepared
to receive TENDERS for the Supply of about
40,000 Tons of GAS COAL,
900 Tons of ROLLER SLACK,
400 Tons of BURY,
300 Tons of HOUSE COAL.
Forms of Tender and Conditions may be obtained on
Application to Mr. H. Simmonds, Engineer and General
Manager, Gas-Works, Bury.
Tenders to be delivered to the Town Clerk, Bury, not
later than Friday, July 8, 1910.

BOROUGH OF ILKESTON.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for
11,000 Tons of Screened GAS NUTS or PEAS to
be delivered at their Siding on the Midland Railway,
as required for the Year ending July 31, 1911.
Sealed Tenders, endorsed "Tenders," on Forms to
be had on Application to the undersigned, to be delivered
to Wright Lissett, Esq., Town Clerk, Ilkeston, before
July 6.
The Committee reserve the right to divide the Quan-
tities offered and do not pledge themselves to accept the
lowest or any Tender.

F. C. HUMPHREYS,
Engineer and Manager.
Gas-Works, Ilkeston,
June 17, 1910.

EXMOUTH GAS COMPANY.
THE Directors of the Exmouth Gas

Company invite TENDERS for the Supply of
about 6000 Tons of Best GAS COAL (Screened or Un-
screened), to be Delivered in such Quantities and at
such times as may be required from the 1st of August,
1910, to the 31st of August, 1911, and to weigh 20 cwt.
to the Ton over the Gas Company's or Dock Company's
Weighbridge, the Coal to be Fresh Wrought, Dry, and
free from Hards, Smudge, Shale, and Pyrites.
Tenders to be accompanied by Practical Working
Analysis.

Prices may be quoted c.i.f. or f.o.b. (by Sailing Vessels
only) Exmouth Docks, or f.o.r. Exmouth Railway
Station (London & South Western Railway).
Sealed Tenders, endorsed "Tender for Coal," to be
sent to the undersigned not later than Monday, the
4th of July, 1910.
The Directors do not bind themselves to accept the
lowest or any Tender.

Special Tender Forms are not provided or required.
JAMES T. FOSTER,
Secretary and Manager.
Gas-Works, Exmouth,
June 6, 1910.

COAL WANTED.

THE Urban District Council of Bangor
(County Down) invite TENDERS for Supplying
about 3500 Tons of Best Screened COAL, to be Delivered
and Trimmed into Coal-Store at the Gas-Works, Bangor,
at such times and in such Quantities, of about 250 Tons,
as may be required, from the 1st of August next.

Deliveries of Coal into the Works will only be re-
ceived between the hours of 6 a.m. and 11 p.m.
Persons tendering to name the pit from which the
Coal offered is raised.
Tenders should be accompanied by Analyses, placed
in sealed envelopes, marked "Tender for Coal," and
must reach me not later than Monday, the 18th of
July, 1910.

No Tender Forms issued.
Any further Particulars can be had from the Gas
Manager, Mr. B. Mitchell.
The Council do not bind themselves to accept the
lowest or any Tender, and will require security for
the due and faithful performance of the Contract.

By order,
J. MILLIKEN,
Clerk to the Council.
Town Hall, Bangor,
Co. Down, June 24, 1910.

MANCHESTER CORPORATION GAS-WORKS.

TENDERS FOR COAL AND NUTS.

THE Gas Committee of the Corporation
of Manchester are prepared to receive TENDERS
for the Supply of their requirements of Screened COAL
and Screened NUTS (Unwashed) during One or Two
Years at their Gaythorn, Rochdale Road, Bradford
Road, and Droylsden Works, delivery to commence on
the 1st day of October, 1910.

The Tender must state at what Colliery the Material
offered is raised, and give the size of the mesh of the
Screen over which it is passed, with the angle of in-
clination of the Screen.

Printed Forms of Tender may be obtained on Appli-
cation (in writing only) to Mr. Fredk. A. Price, Superin-
tendent, Gas Department, Town Hall, Manchester; and
Tenders, endorsed "Tender for Coal or Nuts," as the
case may be, must be delivered at the Gas Department,
Town Hall, Manchester, before Ten o'clock on Thurs-
day morning, the 7th of July, addressed to the Chair-
man of the Gas Committee.

The Gas Committee do not bind themselves to accept
any Tender, and reserve to themselves the right to
divide any offer as they may deem advisable.

By order,
THOMAS HUDSON,
Town Clerk.
Town Hall, Manchester,
June 24, 1910.

PATENT.
THE Proprietor of the British Patent

No. 10,616/05 for "IMPROVEMENTS IN
MEANS FOR GENERATING AND USING HYDRO-
CARBON VAPOURS FOR HEATING AND LIGHT-
ING PURPOSES" desires to sell his Patent or to
Grant Licences thereof.

All Communications should be addressed, in the first
instance, to L. DUVINAGE, Patent Agent, 10, Avenue des
Nerviens, BRUSSELS.

EUROPEAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ANNUAL GENERAL MEETING of the Shareholders will be held on Tuesday, the 12th day of July next, at Two p.m. precisely, at the Offices, Finsbury House, Blomfield Street, London, pursuant to the Regulations of the Company.

The Directors who retire by rotation are H. E. Jones, Esq., M.Inst.C.E., and R. S. Gardiner, Esq.; and the retiring Auditors are J. Reeson, Esq., and H. J. Luft, Esq., who, being eligible for re-election, offer themselves accordingly.

The Directors, pursuant to the regulations of the Company, have appointed W. Williams, Esq., to a seat on the Board as Managing-Director; and his Election as a Director will be submitted for confirmation to the Shareholders at the General Meeting.

N. E. B. Garey, Esq., having resigned his seat on the Board, the Directors, pursuant to the regulations of the Company, have filled up the vacancy, and have nominated A. T. Eastman, Esq., as a Director, subject to confirmation by the Shareholders at the General Meeting.

The Accounts to be submitted to the Shareholders will be open for inspection at the Company's Offices on and after the 4th of July next.

NOTICE is ALSO GIVEN, that the TRANSFER BOOKS WILL BE CLOSED from the 9th to the 29th of July next, both days inclusive.

By order of the Board,
W. B. BRADY, Secretary.

Finsbury House, Blomfield Street,
London, E.C., June 24, 1910.

In accordance with Clause 12 of the Company's regulations "The bearer of a Share Warrant may, on depositing his Warrant at the Chief Office of the Company in London not later than 48 hours before holding any meeting of the Company, be present and vote at any such meeting in respect of the Shares or Stock included in such Warrant."

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £10,000 "D" CAPITAL WATER STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 12, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of **SOLOMON BLAIBERG, Esq.,** decd.

GAS AND WATER STOCKS AND SHARES,

IN THE
SOUTHEND GAS COMPANY,
SOUTHEND WATER-WORKS COMPANY,
LOWESTOFT WATER AND GAS COMPANY.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 12, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

TONBRIDGE GAS COMPANY.

NEW ISSUE OF £1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

THE Directors of the above Company give Notice that they will be prepared to receive not later than Twelve o'clock Noon on Saturday, the 16th of July, 1910, sealed Tenders for £1000 FOUR PER CENT. DEBENTURE STOCK, in Lots of £10 each, or multiples of £10.

Minimum Price, £100 per £100 Stock.
Full Particulars and Forms of Tender may be obtained from the undersigned.

JAMES DONALDSON,
Secretary and Engineer.

Offices; 109, High Street,
Tonbridge.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to CAPITAL STOCKS, WILL BE CLOSED at Four o'clock p.m., on Tuesday, the 5th day of July next, and WILL BE RE-OPENED immediately after the Half-Yearly Ordinary General Meeting of the Company to be held on Friday, the 5th day of August next.

By order,
HENRY RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., June 23, 1910.

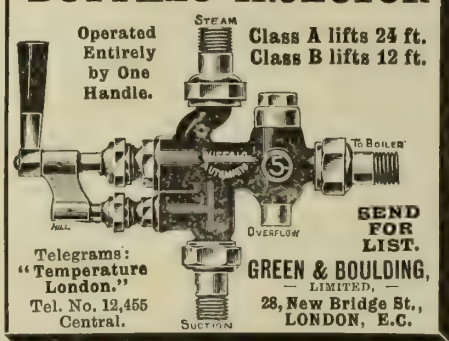
TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
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GRASSMOOR COLLIERIES,
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Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

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Sperm Value 878.85 lbs. per Ton.

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Important Improvements.



BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, it occasionally cleaned with warm water, will not become discoloured.

LAMPS.

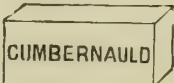
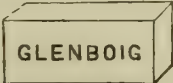
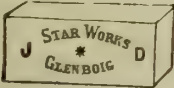
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

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GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

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The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

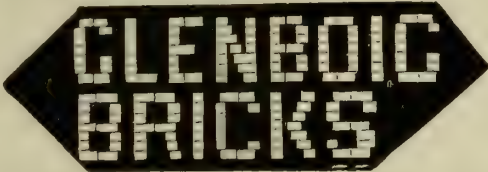
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The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.



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Highest Award wherever exhibited.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

DEAR SIR,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

| | Raw. | Fired. |
|--------------------------------|----------|----------|
| Silica, free | 3.03 .. | 3.49 .. |
| Silica, combined | 43.20 .. | 49.77 .. |
| Alumina | 36.55 .. | 42.16 .. |
| Ferric oxide | 1.80 .. | 2.08 .. |
| Titanic oxide | 1.80 .. | 1.50 .. |
| Lime | trace .. | trace .. |
| Magnesia | trace .. | trace .. |
| Alkaline oxides | trace .. | trace .. |
| Sulphates as trioxides | 0.92 .. | 1.06 .. |
| Loss on Ignition | 13.20 .. | — .. |
| | 100.00 | 100.00 |

PHYSICAL RESULTS.

| | |
|-------------------------------------|--------------------------|
| Density | 2.65 |
| Volume weight | 1.90 |
| Porosity | 15.4 % |
| Linear shrinkage at 100° C. | 3.70% |
| " " " 1050° C. | 4.76% |
| " " " Total | 8.46% |
| Volume shrinkage at 100° C. | 10.7 % |
| " " " 1050° C. | 12.6 % |
| " " " Total | 23.3 % |
| Plasticity | 20.0 % |
| Fire Stability | 1850° C. equiv. 3362° F. |

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,

JOHN T. NORMAN,

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Coal and Coke Elevators and Conveyors.

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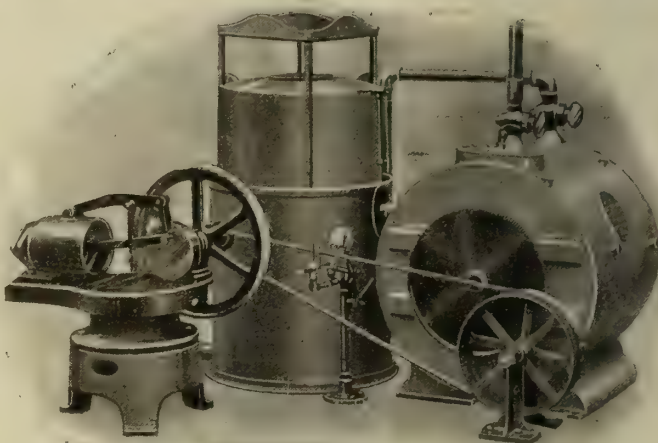
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THE CENTENARY PETROL GAS TURBINE GENERATOR.FOR
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Mansions,
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Railway Stations,
County Lighting Districts.Plants from 100 cub. ft. per hour up to
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WILLIAM KEY, Engineer.

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GAS METER
MAKERS.****DRY METERS**IN
TIN AND IRON CASES.**WET METERS**IN
TIN AND IRON CASES
WITH ORDINARY AND
COMPENSATING DRUMS.All Materials used in the
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are of the best quality, and
the Workmanship of the
Highest Standard.

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LONDON, E.C.

Welsbach

LIGHT

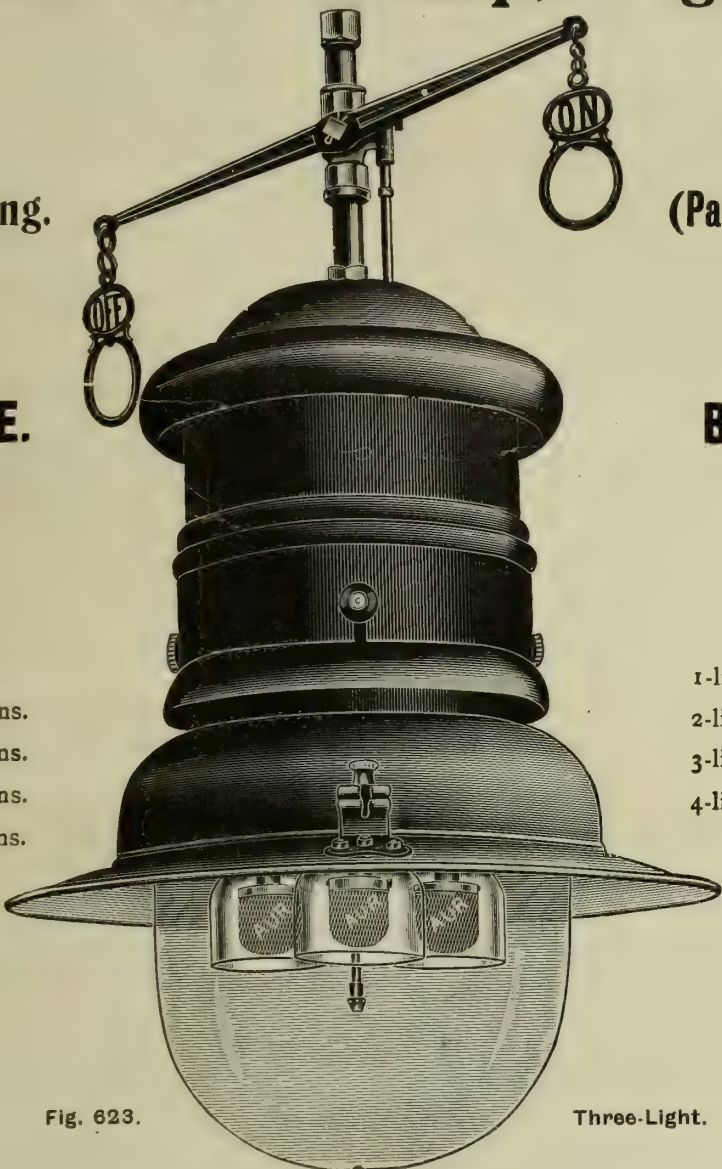
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 8 ins. |
| 2-light | . . . | 2 ft. 4 ins. |
| 3-light | . . . | 2 ft. 4 ins. |
| 4-light | . . . | 2 ft. 7 ins. |

Width over all.

| | | |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in. |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

| | Gas per hour. | C.P. | Steel. | Copper Case. | | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet | 125 | 30/- | 5/- extra. | 3-light | 12 feet | 400 | 52/6 | 6/- extra. |
| 2-light | 8 feet | 260 | 47/6 | 6/- extra. | 4-light | 16 feet | 550 | 72/6 | 9/- extra. |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

| | 1-Light. | 2-Light. | 3-Light. | 4-Light. | | 1-Light. | 2-Light. | 3-Light. | 4-Light. |
|-------------------------------|----------|----------|----------|----------|----------------------------|----------|-------------------|----------|--------------|
| Clear Glass Globes, each | 2/3 | 5/9 | 5/9 | 9/- | Wired Globes, extra | each | 2/- | 2/- | 2/9 3/6 |
| " " " In Case lots per dozen. | 19/6 | 57/9 | 57/9 | 93/- | Parabolic Reflector, extra | " | 3/6 | 6/- | 7/6 Not made |
| Case contains | 80 | 18 | 18 | 12 | Welsbach Mantles, each | 6d. | subject as usual. | | |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.

METROPOLITAN GAS METERS, LIMITED,

SOLE MAKERS AND LICENSEES OF THE

"Simplex" AUTOMATIC GAS LIGHTER AND EXTINGUISHER.

Some of its Special Advantages are:

1. It is instantaneous in Lighting and Extinguishing without shock to Mantle, and can be set to its pre-determined times in a few seconds.
2. The Mechanism will act correctly, even though the Lamp-post and Controller be out of the perpendicular.
3. **THE VALVE.**—As this never leaves its seat, and the gasways being away from the seating, no impurities can collect between the valve and the seating, and by simply removing a small cap, the gasways can be freed of Naphthalene or any other matter.
4. The leakage of gas into the Clock Mechanism and its resultant troubles are entirely done away with.
5. Vibration of any description will not cause the Mechanism to operate prematurely.
6. The "Simplex" Clock also has the advantage of a Lever Escapement.

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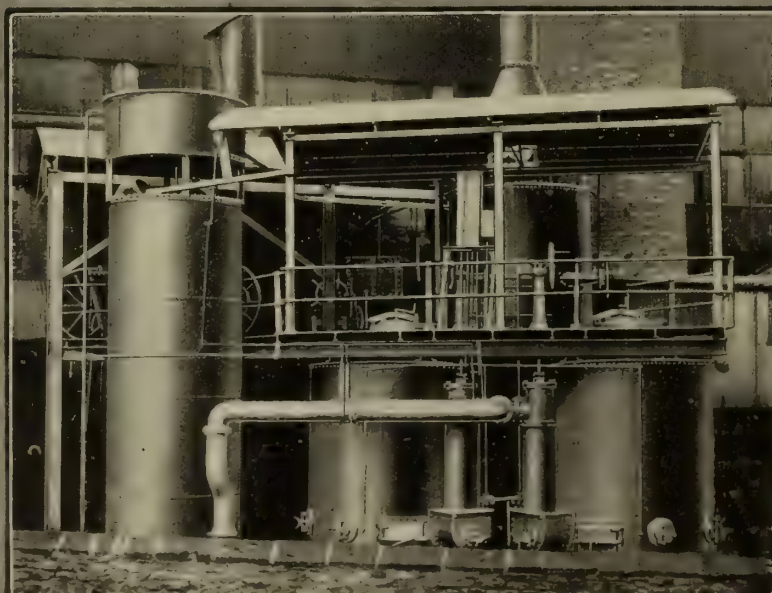
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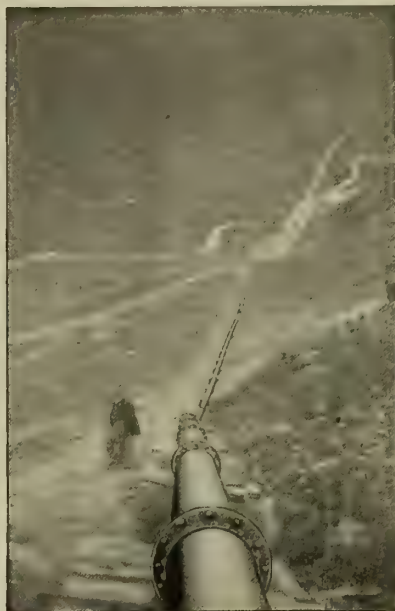
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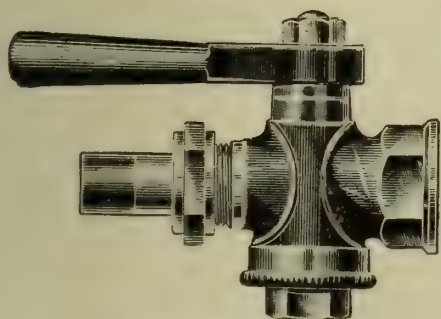
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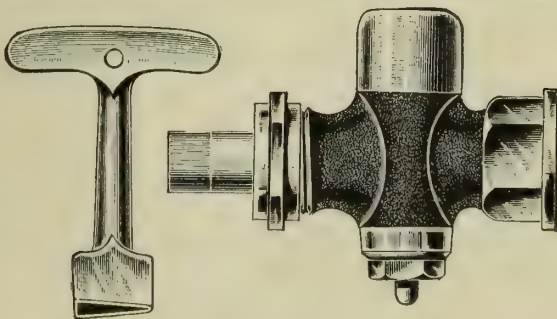
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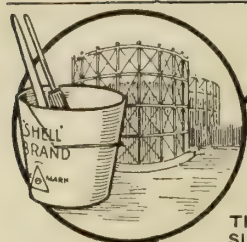
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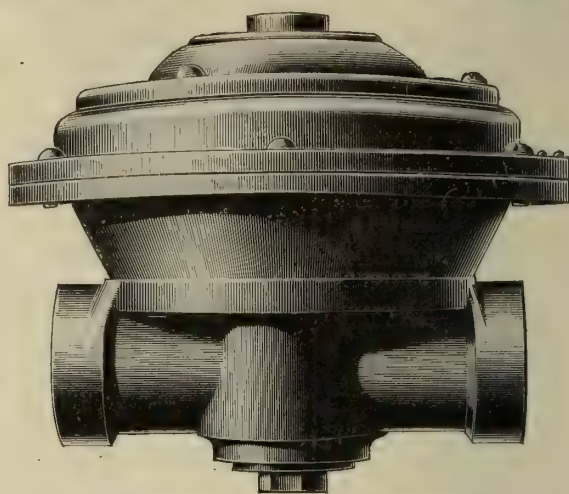


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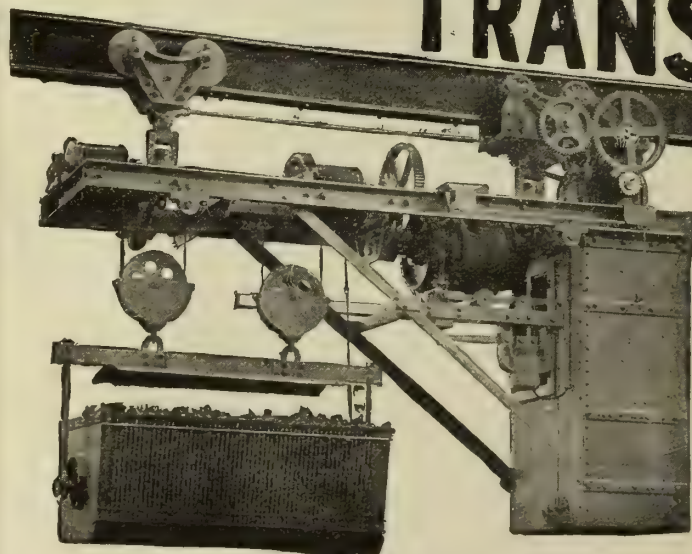
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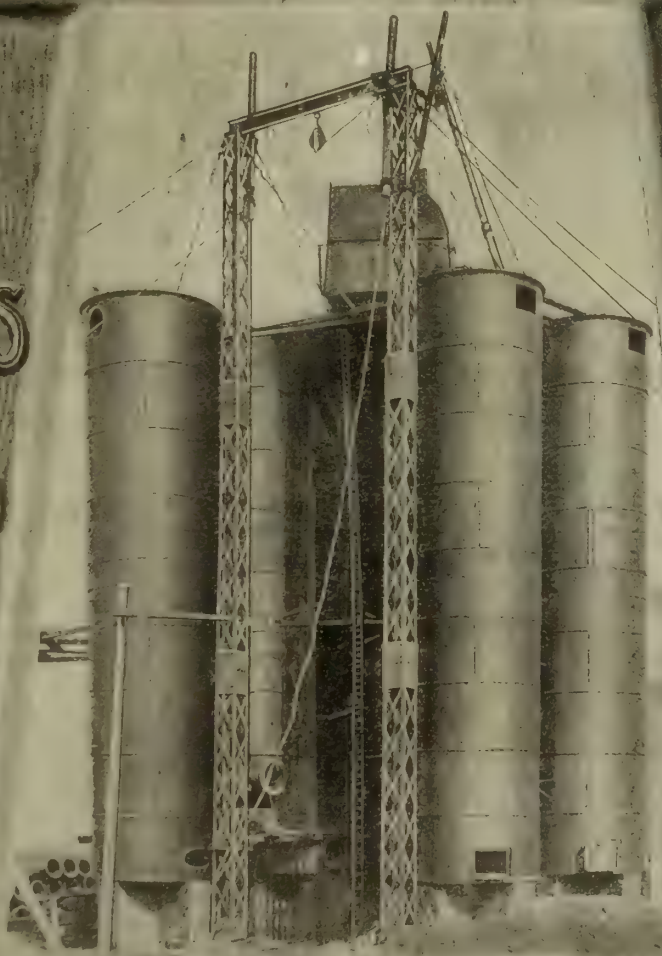
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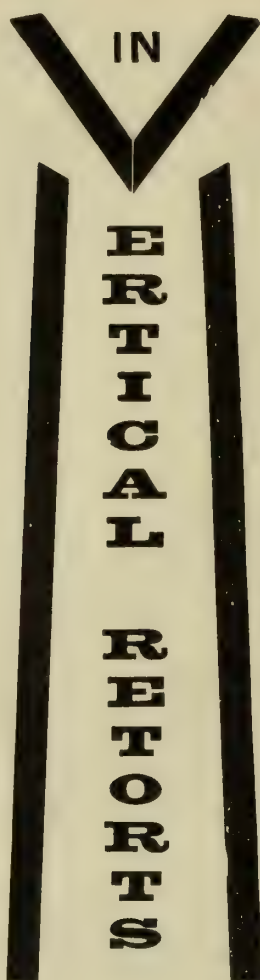
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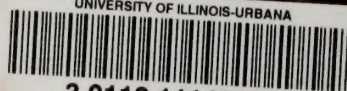
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